

# Challenge Based Learning (CBL): Implementation Guide for those who Teach

September 2021 (v.2.2)

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# What is CBL?

This guide provides an overview of Challenge Based Learning (CBL) and how it can be incorporated into your course design to enhance the student learning experience. While CBL has become an increasingly popular idea in higher education, there remains a lack of consensus on what it actually involves. Hence this guide seeks to provide a broad explanation of CBL, outline its underlying principles, and provide practical guidance that may be of value to those who are new to implementing this approach in their teaching.

CBL is a pedagogical approach that is increasingly being used in higher education to foster transversal skills, increase knowledge of socio technical problems, and enhance collaboration with industry and community stakeholders (Gallagher & Savage, 2020). Challenge Based Learning provides an efficient and effective framework for learning while solving real-world Challenges. The framework is collaborative and hands-on, asking all participants (students, teachers, families, and community members) to identify big ideas, ask good questions, discover and solve Challenges, gain in-depth subject area knowledge, develop 21st-century skills, and share their thoughts with the world' (Nichols, 2016, p.6). It is defined by the European Consortium of Innovative Universities (ECIU) project as 'a pedagogical approach that actively engages learners in a situation that is real, relevant and related to their environment' (Tecnologico de Monterrey, 2017). It takes place through identification, analysis, and design of a solution to a socio technical problem. The learning experience is typically multidisciplinary, involves different stakeholder perspectives, and aims to find a collaboratively developed solution, which is environmentally, socially and economically sustainable (Khon Rådberg et al, 2020, as presented at ECIU Online event on challenges and microcredentials on 28/4/21).

The focus of CBL is on investigating real-life problems related to pressing societal issues. Clearly the concept of a Challenge is consistently at the heart of the approach but there are many forms of challenge that may potentially be undertaken. Whether they involve hackathons, competitions, or design projects, Challenges are activities that require students of all levels to solve difficult problems. They can therefore serve as a powerful vehicle for authentic pedagogies that reflect the skills and competencies learners are likely to need in their future careers. The potential of CBL to achieve learning transfer (which Perkins and Saloman, 1992 describe as the application of learning to another context) is one of the most important justifications for its use and will be discussed further in the following section of this document.

CBL draws on experiential learning and shares some characteristics with both project and problem-based learning (PBL). The differences lie in the authentic nature of Challenges which are always based on real-world issues as opposed to problems or projects which simulate or reflect real life, but are fictional. Challenges are also broad and open allowing students to identify the specific aspect of the Challenge to be tackled in their project. Another key difference is the shared nature of CBL in that students, researchers, academics, communities, society and industry are key stakeholders in the Challenge, and it is explored and solved in a multi-disciplinary and multinational manner. Similarities rest in the manner in which all are collaborative, team-based approaches with a reliance on student autonomy, agency and regulation.

The short [CBL explained video](#) (Challengebasedlearning.org, 2013) provides a practical example of CBL in action and is highly recommended viewing to get a sense of how CBL can potentially work. Furthermore, the following graphic drawn from the recent CBL exploratory literature review by Gallagher & Savage (2020, p.15) provides a useful overview of CBL characteristics identified in their thematic analysis of the literature (Figure 1).

Figure 1: Characteristics of CBL



Source: Visual Extracted from Gallagher and Savage (2020, p.15)

## Why adopt CBL?

Why might educators consider adopting this approach? The following list summarises some common reasons:

- CBL's potential in enabling increased learning transfer: Psychologist and educationalist Howard Gardner (1999) wrote that learning is achieved when 'An individual understands a concept, skill, theory, or domain of knowledge to the extent that he or she can apply it appropriately in a new situation.' This ability to *apply* learning could be seen as central to the definition of learning itself - if a learner is not able to transfer their new-found knowledge to a different (non-academic) context, can it be truly said that learning has occurred? The educational research literature has shown us that learning transfer can be enabled through the use of authentic, real

world contexts. For example, numerous authors highlight the value that learners gain by immersing themselves in the types of activities they will be expected to perform in the workplace (Pitchford et al, 2021). This critical principle of learning transfer has previously been explored in Perkins and Salomon (1992) who describe how 'conventional educational practices' frequently fail to establish the conditions required for effective transfer (p. 2). They write that transfer seems to occur best under conditions where learners are given opportunities to: carry out extensive practice in a variety of contexts; develop explicit abstractions of underpinning principles; engage in activities to encourage active self-monitoring; develop mindfulness; and leverage metaphor or analogy.

CBL can play a valuable role in fostering such conditions. To explain this further, it may be useful to consider concepts of 'near' and 'far' transfer. Near transfer relates to transfer that takes place between similar (but not identical) contexts. Far transfer relates to transfer between very dissimilar contexts. Closely connected with these ideas are distinctions between 'High Road' and 'Low Road' transfer, as described in more depth in Perkins and Salomon (1992) and [Higher Education 4.0: Certifying Your Future](#), a recent DCU FutureLearn MOOC (2021). The potential impact of CBL in promoting the highly-coveted 'High Road Transfer' - that is, the mindful abstraction and application of new learning to new and very different contexts - could be significant.

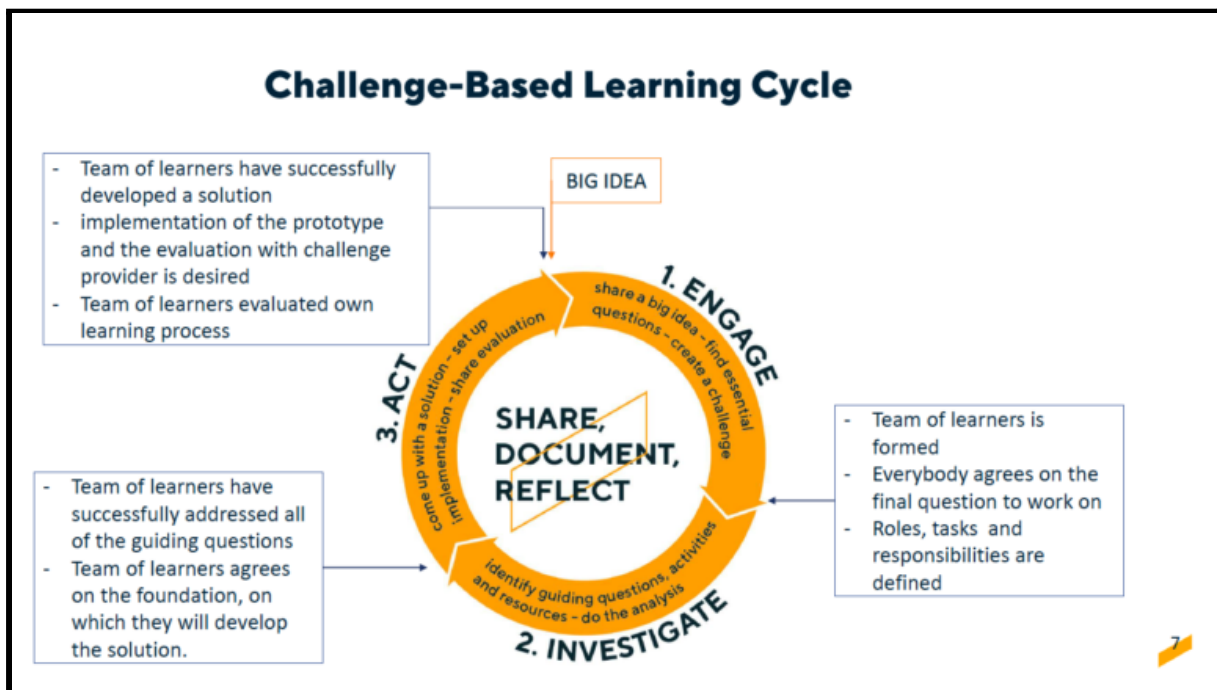
- As an emerging pedagogy, CBL adopts many of the central principles of active learning which is described as learning that engages students in the process of learning through activities and/or discussion, as opposed to passively listening to an expert (Freeman et al, 2014). CBL pedagogy, which will be discussed in more depth later, also draws on Dewey's (1902) thinking on experiential learning and innovative ideas from industries such as technology, entertainment, media, and education. It is intended to be flexible in its use and application, allowing for multiple points of entry (<https://www.challengebasedlearning.org>).
- CBL is designed to be collaborative, multidisciplinary and applied. It seeks to solve real societal and economic problems, using real world technology and resources. CBL takes problems that are realistic, open-ended, and complex in nature, as Challenges. It requires students and educators to take the teaching and learning outside of the confines of the traditional lecture hall into the real world (Cruger, 2018).
- Some high-profile companies, including Apple Inc, describe a disconnect between traditional methods of teaching, and the type of innovative graduate that they want to hire. 'Students today have instant access to information through technology and the web, manage their own acquisition of knowledge through informal learning, and have progressed beyond consumers of content to become producers and publishers. As a result, traditional teaching and learning methods are becoming less effective at engaging students and motivating them to achieve' (Apple, Inc., 2012, p.3).
- Research indicates that well-designed CBL experiences have the potential to broaden and deepen students' learning experiences while fostering increased creativity and higher-order thinking (Ngiamsunthorn, 2020). CBL also has the potential to foster deeper disciplinary and transversal competencies (Félix-Herrán, Rendon-Nava, AE, & Jalil, 2019). However, the benefits of CBL are highly dependent

on how it is implemented by educators, which is why the next section turns attention to supporting frameworks.

## How do you design for CBL?

CBL has a distinct framework that outlines the core phases of a CBL cycle. The framework provides a set of three interconnected phases that support teams making their way through the lifecycle of a challenge in a logical and structured way (Figure 2). The length of time teams spend in each phase is not prescribed, although it is influenced by the challenge format or size and the accredited or notional ECTS credits. The following sections explain what is involved in each phase.

Figure 2: CBL Framework



Source: <https://eciu.tuhh.de/595/> from ECIU Workshop hosted by DCU (January 2021)

### Engage Phase

The Engage phase is almost like the team inducting themselves into the big idea, identifying with it and defining where they would like to focus attention. It is, as it sounds, a time for everyone to connect and engage with the Challenge. It begins with a *big idea*, which is then explored and interrogated to facilitate design of *essential questions* that resonate with the team, and motivate them by way of a call to action in the form of a Challenge statement.

Each phase, including the Engage phase, ends with a reporting piece. This can be in the form of a presentation, recorded video, or written report. This piece of work will draw on

individual and team reflections on the process of exploring and agreeing the challenge statement. It might be helpful to explore the following [example of CBL reflection activity](#). Stakeholders provide feedback to help advance and direct the project. Throughout this phase, stakeholders can include the academic (i.e. discipline expert) leading the course or module, other class teams, discipline experts, researchers, members from society and/or industry.

**Ask Yourself:** What are the kind of questions the team would like to explore to help solve the challenge? Are these questions specific enough, and realistic in the time allocated?

## Investigate Phase

During this phase the team explores *guiding questions* that they need to answer in order to solve the challenge. In doing this they will identify the *guiding activities* required to answer questions. Some of these activities may require teams seeking master classes and further learning resources or objects. At this time, learners will liaise with the academic or tutor leading the challenge, and other stakeholders that can help direct them to finding information to help investigate their *guiding questions*. Once they have used the relevant activities and resources for investigation, the team will *synthesise and analyse* the data and information.

The concluding piece of this phase requires the team to share their work to date by way of report, presentation or any other appropriate medium. In sharing their work with stakeholders they will show how they went about finding and analysing the information in a way that helps them come up with conclusions, leading to recommendations and/or solution formulation. It is important that the challenge owner offers specific guidance and direction at this point.

**Ask Yourself:** What does the team need to know? How will they find this information? What does analysis of information tell the team?

## Act Phase

This final phase is where the solutions and recommendations are developed with input from the Challenge provider and other relevant stakeholders. Students will demonstrate multi-disciplinary and competence mastery in the solutions they are proposing. Analysis and synthesis during the Investigation phase will provide a strong basis for the first step in this phase, *solution concepts*. Following this step is *solution implementation* which includes plans to roll out the recommendations and/or implement the solution(s). In developing the solutions, prototypes and recommendations, students may be forced back to the Investigation phase to re-explore the data. Finally, in the *implementation and evaluation* step students may implement the recommendations and/or solution, or recommend



implementation to the challenge owner. Evaluation may take the form of inviting feedback from stakeholders, or preferably evaluating the actual implementation in an authentic environment. This evaluation, and team reflections, will form part of the final presentation and report.

**Ask Yourself:** What are the solutions and/or recommendations? How can they be implemented? How will the solutions/recommendations be evaluated?

## What does CBL look like within a course?

CBL is intended to challenge and engage learners in an authentic and collaborative learning experience that supports them in developing multidisciplinary expertise and transversal skills that will stand to them beyond their university experience. It offers a facility to motivate learners to engage in disciplinary areas that may not ordinarily engage them, by appealing to their empathetic nature and need for social justice. Challenges can take many formats and approaches so there is a wide range of flexibility in designing a course that includes CBL.

CBL experiences can be:

- part of an accredited programme
- an accredited micro-credential that forms part of a flexible learning pathway
- an unaccredited extracurricular course

Within an accredited programme the Challenge can be a module assessment used to drive learning; a shared assessment challenge between modules; or a capstone assessment challenge module at the end of a learning stage.

Other models include running the challenge alongside the entire stage with blocks of immersive time carved out of the timetable to work on the challenge. Regular modules can inform the Challenge in a more traditional way using challenge/problem/enquiry/project based learning, or by way of micro-credentials allowing students flexibility in their learning pathway towards solving the challenge. Three visual examples are outlined along with a brief description to help you unpack the diagram. Remember, these are examples and need to be interpreted and evolve to suit the specifics of each different situation and requirement.

## Examples of Different Models and Structure

Figure 3 is a visual representation of what Year One of a CBL programme might look like. It begins with a block of learning which includes a non-accredited induction piece (1 - 2 days), followed by a suite of introductory disciplinary modules that could be integrated perhaps through sharing an assessment challenge, or co-teaching. The focus will be on engaging with the discipline knowledge and the CBL framework (through module pedagogy). The second block of learning may include modules that offer greater discipline depth and specificity and use more investigative or inquiry-based learning approaches, again using challenges as assessment, and where possible sharing challenges and teaching across modules. Finally the year might end with a challenge that can be solved through application of learning and development from the first two blocks. Year two will be a natural progression of this approach, although nuanced differently to reflect the students' development both in disciplinary knowledge and transversal skill competency. Thus, perhaps less time will be required in block one and more time in block three.

Figure 3: CBL Framework with Capstone Module in Academic Year

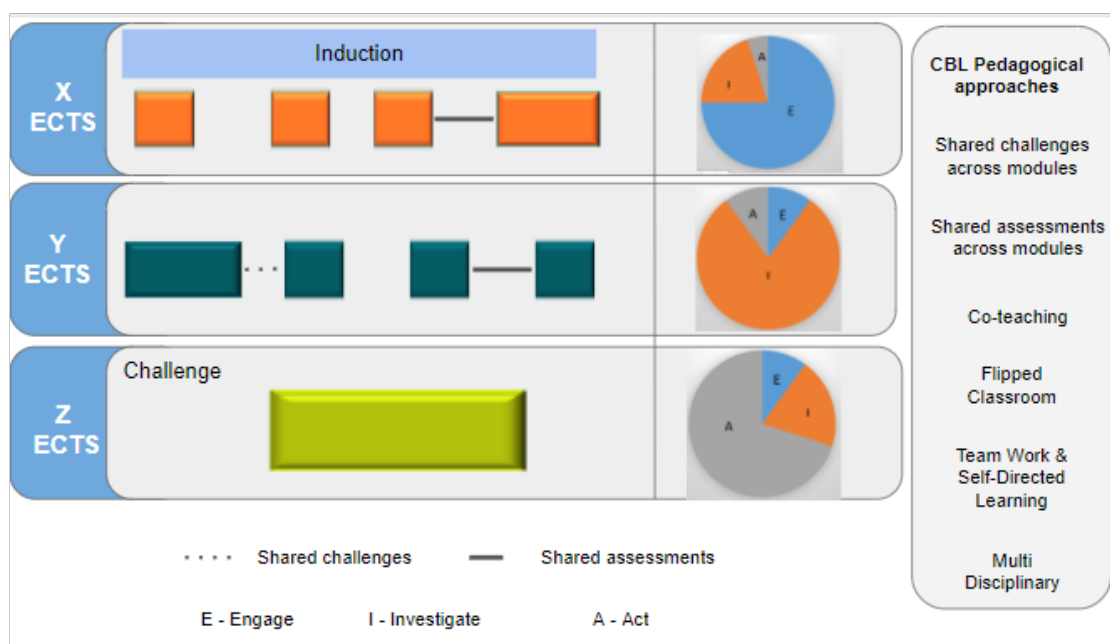


Figure 4 offers a different insight and illustration. In this example the CBL framework is embedded throughout the year with scheduled weekly hours working on the Challenge. The immersion weeks are full 40 hour weeks where students work on the challenge. In this case, student teams are assigned a mentor whom they meet with fortnightly. The coloured segments represent modules that feed into the challenge, different colours indicating different disciplines or streams. Some blocks are not yet defined and are left to meet the specific needs of the students as they complete the challenge. Each module contributes to the challenge, driven by both the learning outcomes and assessment.

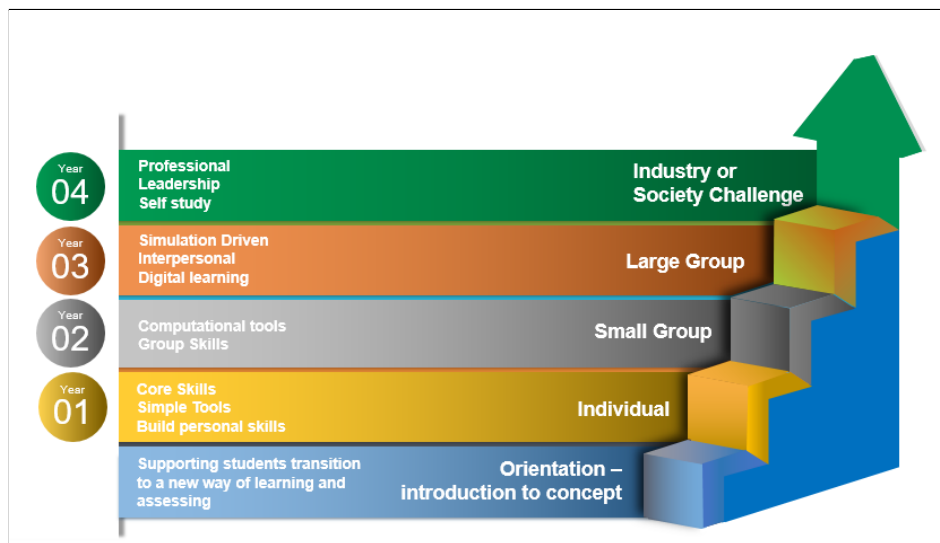
As students progress through their programme, each year can have greater emphasis and deeper engagement with a challenge, and more specifically the challenge provider and wider stakeholders who can inform development of realistic and creative solutions that enhance society and the economy.

Figure 4: CBL Framework Embedded in an Academic Year

Week	CBL F/work	Review Meetings						Challenge
1	Engage Diagnosis		Introduction (disciplinary and transversal skills and competencies)					
2		★						
3			5 hrs					
4		★	5 hrs					
5			5 hrs					
6		★	Immersion					
7	Investigate Proposal Development		5 hrs					
8		★	5 hrs					
9			10 hrs					
10		★	10 hrs					
11			15 hrs					
12		★	15 hrs					
13		15 hrs						
14	★	Immersion						
15	Act Proposal Implementation			TBC				
16		★	TBC		TBC	TBC		
17				TBC		TBC		
18		★	Immersion					

It is essential that each stage/year of the programme scaffolds the learners' journey. For example, in Figure 5, you can see that Year One is about supporting students to develop the core skills required to enhance their CBL learning experience in subsequent years, ultimately building up to a major industry or society challenge in Year Four. What is important to remember, is that students need to be inducted and socialised into this new way of learning, both horizontally and vertically, throughout the whole programme. It is the responsibility of the collective academic team to ensure this scaffolded journey is facilitated and underpinned with appropriate and evidence-based assessment design.

Figure 5: CBL throughout the Learning Journey



Source: 'Preparing our graduates for a rapidly evolving and unpredictable future' presentation by Dr. Blánaid White, May 2021.

The final example (Figure 6) shows how a module might incorporate the CBL framework. This example is taken directly from a challenge run by Professor Deiric O Broin in DCU as part of the ECIU project (You can read more about this in the case studies/scenarios section near the end of this document). The structure for this Challenge is one month for each of the *Engage*, *Investigate* and *Act* phases. Each phase begins with a workshop/meeting and ends with a reporting piece. For the first phase, *Engage*, the team reports by way of presentation. For the second phase, *Investigate*, the team provides an interim report and presentation; and for the last phase, *Act*, they provide a final report, including in the appendix an infographic and elevator pitch recorded video, both summarising the main points in the report.

Figure 6: CBL Framework in a VLE Module



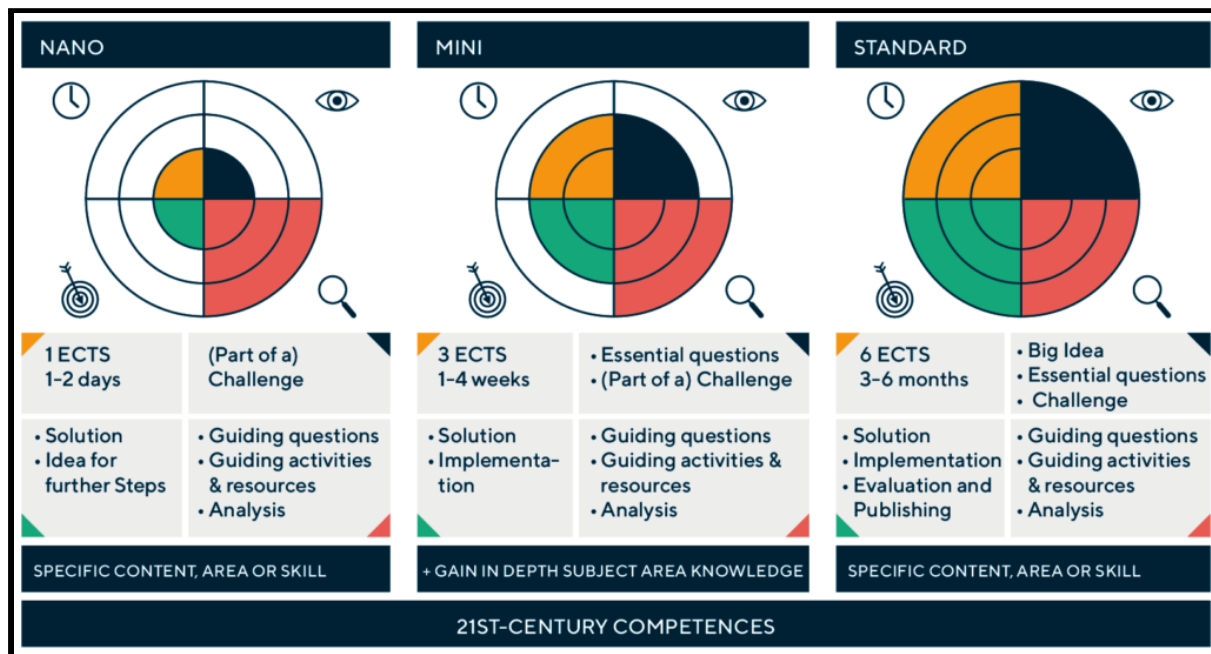
Source: ECIU DCU Challenge - Carbon Intensive Regions in Transition

## Challenge Formats

There are different formats/ways to incorporate and run a Challenge. As outlined above, some use a challenge to guide a module, or share a challenge between modules. In other cases the challenge can be a type of capstone project at the end of a period of learning. Challenges can be hackathons, competitions, design projects or an innovation-type week or course, sometimes referred to as iWeek or iLab. To give some idea of the size and work

involved in different challenges, ECIU uses three formats - nano, mini and standard (Figure 7).

Figure 7: Different Challenge Formats & Timeframes



Source: <https://eciu.tuhh.de/cbl-in-more-detail/>

The extent of time and engagement with the challenge can be equated notionally to European Credit Transfer System (ECTS) credits. As you can see a *nano* challenge runs for a number of days, thus influencing the level of engagement and investigation that can realistically occur. The nano challenge equates notionally to 1 ECTS credit. The DCUBS [Hack4Change](#) hackathon is a good example of a nano challenge. In a nano situation students work on a ready created challenge.

A *mini* challenge runs over a number of weeks and as such facilitates more time to engage with the challenge, to investigate potential solutions, and make some early or preliminary recommendations. Case studies one and two (see case studies section) are examples of mini challenges.

Finally, a *standard* format challenge typically runs over a few months and notionally equates to 6 ECTS credits. In this manner, a standard challenge can be a module within a programme (or stand alone as a micro credential) that uses a challenge to drive the teaching and learning experience. Examples of standard challenges can be found in case studies three and four. Further details on the key aspects that need to be considered when implementing CBL are discussed in the 'Where can I access support for implementing CBL?' section later in this document.

## Learning Outcomes

Like every other kind of learning and assessment activity in higher education, CBL needs to be [constructively aligned](#). This means that we should start with the outcomes we intend students to learn and align teaching and assessment activities to those outcomes. 'Learning outcomes primarily focus on what students should be able to do with their learning. Their main value lies in the fact that they offer a destination and explicit goals for the learning process' (Gormley, 2018, p.3). You might find it helpful to review this introductory [Guide to Writing Learning Outcomes](#), or you can engage with an interactive [Learning Outcomes Activity](#) to help you think through and capture potential learning outcomes.

Anything and everything that you would like to see in your 'transformed' graduate should be explicitly stated in programme, and module learning outcomes. This relates to achievement of both discipline knowledge and transversal skills. Additionally, learning outcomes stating what success looks like in a Challenge based environment should be explicitly called out. Module learning outcomes should be clearly aligned with the programme learning outcomes, and related to or integrated with other module learning outcomes. It is the sum of the collective module learning outcomes that support achievement of the programme learning outcomes.

# How do you assess CBL experiences?

As you are aware, all programme, and module learning outcomes must be assessed. Within a CBL framework all teaching, learning and assessment strategies are driven through engaging with authentic problems or challenges and seeking to solve them by providing considered and informed recommendations. There are various ways of achieving this as we shall now explore.

Assessment will drive the teaching and learning and so should be addressed first. When there is a distinct Challenge module, the thinking is that other modules will serve to prepare students for the ultimate Challenge. At the early stage of a programme, many of the modules will be introductory and could be related to the Engage phase of the CBL framework. Assessment strategies for these modules will include methods that facilitate students to see the relevance of the theory and conceptual frameworks to real life, and across different contexts. Discussions with DCU faculty have highlighted the need for a bank of technology-supported assessment exemplars across a range of disciplines. The resultant [bank of assessment exemplars and case studies](#) offers examples of a rich range of assessments including [ePortfolios](#), [vlogging](#), and [infographic creation](#). The screenshot below also outlines a range of possibilities to consider as part of your assessment strategy:

Figure 8: Potential Assessment Types

## Assessment Types - Plethora of options!



1. Asynchronous online discussion forum assessments
2. Challenge Based Learning assessment (e.g. from Hackathon)
3. Debates
4. H5P creation assessment (e.g. multimedia tutorial)
5. Immersive Learning assessment
6. Interactive Oral Assessment (conversation roleplay)
7. Interviews (e.g. interview an expert)
8. Lab-based assessment
9. Learning Portfolio (e.g. Loop Reflect)
10. Live or recorded group discussion/roleplay
11. Online quiz (MCQs, short answers, matching text e.g. Loop Quiz)
12. Oral examination
13. Peer assessment
14. Performance
15. Physical artefact creation
16. Poster creation assessment
17. Presentations (individual or group)
18. Project Based Learning assessment
19. Research project
20. Self-assessment
21. Self-designed assessment
22. Terminal written examinations
23. Timed skills demonstrations
24. Timed, open-book examinations
25. Video- or audio-based submission (e.g. video report or reflection; podcast)
26. Visual representations of designs or plans (e.g. [mindmaps](#) or models)
27. Website/wiki/web-based creation assessment
28. Work placement/internship performance evaluation
29. Written assessments (e.g. essays, reports, case studies)
30. Other (not listed)

Just as important as the specific assessment type though, is the knowledge and judgement of when it is appropriate to use it. As always, this should be informed by careful consideration of the intended learning outcomes and what would show evidence of achievement appropriate to different professional contexts.



Also important at this early stage are assessment methods that include opportunities to develop transversal skills, particularly ways of working (e.g. communication, teamwork), and tools for working (e.g. data and language literacy). Once the modules move into a more specialised disciplinary space, assessment methods that promote investigation, research, inquiry are called for (i.e. phase two of the CBL framework). This will require students to develop their transversal skills, in particular ways of thinking (e.g. critical thinking and problem solving). As students become more experienced learners they will be motivated and engaged with larger, more complex assessment approaches that are still authentic and collaborative, requiring them to develop tools for thriving (e.g. emotional intelligence, intercultural awareness and agility).

Finally, it is timely to mention that a recent JISC report (2020) on the future of assessment highlights five core principles for the digital world of assessment. These are that assessments should be: Authentic, Accessible, Appropriately automated, Continuous and Secure. Looking at Authenticity in particular, the opportunities for CBL assessment are evident: 'In a move away from the traditional essay or exam, assessments are building in authenticity by asking students to develop websites, set up online profiles, shoot and edit videos, and use social media. Crucially, assessment design encompasses the process as well as the end-product, giving students experience of working in teams and in ways they are likely to meet in industry' - ([Jisc, 2020, p. 9](#)).

## Reporting and Evaluating

A key element of CBL assessment is the reporting, dissemination and evaluating component. The CBL framework calls for multiple reporting and dissemination points across various modes (e.g. presentations, reports, video recordings, conference presentations etc.). The idea is that students are afforded many opportunities to share their work with a wide group of stakeholders (peers, academics, researchers, industry partners) that can inform and help them provide innovative and leading-edge solutions. These reporting or dissemination pieces will require students to reflect and act on the feedback or input they receive. Students learning as part of their reflection is key to successful CBL. Simple reflection tools can include use of Gibb's (1988) reflective cycle or Rolfe et al.'s (2010) model of reflective practice as described in the [example of reflection activity using Rolfe's model](#).

An important aspect of student development (such as personal agility) will be in their ability to interpret many types of feedback, and not exclusively the traditional feedback that comes by way of a tutor or peer using pre-agreed or designed marking criteria. What might be helpful for providing formative feedback is a single point rubric (see example in appendix), or a more detailed CBL rubric (also in the appendix). It is important to be aware, however, that busy industry or governmental bodies may not engage in this type of feedback. Their feedback could be by way of Q&A at the end of a presentation, or questions as a result of reading the report or seeing a video presentation. Check out the following example of a [report template](#) used as part of the DCU ECIU challenge. Another support resource is Prof. Deiric O Broin in conversation in a [15 min podcast](#), sharing tips and ideas to help develop and manage industry relationships.



On this important point of feedback, students will have to be discerning enough to appreciate and accept feedback in many different ways. This means that, with the support of staff, students will need to develop their 'feedback literacy' which can be defined as the understandings, capacities and dispositions needed to make sense of information and use it to enhance work or learning strategies. 'Students with well-developed feedback literacy appreciate their own active role in feedback processes; are continuously developing capacities in making sound judgements about academic work; and manage affect in positive ways.' (Carless & Boud, 2018, p. 4). Feedback literate students will recognise the feedback comes in many forms and potentially from many people. Therefore the use of targeted activities to develop student feedback literacy becomes critical. Two particular developmental approaches are recommended: 1. Activities where students are asked to compose and receive peer feedback and 2. Activities that provide opportunities to analyse exemplars of varying levels of quality. When employing peer feedback in particular, students should be coached in ways of composing specific and relevant feedback and then provided with 'feedback on their feedback' to help them learn how their commentaries might be improved. (Carless and Boud, 2018). It is also important to highlight that teaching staff need to communicate the rationale for these types of activities, highlighting potential benefits and flagging potential obstacles that might arise. The need to dedicate time for this purpose should not be underestimated.

## Co-Assessment

Co-assessments where the assessment (brief, challenge, problem) is shared across modules is a very good example of an approach that promotes interdisciplinary and skill development. Disciplinary competence can be enhanced when combined with an assessment that expects students to demonstrate transversal skills that might be developed in another module e.g. data or language literacy type modules. Equally discipline modules can complement each other and this is best demonstrated to the learner by shared assessment. These shared assessments can be weighted to suit the requirements of each module. For example, 30% of a module assessment could be assigned to a shared challenge, thus leaving 70% for discipline or module specific assessment. This can reduce the risk of losing the opportunity to drive discipline-specific learning through assessment.

## Synoptic Assessment

One potential form of co-assessment is called Synoptic Assessment. A Synoptic Assessment combines two or more modules of study into one assessment (Leeds Beckett University, 2020). It refers to the evaluation of students' ability to link different areas of the syllabus and understand a subject in a holistic manner (Constantinou, 2020). The UK QAA Code of Practice specifically defines it as: 'Assessment through a task that requires students to draw on different elements of their learning and show their accumulated knowledge and breadth and depth of understanding, as well as the ability to integrate and apply their learning' (QAA, 2016)

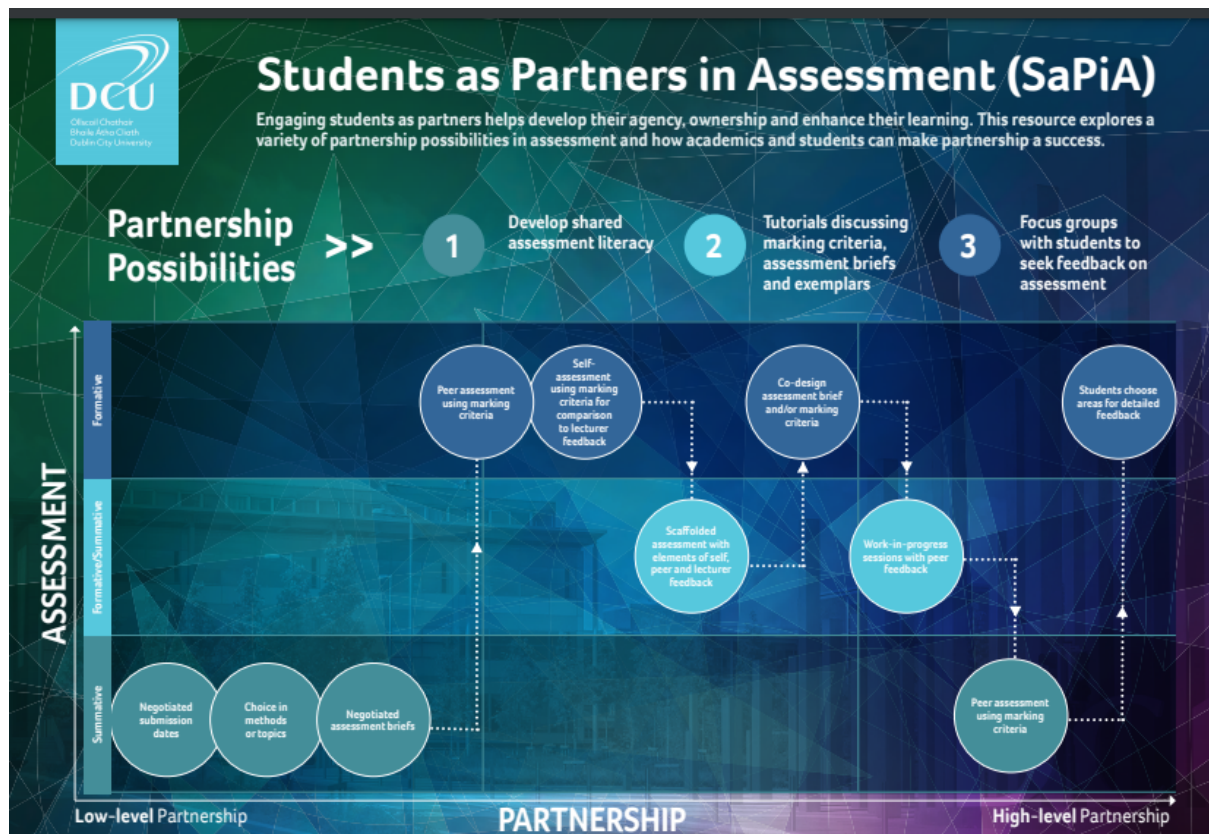
Use of this approach can help to reduce the module 'silo' effect and allows students to make stronger connections between what is learned between modules, leading to deeper learning. It can be used to assess two (or more) modules at one level (either across one or two semesters). This approach focuses more on the process of learning, rather than the outcome, and requires careful planning, communication, and co-ordination across teams right from the outset of the design phase. 'Combining assessments across modules requires staff and students to adopt a 'big picture' approach where the emphasis moves from the reproduction of content to the evidencing of graduate attributes. This in turn shifts the students' thinking from subject-centredness to problem-centredness, thereby supporting knowledge transfer' (National Forum Programme Assessment Resource, 2019, p. 73).

## Students as Partners in Assessment

Any assessment method that has students as partners has the potential to develop many of the DCU required transversal skills, especially ways of thinking and tools for thriving. This is because students are invested, and have a sense of agency in the assessment from the beginning (Ní Bheoláin et al, 2020). When students are partners in assessment they are thinking critically about the best way to negotiate or co-design an assignment or rubric with their lecturer/fellow students or external stakeholder. This involves a certain degree of emotional intelligence and personal agility, depending on the level of partnership. In particular, assessment opportunities that require students to self- or peer-assess are very valuable. In CBL self and peer assessment can be embedded in both formative and summative assessment, by using learning contracts where students can, perhaps with a mentor, define their own learning goals.

Figure 8 offers examples of partnership opportunities that you might consider using. The X axis helps to show partnership examples moving from low level to high level. The level relates to the experience of students i.e. whether they are first year undergraduate vs final year or postgraduate students. The Y axis helps you position, or guide you to using the examples in relation to summative or formative assessment.

Figure 9: Students as Partners in Assessment (SaPiA)



Source: <https://bit.ly/sapia>

## Eportfolio

Eportfolios are designed to make learning visible through the creation of a personalised and reflective living showcase of academic, professional, and personal achievements, thus they provide an effective and efficient way to support CBL assessment. Through their use of many media including text, images, video and more, they are seen as a dynamic online medium for recording and showcasing learning as well as a powerful tool for reflection.

Eportfolio provides the opportunity to creatively engage with long term learning activities, assess learning, and make connections across course concepts. Loop Reflect is the eportfolio available to all DCU students and faculty. Initially launched to enable students to capture and share graduate attributes, it is now used extensively across DCU for assessment and co-curricular purposes. Reflect is based on the open source Mahara platform. Further information on the Reflect eportfolio is [available on the TEU website](#) and substantial help and practical how-to videos are available on the [Help](#) page. You may also wish to explore an [ebook](#) featuring case studies on eportfolios in action across all disciplines.

## What other teaching methods support CBL?

As mentioned earlier CBL has close links with active learning approaches that seek to engage students through activities and discussion to help develop higher-order thinking and forge a deeper connection with the subject matter. In a large STEM-focused study, Freeman et al (2014) found that student performance was significantly improved in courses utilizing active learning approaches - the mean failure rate was found to be 12% less in active learning courses than those that employed very traditional lecturing methods. In Chickering and Gamson's (1987) earlier paper, active learning techniques are said to be one of the Seven Principles of Good Practice in Undergraduate Education. These authors write that students 'must talk about what they are learning, write about it, relate it to past experiences, apply it to their daily lives. They must make what they learn part of themselves' (p.4). If you are an educator looking for ideas on how to go about it, this recommended quick guide on [Embedding Active Learning into Your Teaching Practice](#) provides clear advice and multiple practical examples for use within and beyond the classroom (Healey & Healey, N.D).

CBL also builds on ideas within Dewey's experiential and inquiry-based learning (1902). Dewey is attributed as one of the earliest proponents of inquiry learning and viewed knowledge as hypothetical and more related to the learners' experience and interpretation of the knowledge combined with the learning environment presented to them. In this regard, the learner is not wrong when they come to an incorrect conclusion; they are simply on a discovery route to the correct conclusion. Dewey advocated a curriculum of inquiry that combined the needs of the learner, society and content; and viewed the teacher as a facilitator through activity and reinforcement.

However, in the interest of balance, it is important to note that concepts associated with active learning and Dewey are not without critics. For example, Kirschner, Sweller & Clark (2006) argue that minimally guided instruction approaches are less effective than those that place a strong emphasis on guidance ('direct instruction') of the student learning process, especially with novices. Furthermore, Garrison, Neubert and Reich (2012) ask for Dewey's theories to be reconsidered in light of more modern theories of constructivism. Such evidence suggests that the unique requirements of every context need to be considered, a range of pedagogical approaches are likely required, and there is no simple 'one size fits all' template suitable for all disciplines.

Whatever the context, designing a learning environment where the academic facilitates learning through students inquiring or interrogating information *is* central to CBL. The following table outlines some complementary potential pedagogies to consider in support of CBL, with a brief description of why those are particularly useful in a CBL context:

<b>Audience</b>	<b>Pedagogical Approach</b>	<b>Why useful for CBL</b>
Student & Teacher	Flipped Learning	Enables access to and learning of material in advance of in-person session. Frees up much of the traditional class time for teamwork and discussions while also ensuring key concepts

		and theory are taught in a supportive and interactive manner.
Student & Teacher	Group Work	Knowledge of how to engage in collaborative group work is a key component of successful CBL projects. Academics need to be mindful that they need to prepare students for engaging in group work.
Teacher	Co-teaching	CBL's multidisciplinary focus may require modules to share assessment and teaching. Co-teaching can help to move away from 'silo' thinking.
Teacher	Peer Observation of Teaching (POT)	Peer observation offers an opportunity to learn from others teaching practice in a structured and supportive way. With so much new to learn about CBL, this may be an efficient way to learn from each other.

Further details and links to learn more about these pedagogies are available below.

## Flipped Learning

The Flipped Learning Network (FLN) define flipped learning as 'a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter' (FLN, 2014). FLN differentiate flipped learning from flipped classroom in the way that flipped learning intentionally creates a learning environment that supports learning beyond students engagement with the flipped classroom material (e.g. watching a video or reading an article in advance of class). Simply put, flipped learning is where the theory, concepts, computations and technical demonstrations are prepared in advance and made available through the VLE, Loop, often by way of videos. More recently, technologies like H5P allow video content, and other content, to be presented together as part of an interactive learning object. An example of a H5P learning object, which includes video and pdf content, and opportunities for the students to record their reflections/learnings, is the [reflective learning activity](#) used in case study 3, mentioned earlier. The objective of flipped learning is that students engage asynchronously with pre-prepared material, thus facilitating the use of synchronised time for exploratory discussions and application of the material learned in their own time.

As with any pedagogy, a range of considerations need to be factored in when deciding on a Flipped Learning strategy. Simonson (2017) includes a matrix of important questions to be considered when choosing whether or not to flip. These context-related factors include the course/content (e.g. Is it factual or procedural content in which students can learn the facts or steps before class and spend in-class time practicing and applying?), situational (e.g. Is active learning encouraged in institutional policy?), student (e.g. are students motivated to

do out-of-class activities?) and instructor (e.g. are you comfortable with this approach?). When time allows, the Lundin et al (2018) literature review on flipped classroom research may be of interest.

## Effective Group Work

A key component to successful CBL projects is effective group work. A toolkit for group work developed by DCU colleagues, provides academics with examples, resources and tips for planning and executing group work with students. This resource is available on the [Loop Staff Support page linked here](#).

Loop functionality facilitates and enables synchronous and asynchronous group activities. [The infographic in the appendix](#) provides many ideas and guidance in this regard.

## Co-teaching

CBL is most effective when there are a variety of disciplines working together. One of the main features of CBL is that challenges are solved in a multi-disciplinary manner. This may require modules to share assessment and teaching, thus helping to reduce the module silos of traditional models of curriculum in higher education. Traditional timetables and structures should look and feel completely different in a CBL context. There should be more integration, fluidity and flexibility across a programme with blurred boundaries. Learning should be driven by the needs of societal and economic imperatives rather than content, and should be entirely student centric. Co-teaching offers these changes both conceptually and practically. Additionally, co-teaching within CBL contexts, offers educators support in an uncertain learning environment where content is no longer king, and educators are learning with students and external partners/stakeholders. This exciting journey can be made a little less intimidating with the support of colleague(s) through co-teaching.

## Peer Observation of Teaching (POT)

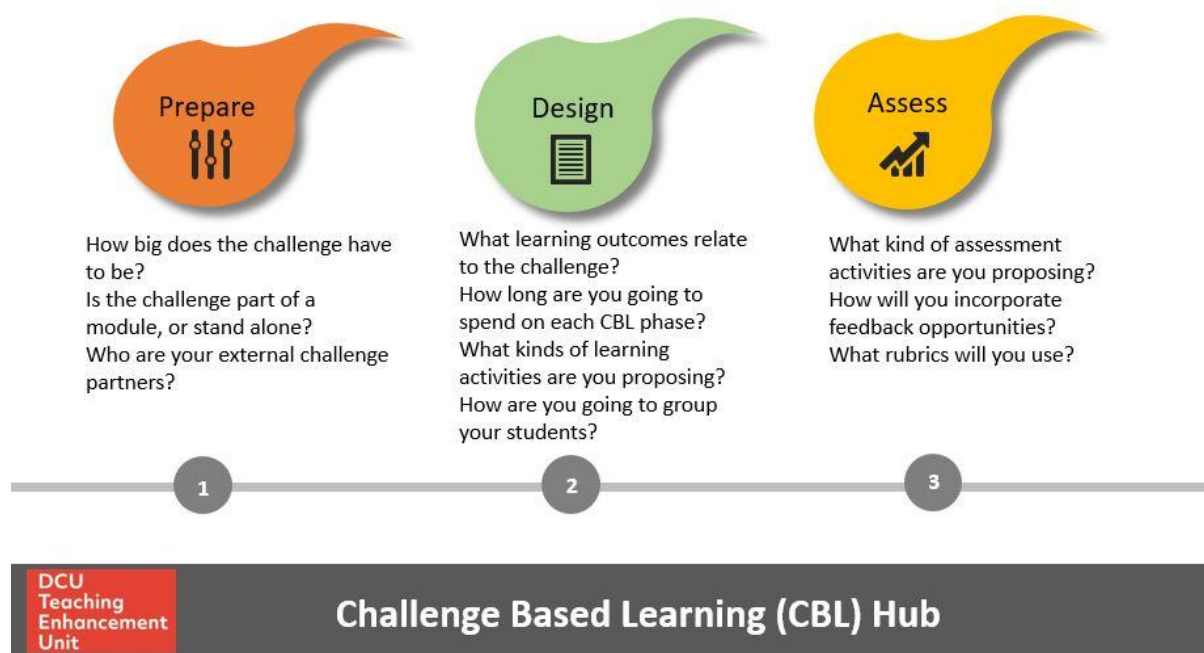
Peer observation can be a useful professional development tool for academics at any time. But perhaps more so now, with the DCU Futures project where innovative and new pedagogies, such as CBL, are being rolled out. Observing one's peers offers great opportunities to learn from each other, both as an observer, and as an observee. Research shows that peer observation can help nurture collegial relationships, build confidence and support professional development, in an authentic, efficient and effective manner. (Lincoln et al, 2021). DCU TEU has developed a [POT User Guide](#) (informed by a detailed scoping literature review) for those who wish to engage in this process.



# Where can I access support for implementing CBL?

The Teaching Enhancement Unit (TEU) is designing a CBL Hub to support academics engaging in CBL in any format or guise. The CBL Hub will offer support both asynchronously and synchronously in the form of workshops, drop in sessions, and online Loop resources such as exemplars, podcasts, videos and case studies. Figure 8 shows the structure of the CBL Hub framework. All activities and supports will be designed around this support framework, and will be influenced and led by the realtime needs of academics engaging in CBL. The following diagram includes some of the key questions to be addressed within this process:

Figure 10: TEU CBL Hub



If CBL is something you are engaging with, or considering using as an approach, know there is support. Also feel free to reach out if you have any recommendations or contributions to make to this Implementation Guide. We welcome input in terms of examples through brief case studies or audio/visual recordings etc. Contact [fiona.m.oriordan@dcu.ie](mailto:fiona.m.oriordan@dcu.ie) or [clare.gormley@dcu.ie](mailto:clare.gormley@dcu.ie)

# CBL Glossary

Some of the terminology used in conjunction with CBL may seem somewhat alien. Below is a glossary of commonly used terms related to various aspects of CBL.

Term	Description	Reference
<a href="#">Act phase</a>	<p>This is the third and final phase in the CBL framework - the first phase is <i>Engage</i>, and the second is <i>Investigate</i>. During this <i>Act</i> phase, teams are designing <i>solution concepts</i> offering several possible solutions. These are used by the team to choose the best solution and begin designing prototype and/or recommendations for that solution. This facilitates <i>solution implementation</i> and <i>evaluation</i>. Lessons are learned.</p>	<a href="#">ECIU guide for teamchairs/facilitators</a>
<a href="#">CBL Assessment</a>	<p>This is evaluation of the team's performance in relation to solving the Challenge and achievement of the learning outcomes. The outcomes should include evaluation of the proposed solution and its impact, and the process of coming to that solution, in addition to disciplinary expertise and transversal skills.</p>	<a href="#">Example set of challenge learning outcomes.</a>
Challenge	<p>An authentic real life economic or societal challenge that provides a stimulating environment for in-depth learning, experimenting with problem-solving skills, and innovative competencies to develop practical solutions. The external stakeholder works with the university (academics/researchers/students)</p>	<p><a href="https://challenges.eciu.org/">https://challenges.eciu.org/</a></p> <p><a href="#">Example of a DCU challenge</a></p>



	to solve the challenge in a multi-disciplinary manner.	
<a href="#">Challenge Based Learning (CBL)</a>	<p>It is a pedagogical approach that actively engages students in a situation that is real, relevant and related to their environment, which involves defining a challenge and implementing a solution. Core to CBL is that students take charge of their own learning.</p> <p>Challenge Based Learning is a collaborative learning experience in which teachers and students work together to learn about compelling issues, propose solutions to real problems, and take action. The approach asks students to reflect on their learning and the impact of their actions and publish their solutions to a worldwide audience.</p>	<p><a href="https://www.dcu.ie/teu/challenge-based-learning">https://www.dcu.ie/teu/challenge-based-learning</a></p> <p><a href="https://images.apple.com/education/docs/CBL_Classroom_Guide_Jan_2011.pdf">https://images.apple.com/education/docs/CBL_Classroom_Guide_Jan_2011.pdf</a></p>
<a href="#">Challenge Based Learning (CBL) Framework</a>	A three-phased approach used to solve real life challenges. Each phase is interrelated and supports all stakeholders through the process of solving challenges. The three phases are (i) Engage; (ii) Investigate; and (iii) Act.	<a href="https://www.challengebasedlearning.org/">https://www.challengebasedlearning.org/</a>
<a href="#">Challenge format</a>	The kind or type of challenge relates to the time spent on the challenge which in turn influences the extent and depth of investigation and action. ECIU supports three formats - <i>nano</i> , <i>mini</i> and <i>standard</i> .	<a href="#">CBL@ECIU guide</a>
Challenge stakeholders	Universities, students, researchers, society and businesses come together to share knowledge, experience and	

	passion to solve real-life challenges.	
<a href="#">DCU Futures</a>	<b>DCU Futures</b> will transform the learning of undergraduate students, reconceptualising how we teach, introducing exciting new areas of study, and embedding the digital literacies, disciplinary competencies and transferable skills students will require to thrive in the post-COVID19 world. With industry partnerships, it will establish a structured pathway that focuses on the development of 21st century skills and create capacity for over 1,000 additional students.	<p>The DCU Futures project involves a number of new terms and concepts which merit explanation. <a href="#">DCU Futures Glossary</a> provides pointers and definitions around key project components.</p> <p>Prof. Deiric O Broin in conversation in a <a href="#">15 min podcast</a>, sharing tips and ideas to help develop and manage industry relationships.</p>
ECIU	European Consortium of Innovative Universities, the first European university where learners, teachers and researchers cooperate with society and businesses to solve real-life challenges. DCU is one of twelve members of ECIU and running pilot challenges as part of this project.	<p><a href="https://challenges.eciu.org/">https://challenges.eciu.org/</a></p> <p><a href="https://www.dcu.ie/research/eciu-university">https://www.dcu.ie/research/eciu-university</a></p>
<a href="#">Engage phase</a>	This is the first phase in the CBL framework. The steps in the Engage phase are the <i>big idea</i> which is the Challenge itself, then the team teases out <i>essential questions</i> to make the challenge more tangible and specific through agreeing questions and an <i>actionable challenge</i> where the team defines the problem they want to work on i.e. a call for action from the team.	<p><a href="#">ECIU guide for teamcher / facilitators</a></p> <p><a href="#">Example of presentation template for student to report on their progress during the engage phase.</a></p>

<a href="#">Investigate phase</a>	<p>This is the second phase in the CBL framework. In this phase teams use <i>guiding questions</i> to find out what information they need to solve the challenge and what <i>guiding activities</i> are required to find that information. Once they have the required information they need to <i>synthesise</i> and analyse it in relation to the actionable challenge agreed during the Engage phase.</p>	<a href="#">ECIU guide for teamcher / facilitators</a>
<p>Mini challenge format</p>	<p>This challenge runs for about 3 weeks and notionally equates to 3 ECTS credits. The focus is on investigation and recommendations. The other formats are <i>nano</i>, and <i>standard</i>.</p>	<a href="#">CBL@ECIU guide</a>
<p>Nano challenge format</p>	<p>This is part of a challenge. It usually runs for 1 - 2 days and notionally equates to 1 ECTS credit. The focus is primarily on investigating. The other formats are <i>mini</i> and <i>standard</i>.</p>	<a href="#">CBL@ECIU guide</a>
<p>Problem Based Learning (PBL) / CBL</p>	<p>Students use pre-acquired knowledge to solve fictional or simulated problems in PBL; whereas in CBL they acquire knowledge to solve real-life challenges. Evaluation of the solutions provided by students in PBL relates to the level they are studying at; in CBL evaluation is related to the best solution for the challenge. In PBL the problem is provided by the university; in CBL the challenge is provided by an external stakeholder.</p>	<p>Extract from a <a href="#">presentation</a> by Jorge Membrillio-Hernández (Technologico De Monterrey) at ECIU CBL working group meeting November 2019.</p>

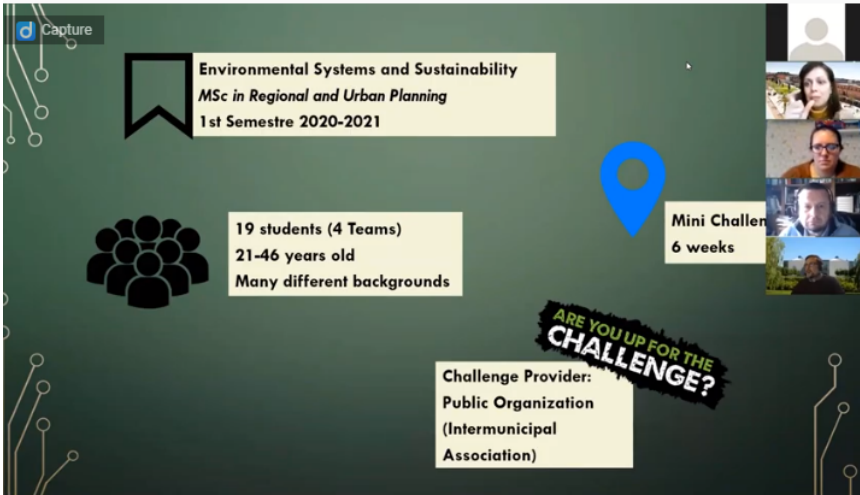
Single point rubric	A type of rubric where a single level of competency must be demonstrated as a sufficient level of achievement. Can be used to provide feedback to teams in terms of suggested improvements and acknowledging good work. This can be a feedback tool to guide reporting and feedback at each phase of the CBL framework i.e. engage, investigate, and act.	<a href="#">Example of single point rubric</a>
Standard challenge format	This embraces the full CBL framework and usually runs for 3 - 6 months. It notionally equates to 6 ECTS credits. The other formats are <i>nano</i> , and <i>mini</i> .	<a href="#">CBL@ECIU guide</a>
Student teams	<p>Student teams can be formed in different ways:</p> <ul style="list-style-type: none"> <li>● predetermined based on project needs and individual competencies</li> <li>● organised based on students' preferences</li> <li>● self-organised</li> </ul> <p>Teams are advised to agree on a team contract to guide performance and behaviour.</p>	<p><a href="https://www2.tuhh.de/zll/challenged-based-learning/#support">https://www2.tuhh.de/zll/challenged-based-learning/#support</a></p> <p><a href="#">Infographic resource used to support teams</a></p> <p><a href="#">Example of team contract</a></p>

<p>Teamcher</p>	<p>This is an ECIU term for the challenge facilitator(s) i.e. academics with disciplinary expertise in the university. They support and guide student teams, using the CBL framework of engage, investigate and act phases, to solve the challenge. This will involve supporting both the process (transversal skills and competencies) and disciplinary knowledge. They will do this with innovation and creative-thinking, building student's self-confidence to be the drivers of the learning process</p>	<p><a href="#">ECIU working definition</a></p>
<p>Universal Design for Learning</p>	<p>When planning a course or module, it is important to be mindful of the principles of Universal Design for Learning (UDL). UDL proposes a set of principles for curriculum development that gives all individuals equal opportunities to learn, including students with disabilities. To achieve this, it is helpful to consider some pointers around how you design the Loop (Moodle) page for each module or Challenge. By having consistency across Loop, students will be better able to navigate their way around each Loop page (module) - <a href="#">Loop UDL Video Guide</a>. The <a href="#">checklists available on the DCU TEU webpage</a> might also be helpful when designing an inclusive CBL experience for all students.</p>	

## Case studies/scenarios

If you're looking to brainstorm ideas about potential challenges, it might be useful to browse the 50+ challenge vignettes at [in.genious.eu](http://in.genious.eu) - this site has a good search facility and might be useful when trawling for initial ideas. For more examples of CBL in teaching, learning and assessment, see the list of short case studies below. This bank of case studies will be extended over time.

### Case Study 1: Environmental Systems and Sustainability

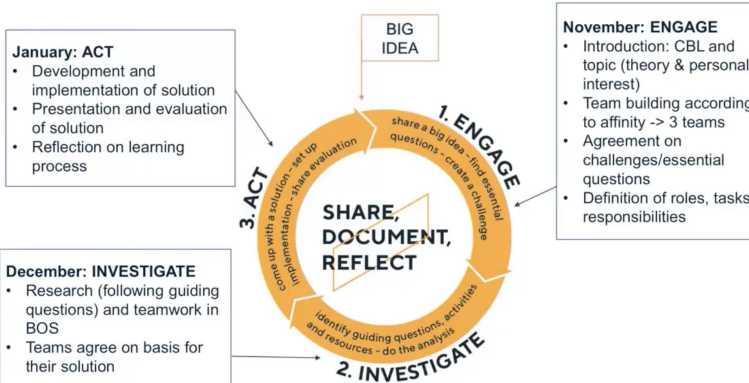
University	University of Aveiro
Title	Environmental Systems and Sustainability
CBL Format	Mini Challenge
<a href="#">Learning Outcome(s)</a>	<ol style="list-style-type: none"> <li>1. Understand the concept of environmental system;</li> <li>2. Identify and understand the major environmental problems;</li> <li>3. Integrate environmental notions at local, regional and global scales;and</li> <li>4. Understand the interdependence of the environmental systems with the social, economic and political systems.</li> </ol>
Discipline and focus	Regional and Urban Planning
What was done?	<p>This example is a re-design of a module where they condensed a typical unit of content lecturing to three phases of CBL framework.</p>  <p>The screenshot shows a Padlet board with the following information:</p> <ul style="list-style-type: none"> <li><b>Environmental Systems and Sustainability</b> MSc in Regional and Urban Planning 1st Semestre 2020-2021</li> <li><b>19 students (4 Teams)</b> 21-46 years old Many different backgrounds</li> <li><b>Mini Challenge</b> 6 weeks</li> <li><b>Challenge Provider:</b> Public Organization (Intermunicipal Association)</li> <li><b>ARE YOU UP FOR THE CHALLENGE?</b></li> </ul> <p>This was run as a reduced version of the typical course they gave traditionally, but with more time allowed for team work. Weekly timetable of 4 hours. Students work in their teams during the timetabled time. The final hour every week each team presents to each other and receives feedback.</p> <p>This example shares examples of templates used to guide the students in their work. Padlet used as a tool to support teams.</p> <p>Learnings:</p>

	<ul style="list-style-type: none"> <li>• More input from, and better relationship with the challenge provider. Investigation phase suffered as a result.</li> <li>• Students were highly motivated.</li> <li>• Good experience working in a multi-disciplinary team and professional skills developed.</li> <li>• Very rewarding for both academics and students.</li> </ul>
Further information	<a href="#">Link to recording of this example</a>

## Case Study 2: TUHH all online?!: Designing accessible e-Learning

University	Hamburg University of Technology
Title	“TUHH all online?!: Designing accessible e-Learning”
CBL Format	Mini Challenge (Equates to 2 ECTS)
Learning Outcome(s)	<ul style="list-style-type: none"> <li>• Reflect on social, cultural, historical and discursive context;</li> <li>• Make online teaching and learning more accessible.</li> </ul>
Discipline and focus	Engineering - but open to students from multiple disciplines
What was done?	<p>The specific challenges (as identified by three teams of students) were to:</p> <ul style="list-style-type: none"> <li>• Design a concept for a platform/Learning Management System that enables learning groups to work together and organise themselves independently in the best way possible</li> <li>• Design a digital rating system and tool to compare, evaluate, and enhance existing communication platforms to provide a more suitable solution for students online communication, collaboration, and social networking</li> <li>• Design a concept to facilitate digital communication and increase transparency between administration and students</li> </ul> <p>This was an elective, non-technical course for Masters students which was delivered fully online Nov 20 - Jan 21. There were 11 participants. In this pilot project, there was no external stakeholder involved.</p>

### Course structured according to Challenge-Based Learning Cycle



The Engage Phase introduced students to CBL and theoretical aspects of the challenge (such as ableism and inclusion). It was found to be very important to build on the personal experiences and interests of participants. Time was spent reflecting on the experiences of the previous semester (which also had been fully online). Then team building commenced and three teams were formed according to their interest. These teams identified the challenges and essential questions, defining roles, tasks and responsibilities at this point. At the end of this phase small group presentations took place and each student was asked to identify their personal learning goal(s).

The Investigate Phase is where students carried out research on their topic, following the guiding questions and spending time in breakouts to work on their challenges. At the beginning of this stage, interviews were held with each team (30 minutes per team, 1 teacher) in a relatively informal way to ensure that guiding activities and resources were being used effectively. Written feedback was provided.

During the Act phase the teams worked on implementing their proposed solutions. They also presented and reflected on their solution and on the learning process throughout. At the end of the course final group presentations took place where external experts attended and gave feedback. Students were asked to present products, solutions and reflections of the learning process at the individual and team level and written feedback was provided.

Padlet was used as a tool for organising and collaborating throughout the project, alongside frequent Zoom meetings (90 mins per week) where everyone met in plenary and breakout sessions. Team teacher observations and experiences highlighted that the project was relatively demanding of students workload but also highly motivating. One of the teams initially required significantly more support than the other two to produce a quality output. However it was deemed that overall, the volume of supervision and feedback was adequate and rewarding compared with other



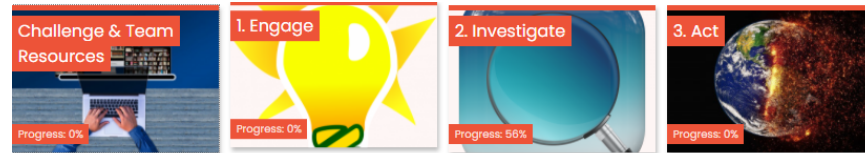
	<p>approaches. Concerns were raised about what should happen to the products when the cycle completes. Given the high dependency on extensive supervision and support, questions were also asked about what happens when teaching is relatively under-resourced and it was also questioned if the sociological and theoretical perspective was sufficiently addressed.</p>
Further information	<a href="#">Link to recording of this example</a>

### Case Study 3: Carbon intensive regions in transition

Challenge Provider	DCU in partnership with the <a href="#">Eastern and Midland Regional Assembly</a>
Challenge facilitators	<a href="#">Professor Deiric O Bróin</a> , School of Law and Government, DCU. <a href="#">Dr. Fiona O'Riordan</a> , Teaching Enhancement Unit (TEU), DCU.
Title	Carbon intensive regions in transition
CBL Format	Standard Challenge run over 3 months
Learning Outcome(s)	<ol style="list-style-type: none"> <li>1. Evaluate the potential impact and sustainability of a proposed solution for the challenge provider;</li> <li>2. Demonstrate professional skills and awareness of ethical values and behaviour required to work in international and multicultural teams and environments;</li> <li>3. Effectively collaborate with, and communicate across different disciplines to analyse, synthesize and report on the local and/or regional effects of the challenge and current ways of addressing these; and</li> <li>4. Competently meet the expectations of the challenge provider in terms of professional communication, reporting, and overall standard of engagement with' the challenge provider.</li> </ol>
Discipline and focus	Law and policy
What is being done?	<p>The Midlands of Ireland must pivot from reliance on fossil fuel energy production to greener renewable energy production using the existing energy infrastructure and converting to modern and future energy use. The region is central, is well connected (especially to the capital city) and it can provide a release valve for the development pressures on the eastern coastal areas including Dublin. This can be achieved by relocating business, second site or back of house facilities, and remote working facilities, with attractive high quality of living, and lower operating costs than coastal locations. The challenge is to reskill the existing workforce who are impacted by the transition and to attract high skilled workers to the region.</p>

For this challenge, Moodle was used as the VLE to support students remote engagement with the challenge and stakeholders - see screengrab from course (fig. 1):

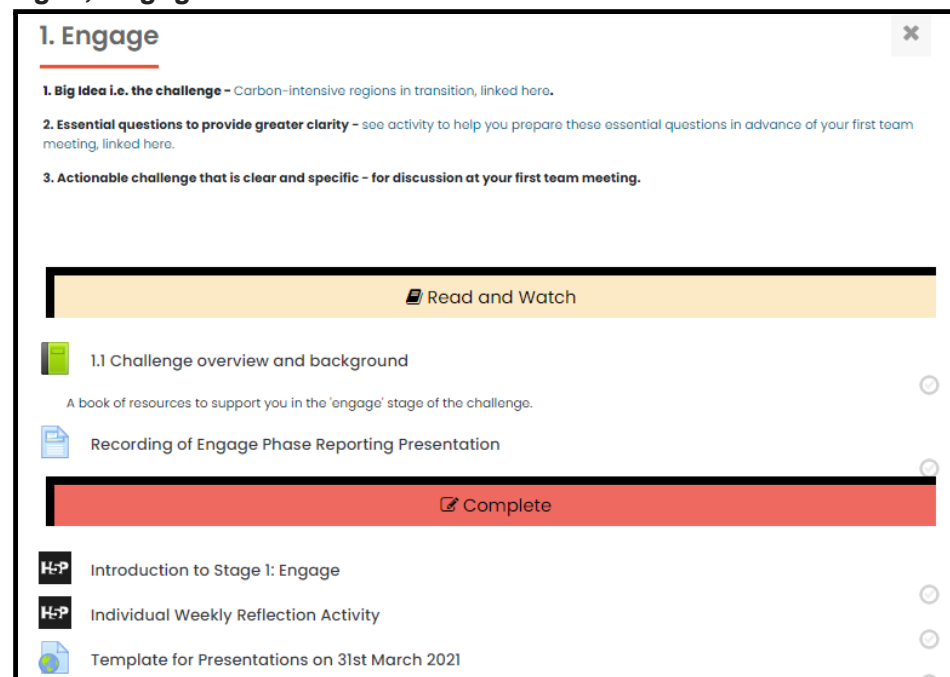
**Fig.1: VLE Course Structure**



The structure for this challenge was 3 weeks for the Engage phase, and 4 weeks for both investigate and action phases. Each phase began with a workshop/meeting and ended with a reporting piece. For the first phase - Engage - the team report by way of presentation ([template linked here](#)). For the second phase - Investigate - the team provided an interim report and presentation; and the final phase - Act - they provided a final report ([template linked here](#)) and presentation. All presentations were to a panel of stakeholders/advisors, including members of the [Eastern and Midland Regional Assembly](#).

A module handbook book, and an introductory resource book were created in Moodle for the Engage phase - figure 2.

**Fig. 2; Engage Phase Resources on Moodle**



Relevant DCU library resources were integrated into the Investigate phase of the CBL course ([LETSbegin](#) and [LETSfind](#)). Also a further book of dedicated resources was developed by the team as part of the Investigate and Act phases, figure 3.


**Fig. 3: Investigate and Act Resources on Moodle**


## 2. Investigate

4.Guiding questions for information overview


5.Guiding activities for additional information

6.Synthesis to analyse information to solve challenge


 Read and Watch


 2.1 Wider resources related to the challenge


This book contains resources that are related to the issue in the challenge but not necessarily about the midland region.

 2.2 Information Sourcing and Gathering

These are a series of interactive e-tutorials the DCU library designed to support students locate, evaluate and use information effectively.

 Recording of Investigate Phase Workshop on 8th April 2021

 Recording of presentation to all stakeholders on 6th May 2021

 Complete


 Individual Weekly Reflection Activity

## 3. Act

7.Solution concepts and development to design several possible solutions and solution design


8.Solution for challenge provider (realistic and implementable)


9.Evaluate and share

 Read and Watch

 Recording of presentation and feedback from stakeholders on 6th May 2021


Use this to inform your final report

 Writing a Research Report

 Short 3 minute video or writing a research report

Taken from the DCU Writing Center.

Use as a guide.

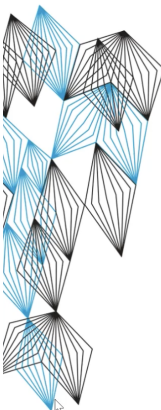
 Complete

 Individual Weekly Reflection Activity


	There was an individual interactive reflection activity required in each phase ( <a href="#">linked here</a> ), and this informed the final report.
Challenge detail	<a href="#">Carbon intensive regions in transition</a> challenge <a href="#">Loop Course using CBL framework</a> (to request access to this course please email <a href="mailto:fiona.m.oriordan@dcu.ie">fiona.m.oriordan@dcu.ie</a> and she will add you as a non-editing teacher)

## Case Study 4: Think Big, Act Bold: The Autumn Challenge Programme


University	University of Twente
Title	Think Big, Act Bold: The Autumn Challenge Programme
CBL Format	Standard challenge (3 months)
Learning Outcome(s) (Described initially as Learning Goals)	<p>After finishing the programme, the student...</p> <ul style="list-style-type: none"> <li>• Discusses the UN Sustainable Development goals and can place them into real-life context, connecting their education and knowledge to real-life local situations and challenges stemming from the locations of the participating universities (knowledge and comprehension)</li> <li>• Is able to analyse and critically assess societal challenges in the framework of the UNSDG 11: "Making cities and human settlements inclusive, safe, resilient and sustainable (analysis)</li> <li>• Can co-design and conceptualise solutions for given societal challenges (synthesis)</li> <li>• Can present these solutions in a suitable format, taking into account their skillset, innovation, and the various stakeholder dynamics (societal leadership)</li> <li>• Has acquired knowledge of different disciplines around the main thematic</li> <li>• Has developed intercultural competences through communicating and functioning effectively in a multicultural team</li> </ul> <p>The main goal was for students to be able to work together with students from other cultures and educated in other disciplines to solve complex societal challenges. Learning activities and assessment items are outlined below:</p>



## ...TO LEARNING OUTCOMES



Learning activities	Assessment				
	Team Reflection Report	Individual Reflection Report	Group Presentation	Individual Skills Lab Portfolio	Individual Cultural Activities Product (non-compulsory)
Virtual Teams	✓	✓	✓		
Thematic Weekends		✓			
Skill Lab				✓	
Cultural Activities					✓



Discipline and focus

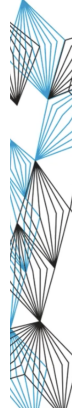
Extra curricular programme

What was done?

Key numbers included:  
 6 universities  
 7 Challenges  
 7 Virtual teams  
 33 Students  
 3 Months

It was noted that students were initially 'overwhelmed by the amount of freedom they had'. Therefore in this case, the influence of coaches (who were mainly student assistants trained up by the Teamchers) was considered particularly important:

### WHY A COACH IS IMPORTANT



Structure in open education:

*"Our coach helped us with the organisation and gave us valuable feedback regarding our work and final deliverables"*

Creating a comfortable environment:

*"Our coach was very polite and helpful throughout the challenge and also made sure each team member would feel comfortable"*

Availability & flexibility:

*"I would not have learned as much without the guidance of my coach, who gave me active feedback for improvement"*

Student assistants:

*"In the beginning I felt quite uncomfortable because of my age. Once I noticed the coaches were students like me, I felt a lot more relaxed and less under pressure"*

A core goal of the project was to give students a chance to bond (particularly important in the Covid context). Cultural benefits were significant and evaluation feedback was extremely positive about this - these were all organised by the students and included cooking workshops, language cafes, pub quizzes and storytelling.

It should also be noted that assessment was pass/fail and coaches advice was also taken into account. For group presentations there was an assessment committee. After all this there was an official examiner at the end who determined student

	progression.
Further information	<a href="#">Link to recording of this example</a>

# Other Examples

[Tec de Monterrey Technological: A Digital Confidant](#)

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This Implementation Guide on Challenge Based Learning (CBL) was developed by Dr Fiona O’Riordan and Clare Gormley of DCU Teaching Enhancement Unit. Information current as of June 2021.



## FAQs

*Do I need to collaborate with other academic colleagues in CBL, or can I “go it alone”?*

Collaboration is best practice for Challenge Based Learning. It helps ensure that the content is multidisciplinary and it allows for students to immerse themselves in content and draw connections between subjects. However, a single teacher and a single class can successfully complete a challenge. You can also collaborate virtually with colleagues in other universities (adapted from (Apple, Inc., 2012, p.16).

*Will students learn the material they need to know?*

Teachers who have implemented Challenge Based Learning have found that the process itself promotes mastery of the content. Towards the end of the study, many teachers observed that students had mastered the study material beyond their expectations. Teachers can start using standardized content and then proceed to connect it to 21st-century skills through the process. Don't forget that the design of the solution and its implementation require space to conduct research, discuss information, implement the knowledge and receive timely feedback (Observatory of Educational Innovation, 2017, p.34).

*Some students are not very participative, how can we engage them with this approach?*

Studies have found that even students who tend to lose interest in school find themselves motivated and interested in addressing challenges (Apple, 2015;. Johnson et al. 2009). This is attractive because it connects schoolwork to real life and it is structured very differently from what many students are used to doing. In your work as an educator, you can present the process, especially the challenge, in a real context, in a way that motivates and engages students (Observatory of Educational Innovation, 2017, p.34).

*If the teacher doesn't teach the content, how will students learn it?*

This question is based on the fallacy that students don't learn anything unless the teacher tells them what to learn. This presupposes that students should be taught content so that they can succeed at the next level. Research shows the inadequacy of this argument: active and interactive learning multiplies learning for students (Kim Sharma, Land and Furlong 2013; Tandogan & Orhan, 2007; Tay, 2015). It is through inquiry, application, demonstration, communication and metacognition that students gain new knowledge and skills (Observatory of Educational Innovation, 2017, p.34). This guide is designed to introduce you to potential implementation ideas. Also, the CBL Hub and the [active learning quick guide](#) highlighted earlier should be a useful source of practical, usable implementation ideas. See pages 4-8 in particular.

*Can Challenge Based Learning be implemented in a short academic period?*

Yes. A challenge can be implemented in as much or little time as you see fit. Above all, make sure that the Challenge is designed to be solved in the time available. In turn, certain stages of the process need to be coordinated. For example, while some students continue to work in groups to develop questions, investigate, propose solutions and create products, the implementation of the challenge can be carried out by other students. You can also explore ways in which students can continue to work on the challenge outside the classroom (Observatory of Educational Innovation, 2017, p.34).



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# Appendix

## Single Point Rubric for DCU ECIU Challenge

### Challenge - Carbon-intensive regions in transition (see case study 3)

At the end of the CBL course learners will be able to:

1. Evaluate the potential impact and sustainability of a proposed solution for the challenge provider;
2. Demonstrate professional skills and awareness of ethical values and behaviour required to work in international and multicultural teams and environments;
3. Effectively collaborate with, and communicate across different disciplines to analyse, synthesize and report on the local and/or regional effects of the challenge and current ways of addressing these;
4. Competently meet the expectations of the challenge provider in terms of professional communication, reporting, and overall standard of engagement with' the challenge provider.

Points and tips for improvement...	LO	At Standard	Well done, and more of....
	1.1	Well-designed essential questions that clearly define the problem/challenge questions.	
	1.2	Evidence of being able to source information and activities required to help solve the challenge.	
	2	Demonstrates professional skills and awareness of ethical values and behaviour required to work in international and multicultural teams and environments.	
	3	Excellent communication and collaboration skills evident in the way the team source, synthesise and analyse the information to help solve the challenge.	
	4	Competently meet the expectations of the challenge provider in terms of professional communication, reporting, and overall standard of engagement with' the challenge provider	

## CBL Rubric

# CBL Rubric



	Beginning	Developing	Exemplary
<b>Big Idea</b>	Understands the concept and utility of a big idea	Identifies or creates Big Ideas that are personally meaningful.	Identifies or creates Big Ideas that are personally meaningful and have local and/or global significance
<b>Essential Question</b>	Understands the role of an essential questioning process and essential question.	Through essential questioning derives an applicable set of essential questions from a big idea.	Through essential questioning derives a specific, clear and meaningful essential question from a Big Idea
<b>Challenge</b>	Understands the structure and purpose of a challenge.	Construct an appropriate and actionable challenge from an essential question.	Construct an appropriate and compelling challenge from an essential question that inspires and drives action.
<b>Guiding Questions</b>	Understands the role and importance of guiding questions.	Explain the purpose of different types of questions (over and under the surface). Develop an extensive set of questions.	Develop an extensive set of questions that include multiple perspectives,. Categorize and prioritize the questions. The questions lead to a firm foundation for the challenge and develops a learning pathway.
<b>Guiding Activities/ Resources</b>	Understands the purpose of guiding activities and resources.	Identify appropriate guiding activities and resources to answer the guiding questions.	Identify, develop and create appropriate guiding resources and activities to answer the guiding questions. Provide clear findings for all guiding questions.
<b>Synthesis</b>	Understands the components of a research synthesis and its importance for determining a solution.	Write a clear synthesis that accurately reflects the information learned through the guiding activities and resources.	Write and present a clear, concise and accurate synthesis. Articulates what was learned and how it sets the stage for a solution and meets the learning objectives.
<b>Solution</b>	Understands the idea of a solution concept and the role it plays in moving from investigating to acting.	Develop multiple solution concepts that logically flow from the investigation phase.	Develop and present the best solution based on the research synthesis. Is able to admit that a solution may not be possible or warranted and return to earlier steps in the framework.
<b>Implementation</b>	Solution is implemented with a specific audience for a specified amount of time.	Follows a detailed implementation and evaluation plan. Solution is implemented with a specific audience for a specified amount of time with some data collection.	Conclusions are drawn using the data generated from the implementation. Findings are presented in a clear and compelling manner in a written report .
<b>Evaluation</b>	Conclusions are drawn using the data generated from the implementation.	Conclusions are drawn using the data generated from the implementation. Findings are presented in a clear and compelling manner in a written report	Conclusions are drawn using the data generated from the implementation. Findings are presented in a clear and compelling manner in a written report.

Source: [https://www.challengebasedlearning.org/wp-content/uploads/2019/03/CBL\\_Rubric.pdf](https://www.challengebasedlearning.org/wp-content/uploads/2019/03/CBL_Rubric.pdf)

## Group Work on Loop

**online teaching tips!**


# GROUP WORK ON LOOP

Loop offers many opportunities to support group work through the group functionality and also through the various assessment opportunities that can be managed as group work or group assessment. You may use groups on Loop to simply filter forum posts, or you can create and manage group assessments. Extensive resources on Groups and Group work are available on the [Loop Staff Support page](#) and workshops are also scheduled throughout the semester. This infographic highlights some of the opportunities available to work with groups on Loop.

### SETTING UP GROUPS

Groups are defined at course level and can then choose to apply group modes to individual activities based on your requirements. You can set up groups on Loop in several ways.

- Randomly based on the number of groups or the number of students per group.
- Specific students in specific groups
- Allow students to self select



### GROUP ASSIGNMENTS

You can set up a group assignment within Loop within the assignment activity. The group works together offline (or in the current context through Zoom/Google hangouts). When the assignment has been completed, **one** student submits the assignment to Loop on behalf of the entire group. When you come to grade on Loop, you will view, grade and offer feedback to the entire group. In this way the group assignment offers you a chance to reduce the time spent on the grading and feedback process.

### RESTRICT ACCESS

You can use groups and groupings on Loop to restrict access to activities/resources based on group membership. For example you can share one resource with Group A, and a completely different resource with Group B.

Restricting an activity/resource can be achieved either by:

- Setting an access restriction on it
- Setting its group mode to 'separate groups'

Discussion forums are commonly restricted by group. Applying a group restriction allows you to target groups within a Loop module page instead of sending the same message to all students.

Groups are particularly useful when dealing with large cohorts. For example if you have a cohort of 400+ students and you have multiple tutors grading assignments, put students in groups and tell tutors to take one or two groups each to grade.

### COLLABORATIVE LEARNING




Loop provides several opportunities for collaborative learning through activities such as the glossary activity, the database activity, the Wiki activity. These tools allow you as the teacher on the Loop page, to track individual contributions to the group activity which may be important for grading purposes.

You can also support collaborative learning through breakout rooms on Zoom.

Outside of Loop, students can also use Google applications to work collaboratively e.g. google docs and google slides.

Loop reflect, the ePortfolio platform also facilitates sharing of portfolios between students which could be used to support collaborative learning.

Online Teaching Tips - Groups and Group work by Suzanne Strain for Teaching Enhancement Unit is licensed under a Creative Commons Attribution 4.0 International License. Design by Yvett Gale



This resource on Challenge Based Learning (CBL) is being developed by Dr Fiona O’Riordan and Clare Gormley of DCU Teaching Enhancement Unit. Information current as of September 2021.