Perceptions of Challenge-Based Learning among those leading its implementation in ECIU universities

Clare Gormley, BA, PgD Applied Communications, MSc Applied eLearning

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DCU Institute of Education

Supervisor: Dr Enda Donlon

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Declaration

I hereby certify that this material, which I now submit for assessment on the programme of study leading to the award of Doctor of Education, is entirely my own work, and that I have exercised reasonable care to ensure that the work is original and have conformed to the regulations on the use and declaration of Generative AI, and does not to the best of my knowledge breach any law of copyright, and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work. I hereby certify that no Generative AI Intelligence (Gen AI) tools have been used in the creation of the thesis.

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List of Publications & Presentations

Gormley, C., Girme, L., Crehan, M., and Campau, S. (2026, forthcoming) 'Modelling Active Learning Through a Challenge-Based Hackathon' In Wilson-Medhurst, S. and Horrocks, J. (Eds.), *Making Active Learning Happen for All*. Open Press University of Sussex.

Gormley, C., Lee, H., Ó Broin, D., McParland, C., Girme, L., Mallon, B., O'Dochartaigh, A., and Downes, A. (2025) 'Can a Picture Paint a Thousand Words? Visualising Variety in Challenge-Based Learning,' *Irish Journal of Academic Practice*: Vol. 13: Iss. 1, Article 12. Available at: https://arrow.tudublin.ie/ijap/vol13/iss1/12

Gormley, C. (2025) Exploring Perceptions of Challenge-Based Learning from a Leadership Perspective: A Methodological Overview. Presentation at *PGR Unconference 2025*, DCU Institute of Education, May 21st.

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List of Abbreviations

CBL – Challenge-Based Learning

CDIO – Conceive Design Implement Operate

DCU – Dublin City University

ECIU – European Consortium of Innovative Universities

EU – European Union

EUA – European University Association

ESD – Education for Sustainable Development

HEA – Higher Education Authority

HEI – Higher Education Institution

Gen AI – Generative Artificial Intelligence

PBL – Problem-Based Learning

PICO – Problem Intervention Comparison Outcome

PjBL – Project-Based Learning

PRISMA – Preferred Reporting of Items for Systematic Reviews and Meta-Analyses

RTA – Reflexive Thematic Analysis

STEM – Science Technology Engineering Mathematics

T&L – Teaching and Learning

Abstract

Clare Gormley

Perceptions of Challenge-Based Learning among those leading its implementation in ECIU universities

Challenge-Based Learning (CBL) has been described as a process of collaborative engagement with student peers, academics, and stakeholders to develop solutions to real-world social, technological, environmental and economic challenges of urgency and significance. While the educational research literature base for CBL continues to develop, little has yet been written from the perspective of those in CBL leadership roles. Exploring an identified gap, this study has a specific focus on perceptions of CBL among those leading its implementation in the European Consortium of Innovative Universities (ECIU).

This qualitative study employs a case study methodology to gain detailed insights from a variety of perspectives. Nineteen semi-structured interviews were conducted with those leading CBL implementation in various capacities across ECIU. Participants were asked about how they understood the term CBL and what they saw as the barriers and enablers to its successful implementation in practice.

In keeping with the researcher's interpretive stance, a six-stage process of reflexive thematic analysis (Braun and Clarke, 2021) was carried out to analyse the data. Findings indicate that although CBL has certain defining characteristics, it is being conceptualised and adapted in various ways at institutional level. Building on previous definitions, an emphasis on societal impact and student leadership was evident. Barriers to CBL implementation include a lack of time and space to develop deep engagement with external stakeholders, lack of funding, and sometimes inflexible institutional systems and structures. Enablers to support CBL implementation include greater recognition of the effort of innovative teaching, an appropriate range of professional learning opportunities, aligned institutional vision, and curriculum design support. This professional doctorate study aims to contribute to the knowledge of factors that should be considered by university leaders, teachers, and policymakers when embedding CBL in higher education contexts.

Chapter One: Introduction

1.1 Introduction

> The outcome is not predictable. Sometimes my students, they want very clear answers, and they ask, Is it good? Is it right or not? But nobody knows that. So that's why we are in this situation. That's why we're solving this challenge, because nobody knows which answer is the best. (P4)

I have chosen this quote from one of my participants to start my thesis as not only does it convey an important characteristic of Challenge-Based Learning (CBL), it also captures where I stood at the start of this doctorate. Uncertain about where the study might go but interested in conducting an inquiry that might lead to a better understanding of the complexities of implementing Challenge-Based Learning in practice.

The title of this thesis is: Perceptions of Challenge-Based Learning among those leading its implementation in ECIU Universities.

The European Consortium of Innovative Universities (ECIU) mentioned in the title is an educational alliance of universities with a common interest in promoting innovation, engagement with external stakeholders, and CBL for sustainable societal impact across Europe (DCU, 2012; ECIU, 2022). It aims to integrate CBL into its educational offering through challenges that are 'designed to facilitate the development of competencies in a manner that is integrated into the academic trajectory of students' (Perzolli *et al.*, 2025, p. 94).

The perceptions of Challenge-Based Learning to be explored are those of individuals who are leading implementation of CBL within the ECIU University. These individuals are responsible for strategically and/or directly supporting teaching colleagues to implement this approach and in many cases will have experience applying it within their own teaching practice. This thesis will focus on how the term and concept of CBL seems to be understood by a sample of these individuals who are leading and influencing CBL adoption within their institutions within the ECIU context. It will also explore the multi-faceted factors that may be inhibiting and enabling the implementation of CBL in higher education.

This chapter will start by briefly explaining why this topic was of interest, referring to some of the literature that initially indicated it as a gap worth exploring. The research questions are then outlined and the ECIU context of the study is described in further depth. A short primer to the fundamentals of CBL is provided to help orientate the reader to some common terminology that will be used later in the thesis. The research approach is summarised, and I introduce my approach to reflexivity, including a statement of my positionality and how I have dealt with the implications of my insider-outsider researcher status. The chapter closes with an overview of the thesis structure to help guide navigation through the document.

1.2 Why I chose this topic

When submitting my research proposal for this thesis, I needed to explain why I wanted to undertake this research. This is what I said:

> On a personal level, I find the topic very interesting, highly topical, and indeed I have switched to this topic because it very much relates to my current work as an academic developer at DCU. The vision of CBL achieving significant societal impact and preparing students for future uncertainty (discussed further in the literature review) resonates very strongly with me. However, I am conscious that CBL could be a 'flash in the pan' and so I would like to get behind the hype to find out whether or not the rhetoric lives up to the reality.

I also referred to my impressions that CBL represents a major investment of time and resources and therefore I thought it particularly important to investigate its use and resource implications within a publicly-funded institution. I wanted to use this study to find out more about the experiences faculty have when implementing CBL and apply that knowledge to enhance the advice I and others in supportive roles provide. I saw the study as a vehicle to improve my own knowledge of CBL, certainly, but more importantly as an opportunity to inform the implementation efforts of others in evidence-based ways.

1.3 How the literature initially informed the topic

Like any research study, this one began with consideration of the existing literature. When developing my research proposal, it was necessary to consider what was already known about the proposed research topic. Researchers such as Gallagher and Savage (2023) and Leijon *et al.* (2022) published literature reviews

which provided a useful starting point in summarising the CBL state of play in higher education. A number of publications that emerged from work at Tecnológico de Monterrey, Mexico, who had been researching and implementing CBL since 2013, were also explored (Membrillo-Hernández *et al.*, 2019, 2021).

Initial investigations revealed several potentially ripe areas for further investigation. There was notable inconsistency in conceptualisations and understandings of CBL, with varying definitions and explanations of CBL in existence (Gallagher and Savage, 2023). The Gallagher and Savage study also highlighted the fact that while there were ample small-scale, sometimes anecdotal case studies documenting a largely positive student experience, the educator and stakeholder perspectives on CBL were largely absent to date.

Leijon *et al.* (2022) asserted that there were relatively few research publications available on CBL within higher education, with little exploration of its societal remit. Similar to Gallagher and Savage (2023), Leijon *et al.* (2022) discuss the multidisciplinary characteristic of CBL which appears to be aspired to in the literature – while in fact CBL seems to be more strongly located within STEM disciplines in particular. This added to the sense that all may not quite be as it seemed and disciplinary and organisational factors could be at play.

Early reading also confirmed a potential confusion with other pedagogies and the need to articulate differences between CBL and similar-sounding methods such as Project-Based and Problem-Based Learning. One of the most widely cited contributions from Membrillo-Hernández *et al.* (2019) provides a description of the fundamental differences between these three approaches, emphasising CBL's real-world, open-ended ethos. Furthermore, rather than being a facilitator, project manager, or guide, this paper highlighted that a CBL teacher should have a markedly different coaching, co-designing, and co-researching role. Membrillo-Hernández *et al.* (2021) further described how teachers require adequate training in CBL to develop the necessary competencies for this active, highly-collaborative, and oftentimes unpredictable teaching approach.

1.3.1 A leadership perspective

While the previous summary indicates some of the known issues in the literature at that time, there was also an 'implementation gap' between translating the vision and theory for CBL into practice. Most of the case studies appearing in the CBL literature seemed remarkably positive with limited scholarship reporting the organisational barriers and enablers that may hinder or support implementation strategies. Similarly, while leadership is recognised as important to the success of teaching and learning initiatives in general (European University Association, 2022; Deacon, Laufer and Schäfer, 2023), it seemed little had been written from the perspective of those leading CBL implementations specifically.

This study aims to contribute to addressing some of these gaps, ultimately leading to informed recommendations from experienced CBL leaders. It strives to take a distributed view of leadership where leadership is viewed as a shared process that challenges the perception of leadership as a solely vertical process in which an individual leader is seen as the dominant source of influence (van Ameijde *et al.*, 2009). With distributed leadership, leadership practices are more collaborative, open and decentralised (Azorín, Harris and Jones, 2020). For an example from an educational context, a report from the Leadership and Organisation for Teaching and Learning at European Universities (European University Association, 2022, p. 21) describes educational leaders as follows:

> Leaders in teaching are not only, and not necessarily, to be identified as people with a title and defined responsibility for the education offer. In the context of teaching, leadership responsibilities can be devolved and horizontal (all teachers are peers), and approaches can be fluid, involving communities of teachers or individuals acting as change agents among peers, or student partnerships (where students act as partners and part of these learning communities).

The National Developments in Learning and Teaching in Europe report (Zhang, 2022, p. 38) describes leadership in teaching as 'both the agency to develop strong strategic oversight, coordination and implementation for learning and teaching, and as a collective institutional capacity to address organisational development'. This report, which confirms leadership in teaching as an 'emerging issue, not yet a priority in national systems' (p. 38) identified two main profiles of

leaders in teaching within universities with roles that should complement each other. The first are leaders with a specific role in learning and teaching within an institution, faculty, department or study programmes (e.g. vice-rectors, deans, study programme directors) and/or with responsibilities associated with managing an educational offer (e.g. innovative curriculum design, community-building, and awareness raising). The second group are leaders who could be described as change agents who may be 'particularly active and motivated teachers, or other staff, who contribute proactively to the development of communities of practice in learning and teaching, and to shifting the mindset towards a more reflective, innovative, and research-based practice of teaching' (European University Association, 2022, p. 21). Leaders of all these hues are involved with implementing CBL and their views could shed light on aspects that may be somewhat hidden or underexplored to date.

A framework for considering leadership further through different lenses is that originally developed by Bronfenbrenner (1994) which is drawn upon to frame leadership-related aspects of this thesis. This framework describes macro, meso, and micro levels of activity to organise the complexities of different systems. While the definitions for the different levels can vary across contexts and research, for the purposes of this thesis, the following explanation applies: Macro-level relates to leadership activity carried out at the national or international level, in this case by ECIU. Meso-level relates to leadership activity carried out at the institutional level, in this case, by the individual institutions within ECIU. Micro-level relates to activity carried out at the individual teaching level, in this case by individual teachers or teamchers, programme and/or module co-ordinators, and potentially others teaching or supporting teaching with CBL.

Therefore, as per Tracy's (2010) criteria for quality, through a focus on conceptualisations of CBL and the factors influencing its implementation from a leadership perspective, this struck me as a worthy topic that is relevant, timely, and interesting and I hope offers a contribution of at least some value to the fast-expanding CBL research base.

1.4 Research Questions

The overarching research question is as follows:

What are the perceptions of Challenge-Based Learning among those leading its implementation in ECIU universities?

Specific aspects of that research question will be explored through the following sub research questions:

How is the term CBL understood by those leading its implementation for teaching, learning and assessment in ECIU universities? This question seeks to explore how those in CBL leadership roles perceive various existing definitions of CBL and how they express the term in their own words and in relation to their own contexts.

What do those responsible for leading CBL initiatives in ECIU universities perceive are the barriers and enablers to its successful implementation in practice? This question seeks to understand perceptions of the factors that may positively and negatively impact the implementation of CBL in practice.

1.5 The ECIU Research Project Context

The ECIU is an international alliance of research-intensive universities, one of 65 European university alliances funded primarily through Erasmus+ focused on collaboratively shaping the future of higher education across Europe (European Commission, 2021; EU Publications, 2024). ECIU was founded in 1997 as a network of entrepreneurial universities and at the time of data collection had 13 members from across Europe (Aalborg University, Autonomous University of Barcelona, Dublin City University, Hamburg University of Technology, INSA Group, Kaunas University of Technology, Linköping University, Lodz University of Technology, Tampere University, University of Aveiro, University of Stavanger, University of Trento, University of Twente) and one associate member in Mexico (Tecnológico de Monterrey) (Dikilitaş, Marshall and Shahverdi, 2025a). DCU has been a member of ECIU since 2012 and all members share a common commitment to innovation and entrepreneurship (DCU, 2012).

ECIU has expanded its activities and remit in recent years, leading to the rollout of the ECIU University which began a pilot in 2019. The ECIU University is being constituted as 'a real European university' where students and teachers cooperate with cities, regions, businesses and citizens to solve real-life challenges through CBL (Mayer, Ellinger and Simon, 2022, p. 327). ECIU University aims to create 'an ecosystem of thousands of learners, hundreds of academics, external stakeholders, challenges to solve and micro-modules on offer, ready for creating sustainable societal impact in Europe' (ECIU, 2022). ECIU University describes itself as an agile, open agora at the European level for solving multi-disciplinary societal challenges, doing research and learning for life (ECIU, 2020). It is an EU-funded Erasmus+ initiative intended to offer a fully-fledged European university with a hybrid European campus for creating sustainable societal impact across Europe (ECIU, 2022). At the time of writing, the CBL aspect of the project, which is also referred to as ECIUn+, is in its second phase (November 2022 to October 2026).

The ECIU University considers CBL as a key element of its ecosystem and vision (ECIU, 2020; EU Publications, 2024). It aims to integrate CBL across institutional partners to develop 'a deeper understanding of its principles and practices, as well as the skills and competences to adjust course syllabi accordingly' (Dikilitaş, Marshall and Shahverdi, 2025a, p. xi). Within this context, challenges typically relate to the UN Sustainable Development Goals, in particular SDG 11 'Sustainable Cities and Communities' with potential for societal impact (Stahlberg *et al.*, 2022). At present, students can participate in a challenge offered by any other member institution.

The university I work at, DCU, is one of the members of ECIU University and this has proven to be an important strategic vehicle for the implementation of CBL in my professional context. Similarly, the DCU Futures project, with its focus on reimagining undergraduate education for an unscripted future, has also incorporated extensive use of CBL (DCU Futures, 2023; DCU Office of the Vice-President for Academic Affairs, 2023). CBL is a central pillar of educational innovation of the 10 programmes that emerged from the DCU Futures project

which in addition to ECIU University, provided another significant strategic opportunity to implement this approach at DCU in recent years. There are now DCU staff from several disciplines, including initial teacher education, business, public policy, geography, science, computing, and engineering who have implemented CBL in their practice (Fitzsimons and McDonald, 2024; Gormley *et al.*, 2025; McDonald and Fitzsimons, 2025).

1.6 Pedagogical Context: Challenge-Based Learning

Several definitions highlight CBL as a means to develop students' disciplinary and transversal competence by having them collaboratively work with challenges (Doulougeri *et al.*, 2024) to address a situation that is real, relevant and related to their environment (Tecnológico de Monterrey, 2015).

CBL has a history of various frameworks such as the Software Technology for Action and Reflection (STAR) legacy cycle (Crown, Fuentes and Freeman, 2011) which makes one of the first mentions of CBL in the academic literature (Birol *et al.*, 2002; Gallagher and Savage, 2023). There are a number of frameworks that articulate a guiding structure for the phases and expected student behaviours in CBL (Martin and Bombaerts, 2024). CBL in the ECIU context comprises a cycle of Engage-Investigate-Act phases which are described in Nichols' et al. Challenge Based Learner User guide (2016). The cycle is based upon the widely-cited framework developed for Apple Inc. (Leijon *et al.*, 2022) which has been widely adopted by ECIU University members. The cycle, outlined in Figure 1, provides a set of three structured and interconnected phases that scaffold teams making their way through the lifecycle of a challenge from inception to solution (Scroccaro, 2021; Ambrosi and Hermsen, 2023; Dikilitaş, Marshall and Shahverdi, 2025a).

Figure 1: The CBL Cycle

To explain this CBL cycle further, challenges will often start with a broad, overarching concept known as a 'Big Idea'.

Big Ideas are single concepts that present a wicked societal problem. These concepts are broad and explored in multiple ways that are relevant to learners and the larger community (Nichols, Cator and Torres, 2016). Climate Change, Community, Relationships, and Health are examples of Big Ideas that may provide the starting point of an engagement. Within ECIU, challenges are closely linked to sustainability impact and therefore its Big Ideas are frequently aligned to the UN SDGs (Dikilitaş, Marshall and Shahverdi, 2025a).

The Engage phase is where teams orientate and induct themselves into the challenge, 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 the 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.

During the Investigate phase, the team explores *guiding questions* that they need to answer in order to solve the challenge. Some of these questions may require teams to seek master classes and further learning resources or lectures. Learners collaborate with the academic or tutor leading the challenge and interact with other stakeholders that can help direct them to information of relevance.

This final Act phase is where the solution(s) and recommendations are developed. In developing the solutions, prototypes and/or recommendations, students may return to the Investigate phase to re-explore the data. Finally, at the point of implementation if this is reached, students may implement the recommendations and/or solution with the stakeholder and conduct further evaluation.

Each phase, including the Engage phase, ends with a reporting component which can be in the form of a presentation, recorded video, or written report. For those new to CBL, the language of CBL may be somewhat obscure, if not confusing. Therefore, some brief language explanations may be helpful.

A **Teamcher** is an individual who either on their own or as part of a team arranges, leads and supports CBL activities. Teamchers take on and often switch between the roles of being teacher, coach and organizer of CBL activities (Eldebo *et al.*, 2022, p. 804).

A **Challenge** is a real-world problem in the form of an activity, task or situation that represents an incentive and obstacle to overcome (Tecnológico de Monterrey, 2015). In CBL, challenges to be tackled by students are societally relevant and are typically proposed by an external stakeholder from outside the university (Gallagher and Savage, 2023; Doulougeri *et al.*, 2024).

1.7 Research Approach

1.7.1 Summary of methodology

This qualitative study employs a case study methodology to gain detailed insights from a variety of perspectives. Nineteen semi-structured interviews were conducted with those leading CBL implementation in various capacities across ECIU member institutions. Participants were asked about how they understood

the term CBL and what they saw as the barriers and enablers to its successful implementation in practice. In keeping with the researcher's interpretive stance, a six-stage process of reflexive thematic analysis (Braun and Clarke, 2021) was carried out to analyse the data. This process led to the development of 10 themes capturing viewpoints that occurred repeatedly (and in some cases in contrast) across the dataset. Throughout the process multiple efforts were made to maintain reflexivity and trustworthiness in the execution of the study.

1.7.2 My Positionality

'Do not pretend to be objective when you are not.' (Willis, 2007, p. 210)

If taking an interpretivist position, it is important to recognise potentially problematic biases or subjectivities and acknowledge them upfront. As Savin-Baden and Major (2023) suggest, I will start by describing the various lenses through which I view the research process:

Beginning with the personal, the idea of Challenge-Based Learning is something I find personally interesting, not least because I have not come across anything like it in my own prior education and there are certain aspects that are surprising, fascinating, and sometimes quite peculiar. Like any interested citizen, I would have to be curious about the concept of an approach that models the pursuit of societally-relevant ambitions while developing skills and competencies that students and society need now more than ever. As a married, white, 50-something mother, fortunate to have two healthy children and a home in a wealthy country, I am aware that I am coming from a place of privilege, so it is perhaps easy for someone like me to say that I believe in the idea of education as a moral responsibility. However, growing up as the youngest of six children from a working-class and politically-interested family has also given me insights into different perspectives. CBL seems to fit right in what I see as an opportunity for those who enjoy the benefits of higher education to give back to society for the greater good. CBL seems to embody a noble goal, one that I support, but also one that I recognise is charged with challenges in more ways than one.

Looking at my beliefs and philosophies about what makes for 'good' teaching, it is fair to say that I have had some views and opinions about pedagogy before I ever came anywhere near CBL. I remember being asked to write a teaching philosophy statement for the first time in 2011 when I did a Masters in Applied eLearning with what was then Dublin Institute of Technology (now TU Dublin). I recall this being quite centred on the transition from Behaviourist (Lecturer-led) to Socio Constructivist (Collaborative) approaches in higher education, which were what significantly struck me after returning to formal education for over 20 years. In more recent times, I co-taught an introductory teaching module for new postgraduate tutors and demonstrators that asked participants to consider and develop their teaching philosophies. This required me to revisit my own beliefs about teaching which developed to emphasise what I see as three core components of the learning experience: learning that has an experiential element with hands-on practice and experience, a social constructive element that facilitates pooling of experience and knowledge, and a reflective element that facilitates thoughtful and critical consideration of the bigger picture (Gormley, 2017).

I joined DCU Teaching Enhancement Unit in 2014, working as an instructional designer on specific online projects initially. When I moved into the academic developer role in 2017, my role became more about supporting staff who wish to enhance their teaching practice through various professional learning and research activities. This involves work with faculty from a range of disciplines, most of whom are new to the CBL pedagogy and who look to our unit to offer guidance and expertise in this space. CBL guides, hubs, hackathons, practice-sharing events, workshops, and direct faculty support/advice are all part of this offering which I have been leading and co-developing with TEU colleagues since 2021.

My values, informed by my fellowship of the Staff and Educational Development Association (SEDA), I hope point to a commitment to developing understanding of how people learn, practising in ways that are scholarly, professional and ethical, while continually reflecting on practice to develop myself, others, and processes

(SEDA, 2014). Furthermore, facilitating the sharing of teaching practice and promoting professional learning communities (Gormley, 2022) contributed to my achieving senior fellowship (Advance HE, 2025) of Advance HE in 2020. Indeed having led the Advance HE teaching recognition scheme at DCU, I have since had insight into staff perceptions of professional recognition that continue to influence how important I believe recognition of teaching is. Within Chapter 4: Analysis, the theme 'Recognition Really Matters' is not only drawing on the data from participants but is likely also being influenced by this perspective and experience.

I would not have encountered CBL were it not for the specific role I am in. I have some experience in a CBL leadership role in that I work as a senior academic developer within an institution that has strategically committed to CBL. This has become particularly apparent through the DCU Futures project and through DCUs membership of the ECIU network. I am also chair of the university-wide DCU CBL Working Group and have heard about the issues that affect implementation of CBL through that forum also. Membership of this group is drawn from each of the DCU faculties and the student union executive. Its purpose is to support adoption of the CBL pedagogy by co-developing a range of implementation guides and resources, informing strategic policy, and engaging with the scholarly literature on the pedagogical underpinnings of CBL. It is also a place for frank discussion of the practical realities of CBL and many of the conversations over the years have emphasised the time and resourcing challenges of CBL, the limitations of external stakeholder involvement, and the need to define and differentiate CBL more clearly, to name just some.

All these experiences and activities I hope help to illustrate why I am curious about this way of learning. However, because I also have some sense of the challenges that exist in operationalising CBL, I am of the view that its complexities in terms of its conceptualisation and implementation in teaching require further research. I am therefore particularly interested in exploring how this approach is being perceived, applied, and advanced by those with a range of experience and leadership in this area who can speak to what they have done and share recommendations for the benefit of others.

1.7.3 Insider-Outsider Implications

Positionality, by its nature, raises questions or at least considerations to be borne in mind about the status of the researcher as an insider or outsider or mix of both.

I believe myself to be in the position of having insider-outsider status (Yip, 2024). I am clearly an 'insider' when I am gathering data from DCU participants. But I am moving towards an 'outsider' position when I am meeting and interviewing my nominated participants whom I did not know beforehand. I agree with the contention that there are occasions in qualitative research where 'people are insiders in some respects but outsiders in others' and that this status can change at different points within a study (Chavez, 2015; Dhillon and Thomas, 2019, p. 445; Darwin Holmes, 2020). Rather than consider this issue from a simplistic dichotomous perspective, Dwyer and Buckle (2009) ask us to explore the notion of 'the space between' that allows researchers to occupy the position of both insider and outsider without attempting to resort to a distant researcher role or ignore the knowledge of certain experiences prior to project start. The methodological implications of my positionality are explored in section 3.3.3 of Chapter 3: Methodology.

1.8 Overview of Thesis Structure

The thesis will be presented as follows: **Chapter 2: Literature Review** describes how a systematized literature review was undertaken so that relevant studies could be sourced using a transparent process that informed the subsequent methodology. The chapter describes the characteristics of the scholarship that emerged, synthesizes what is already known about the topic, and discusses the broader implications of this evidence for the study that follows.

Chapter 3: Methodology explains the decision to adopt a qualitative inquiry based on my ontological and epistemological beliefs. It describes the purposive sampling and participant recruitment approach that was adopted and provides details of how I pursued trustworthiness and reflexivity throughout the study. It explains why a case study research methodology was chosen and the use of the semi-structured interview research method. This chapter also describes how

Braun and Clarke's (2021) approach to Reflexive Thematic Analysis (RTA) was applied to support analysis of the data.

Chapter 4: Analysis then discusses the themes that were generated as outputs of the analysis process. It describes and interprets recurring ideas based on what the participants said while also indicating occasions where ideas diverged or contrasted. This chapter includes references to relevant broader literature to help readers make sense of the context of each theme.

Chapter 5: Discussion and Conclusion explores the implications of the themes with respect to the research questions. It discusses how the ideas raised about CBL implementation fit within a broader landscape and where existing research points to potential solutions. It culminates in recommendations for policy, practice, and future research of CBL within higher education.

Chapter Two: Literature Review

2.1 Introduction

Writing about the centrality of the literature review in research dissertations, Boote and Beile (2005, p. 3) suggest that 'a researcher cannot perform significant research without first understanding the literature in the field'. Many different types of literature review can be undertaken, ranging from the traditional narrative literature review that covers a wide range of subjects at varying levels of comprehensiveness (Grant and Booth, 2009) to the systematic review that requires an exhaustive search and transparent approach to reporting (Cooper *et al.*, 2018). While the emphasis may vary, all literature reviews should make arguments for what we know about the topic and what we should do or think about what is known (West and Martin, 2023).

This chapter sets out to source, analyse, and synthesize existing scholarly literature related to questions of how CBL is being understood and implemented in practice. It seeks to explore what, if anything, the literature is saying in response to areas of confusion and concern while also revealing gaps that appear to be evident or under-developed to date. Its purpose is to help to answer the research questions but also guide and inform the data gathering that needs to be undertaken elsewhere in this study.

The chapter begins with an overview of some relatively recent CBL literature reviews, highlighting their relevance to this EdD study. The focus will then move on to the systematized literature review at the heart of this chapter, explaining how it was designed and the precise sequence of steps that were followed to source, screen, and extract data from pertinent publications. The interrogation that follows highlights general characteristics of the scholarship that emerged, followed by a critical analysis that synthesizes the key relevant points. This literature review explores definitions of CBL and its pedagogical heritage in the research base, before introducing various barriers and enablers to CBL implementation that have

been reported to date. A conclusion at the end of the chapter signals the gaps that remain that help inform the methodology of Chapter Three.

2.2 Recent Literature Reviews

Since 2020, there has been a significant growth in literature reviews on the topic of CBL. An exploratory literature review by Gallagher and Savage (2023) – first published online in 2020 – was the first to highlight that most of the existing CBL literature at that time was based on small-scale case studies that were almost exclusively oriented towards the student experience containing very little regarding the educators' perspective. The Gallagher and Savage (2023) review underlines the issues in conducting evaluative evidence-based research into CBL when definitions are so varied. The proposed conceptual framework of eight core characteristics of CBL– use of a defined challenge, real-world challenges, global themes, collaboration, technology, flexibility, multidisciplinarity, and innovation and creativity– is viewed as an important contribution to articulating and guiding what it is that CBL 'is' and should encompass (van den Beemt, van de Watering and Bots, 2023). While acknowledging the importance of this conceptual framework, van den Beemt et al. also highlight the lack of attention in existing research around certain elements of CBL such as the role of external stakeholders, assessment, and support (van den Beemt, van de Watering and Bots, 2021; van den Beemt, van de Watering and Bots, 2023).

A subsequent literature review by Leijon *et al.* (2022) sought to identify how CBL is being defined in higher education settings in relation to a prevalent definition of CBL in the existing literature – the definition originally coined in a White Paper for Apple Inc. in 2008 (Nichols and Cator, 2008). Leijon *et al.* (2022) assert that focusing exclusively on CBL purely as a pedagogical innovation is diminishing the core value of this approach. These authors suggest that the important societal dimension of CBL should not be underplayed:

> We argue that when CBL is used as a framework for educational interventions and not for societal impact, a central component of CBL is lost. Even if the latter may be the hardest aspect to instigate, HEIs as providers of knowledge in a learning society should be able to accept this challenge. (Leijon *et al.*, 2021, p.8).

Looking at matters from an instructional design perspective, Sukackė *et al.* (2022) conducted a systematic literature analysis of the existing research on problem-based learning, project-based learning, and challenge-based learning. Of particular interest was their finding of teachers' potential resistance to change given the effort and time required to implement these types of learning methods. On CBL specifically, this review also points to the reliance on external stakeholders for providing certain resources and the need for ongoing communication throughout CBL projects. Like Gallagher and Savage (2023), Sukackė *et al.* (2022) note the relative absence of teachers' experiences of CBL implementation in the research evidence base.

The following year, Perna, Recke and Nichols (2023) published what they refer to as a 'comprehensive literature survey' in the form of a bibliometric analysis of the literature that explores how CBL is being implemented in various contexts. It describes several possible obstacles to implementation, including the radical change in the structure of the learning environment, inertia or resistance to unfamiliar pedagogies, and potentially contested curricular alignment. Their review also acknowledges that further research is needed to explore the reasons that prevent teachers from adopting CBL. As the authors acknowledged 'the literature survey surfaced some barriers to the adoption and implementation of CBL and possible ways to mitigate them, but there is a need for a deeper dive' (Perna, Recke and Nichols, 2023, p. 29).

A systematic review by Doulougeri *et al.* (2024) focused in-depth on how CBL is being implemented in engineering education. It differentiates between scenarios where CBL was embedded within a course (and the focus is on knowledge and skills acquisition throughout the learning process) and project scenarios (where the focus is more on developing a solution that might not be linked to a specific curricular course). This review is notable for highlighting certain difficulties faced by teachers such as issues in aligning timeframes and intended learning outcomes; choosing appropriate and aligned assessment methods, especially for collaborative groups; and a lack of holistically supportive materials, resources and policies at the university level. Based on the literature discussed, it highlights a

need for pre-emptive CBL training for teachers to address difficulties in designing course activities, facilitating teamwork, and striking the correct balance between helping and influencing student learning and assessment (Doulougeri *et al.,* 2024).

Finally, a more general HE oriented systematic literature review by Galdames-Calderón et al. (2024) sought to focus on the educator perspective by researching specific teaching practices being used within CBL. The teaching practices and dimensions considered vital to CBL include student-centred pedagogical approaches, technology integration, industry/professional engagement, and student support and development. It reiterates that there remains relatively little research focusing on the specific teaching practices used in association with CBL which is sorely needed for educators to continuously develop and adapt their roles.

Considering the implications of these recent literature reviews, some gaps appear evident. There appears to be limited insights on the role and effects of stakeholder involvement in the learning process, indicating a key area of CBL that needs further interrogation (Sukackė *et al.*, 2022; Perna, Recke and Nichols, 2023; Doulougeri *et al.*, 2024). While there is some emerging research on the curriculum alignment difficulties faced by engineering teachers (Doulougeri *et al.*, 2024), there only seems to be limited reporting on the specific teaching practices and competencies required for CBL (Sukackė *et al.*, 2022; Galdames-Calderón, Stavnskær Pedersen and Rodriguez-Gomez, 2024). Adding to this picture varying definitions and frameworks (Gallagher and Savage, 2023) and a potentially mis-placed pedagogical innovation emphasis (Leijon *et al.*, 2022) indicates some important issues that may be affecting the implementation of CBL.

To further differentiate how the current study differs from others conducted previously, this current review seeks to build on earlier work by investigating the problem of what is sometimes referred to as the 'implementation gap' i.e. the gap between translating the vision and theory for CBL into practice. To date, there has not been a focus on the CBL leadership perspective and there has been relatively little attention paid to barriers and enablers affecting implementation in practice. Therefore, it is hoped that a methodical review of the literature about the

implementation of CBL in higher education will highlight what has already been written on the subject and help to bring questions and remaining gaps to the surface for further investigation.

2.3 The Systematized Literature Review

All literature reviews should involve an adequate search for relevant literature where studies are assessed in ways that are clear to readers (Hammersley, 2020). Key to the systematic literature review is the idea of following a 'systematic, explicit, and reproducible method for identifying, evaluating, and synthesising the existing body of completed and recorded work produced by researchers, scholars, and practitioners' (Fink, 2014, p. 2). A systematic literature review is typically undertaken by a review team, ideally including people with relevant expertise in literature searching such as information specialists and librarians (Cooper *et al.*, 2018). To ensure maximum comprehensiveness across the literature, a key strength of the systematic review (Grant and Booth, 2009), it aims to identify all or as many as possible relevant records (Gusenbauer and Haddaway, 2020).

However the required degree of comprehensiveness, what Petticrew (2015, p. 3) calls 'large-scale, scorched-earth searches' can lead to rapidly diminishing returns when 'more' may not necessarily be 'better'. Therefore I sought to undertake a 'systematized review', an approach informed by systematic approaches but that does not claim full systematic review status (Grant and Booth, 2009). A systematized review attempts to include key elements of the systematic review process, such as documenting the search stages across multiple databases, but may not be as comprehensive as a fully systematic review would claim (Grant and Booth, 2009). The systematized approach is more typically undertaken by students (Grant and Booth, 2009; Sataloff *et al.*, 2021).

Furthermore, if the range of literature available on an emerging topic is very limited, there may be a case for considering a wider range of sources than online library databases alone can provide (Kitchenham and Charters, 2007; Foster, 2010). Systematic or systematized literature reviews can run the risk of being too focused on a narrow topic, sometimes veering towards closed research questions

that are ill-equipped to provide rich answers to 'how' and 'why' inquiries (Boell and Cecez-Kecmanovic, 2015). This critique has also been raised by Healey and Healey (2023, p. 13) who argue that searching the literature is not a purely technical process but is an inherently 'messy business to which you keep returning as your understanding of the topic develops'. They write that both comprehensive tools and the use of 'selective sources' (p. 2) including social media, networks and reference lists, and browsing journals are necessary for a full search of the Scholarship of Teaching and Learning (SoTL). For this reason, it is important to clarify that the systematized literature review of this current study does not represent the totality of literature used and extensive literature outside of its strict boundaries has been included throughout the thesis.

That is not to suggest that risks of potential bias should be ignored. Reviews of a systematic nature still need to pay attention to bias, considering such issues as publication bias (such as promoting certain languages, locations and databases) and selective reporting bias (choosing to discuss only certain data within a study) (Booth *et al.*, 2022; Healey and Healey, 2023). Certain instruments can be applied to mitigate such risks, including identifying and applying eligibility criteria for the studies to be included/excluded and adopting techniques to extract as much relevant information as possible from included studies (Booth *et al.,* 2022). If only a selection of databases are to be mined, it is also important to choose those most likely to yield the best possible coverage of the chosen search topic (Gusenbauer and Haddaway, 2020).

Being open and transparent means it is also essential to explain the analytical tools used and the rationale for the approach undertaken. The chapter describes the use of the Population, Intervention, Comparison, Outcome (PICO) strategy for the construction of the research question (Santos, Pimenta and Nobre, 2007; Schardt *et al.*, 2007; Speckman and Friedly, 2019). The reported items also adhered to the well-established PRISMA (Preferred Reporting of Items for Systematic Reviews and Meta-Analyses) reporting tool format. This is captured in the flowchart that follows in Figure 2, Section 2.4.2. The process of developing and

applying a Data Extraction Form (DEF) for focused reading and analysis of the literature is also briefly described.

2.4 Design of Literature Review

Systematic approaches require that items to be included are based on relevance and rigour, not on whether they report a favourable outcome or whether their results are intrinsically 'interesting' (Booth *et al.,* 2022, p.32). The following section will describe how the literature review was designed to identify, screen, and analyse papers most relevant to this research at a given point in time.

2.4.1 How studies were identified

2.4.1.1 Literature search development

To help interrogate the question and determine the scope of the literature review, the Population - Intervention - Comparison – Outcome (PICO) question framework was employed. Advocates of evidence-based approaches often use PICO to inform a focused research question and facilitate a literature search (Schardt *et al.*, 2007). Appropriate use of PICO can help to frame questions to be 'answerable' and search terms based on the framework can help achieve focused results when searching the literature (Speckman and Friedly, 2019).

Early attempts at formulating a research question were broad and ill-defined, a problem that is similarly described in Bedenlier *et al.* (2020). A meeting with a librarian led to a review of proposed search terms. The search term 'CBL' was removed due to the common use of that acronym in other spheres, including Community-based Learning, Case-based Learning, and Computer-based Learning. From an initial perusal of the results, there were many examples of small-scale, context-specific case studies on CBL. Not only did many of these studies tend to focus on one context, they also were oriented to students' perceptions of CBL, rather than educators' views. Furthermore, through reading these initial papers, it also became apparent that a significant issue was the lack of information on factors influencing implementation of CBL. There was limited

scholarship reporting the organisational barriers and enablers that could hinder or support CBL implementation and little was written from the perspective of those leading or implementing CBL specifically. Therefore, I used the PICO framework to narrow the focus towards CBL leaders' perspectives.

Table 1: Final literature search guiding question as interrogated by PICO

"What are the perceptions of Challenge-Based Learning among those leading its implementation in higher education?"			
Population	**Intervention**	**Comparison**	**Outcome**
Leaders implementing Challenge Based Learning (CBL) in Higher Education	CBL	'Traditional' didactic teaching approaches	Perceptions of how CBL is being understood and the types of barriers and enablers affecting its implementation

This PICO question guided the systematized review, helping me to explore what answers the literature provided at a general level and identify what gaps were not being addressed at all.

2.4.1.2 Approach to Search Strategy

Once the decision was made to focus on the leadership aspects of CBL, the search process also naturally evolved. Individual elements of the PICO framework (Population, Intervention and Outcome in particular) were used as building blocks for core concepts in my search for articles. Following testing and careful consideration of various words and synonyms, including keywords from various publications and discussions with supervisors, the following is the final search string that was eventually employed:

Table 2: Final search string

Key Concepts/Topics	Search Terms
CBL	“challenge based learning” OR “challenge-based learning” OR "challenge based instruction" or "challenge-based instruction" OR "challenge-based education" OR "challenge based education" OR "challenge based teaching" OR "challenge-based teaching" OR “challenge-driven education”
Higher Education	Tertiary OR “higher education” OR college OR university OR “post secondary” OR “postsecondary” OR “third level” OR “third-level” OR “post-secondary” OR “undergraduate”
Leadership	“lead*” OR “manag*” OR “strat*” OR “drive*” OR “implement*” OR “position*”

2.4.1.3 Rationale for Databases

The search began with a search of databases considered of most relevance to pedagogical research based on consultation with a university librarian. A paper by Healey and Healey (2023) subsequently described Web of Science and Scopus as useful online databases although relatively few Scholarship of Teaching and Learning (SoTL) journals appear in them and they may omit chapters from books. These authors recommended education-specific databases for SoTL inquiries, including Education Resources Information Center (ERIC), Education Research Complete, EBSCOhost and Proquest, all of which may give access to multiple databases depending on the university subscription. The searched databases were Education Research Complete, Academic Search Complete, Australian Education Index, British Education Index, ERIC, Scopus, and Web of Science Core Collection. The latter three online databases are included in the list of search systems ‘well suited to evidence synthesis in the form of systematic reviews’, according to Gusenbauer and Haddaway (2020) as they have been found to produce identical results for repeated identical queries. Google Scholar was avoided as a search system because it is not considered precise enough for systematic searches, being more suited to exploratory searches requiring only a

small number of relevant results (Gusenbauer and Haddaway, 2020).

2.4.2 How studies were screened for inclusion

2.4.2.1 Inclusion/Exclusion Criteria

Inclusion and exclusion criteria are a set of pre-defined characteristics summarising which literature should be included or excluded from a study (Johns, 2023). Throughout the initial screening and full text review process, inclusion and exclusion criteria were applied. The final version of the criteria display in Table 3.

The initial focus of this literature review was on relevant CBL literature from 2008 until December 2022. It was decided to exclude literature that was published prior to 2008. This is because a definition of CBL that is still in widespread use was first published in a widely-cited paper from that time (Nichols and Cator, 2008). Because English is my native language, it was also determined very early on that only English language papers would be included, although the limitations of this should be acknowledged (Healey and Healey, 2023). In February-March 2023, the initial searches were run. In June-July 2025, the literature review was revisited to include literature from 2023 and 2024 as there had been considerable literature output on CBL in the intervening years.

From the start, it was decided to focus on the university context, rather than primary or second level, as higher education is my professional context and it is there that I intend to apply the findings from my research. Early studies of CBL tended to focus on the K-12 context, especially in the United States, which would be expected to have different implementation issues than the tertiary sector.

Other key decision points included a focus on journal articles (for the depth and rigour of their review process) and conference proceedings (in view of their currency in an emerging field). Grey literature was to be excluded. Grey literature has been described as the manifold document types produced by governments, academics, business, and industry, and typically emanates from organisations where publishing is not their primary activity (Green, 2022). Peer reviewed books were included as a criterion in early 2023 when a highly-relevant book on Challenge Based Learning, published in 2022 by Emerald Publishing, came to my

attention via a reference list and I realised that excluding books and book chapters would mean omitting a valuable source of insight.

The first four criteria (Timeframe, Language, Sample relevance and Type of Publication) shown in Table 3 were applied as limiters within the online database interfaces. The process ultimately identified 561 results as outlined in the PRISMA diagram that follows. These records needed to be screened at the title, abstract, and keyword level, something that I described as a 'first pass' to identify potential sources of relevance to the research question.

Table 3: Search limiters, inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Timeframe	2008 – 2024	Prior to 2008
Language	English	Non-English
Sample relevance	Studies oriented towards the university context	Studies outside of university education e.g. K12 oriented studies
Type of publication	Peer-reviewed, original research published in journals, books, conference proceedings (abstract and full text)	Non peer-reviewed publications e.g grey literature
Educator/leader orientation	Studies that focused on educator/leader perceptions and experiences of CBL	Studies that focused on student perceptions and experiences of CBL
Context	Case studies of CBL from >1 context or iteration that appear to explore wider educator/leader concerns in the abstract	Case studies of CBL from only one context or iteration that did not appear to explore wider educator/leader concerns in the abstract
Pedagogical Focus	Studies where the title indicated that CBL was the	Studies where the title indicated that multiple

Criteria	Inclusion	Exclusion
	dominant pedagogy being focused on and the word 'challenge' was mentioned in the abstract.	pedagogical approaches were being explored simultaneously and it would be difficult to identify CBL-specific implementation factors. The word 'challenge' was only mentioned in the title or as a keyword.
Source	Primary Source e.g. original article	Secondary Source e.g. literature review
Recognisability as CBL	Studies that are recognisable in adhering to a CBL approach e.g. Studies that follow an articulated CBL framework or definition such as the Apple/ECIU framework or others	Studies that are not 'true' challenge-based learning e.g. used the word 'challenge' in a very broad sense, don't mention any CBL framework, or seem more like PBL in using fictionalised scenario(s).
Meaning of 'Implementation'	The word 'Implementation' relates to implementing CBL as a pedagogical strategy within a course, programme or institution	The word 'Implementation' relates to implementing a specific CBL solution (e.g. a prototype or recommendations) with a stakeholder

Reviewing the title, abstract, and keywords in more depth, further issues became apparent. There continued to be a high number of abstracts that focused on the student learning experience, typically small-scale, anecdotal case studies that described one-off iterations of CBL in practice. The prevalence of this type of literature confirmed this issue previously raised by Gallagher and Savage (2023) and Doulougeri et al. (2022).

There were also a number of records where a mix of teaching and learning strategies were under discussion (for example, strategies such as gamification and flipped classroom were being researched alongside CBL). This made it difficult to identify factors relating to CBL specifically. I wanted my review to only use primary sources to see if anything pertinent to my research question had been explored already. The exclusive use of primary sources is typical of systematic reviews which usually synthesize findings from several primary research studies (West and Martin, 2023).

To maintain research focus, it was necessary to add more criteria that would help to pinpoint articles of relevance to the implementation and leadership of CBL. Therefore I decided to add criteria to include studies that focused on the educator/leader experience rather than the student standpoint; include instances of CBL that were iterated more than once and acknowledged wider implementation concerns; include studies where CBL was the main pedagogical focus and it was not simply one of a number of strategies under discussion; and, confine the review to include primary source material only.

This reduced the number of potential papers, but it was still not entirely evident if those papers were going to help answer the research questions. Further assessment as to relevance was required (Kitchenham and Charters, 2007). A second pass of the literature was then undertaken where I read the full article to decide using the following process:

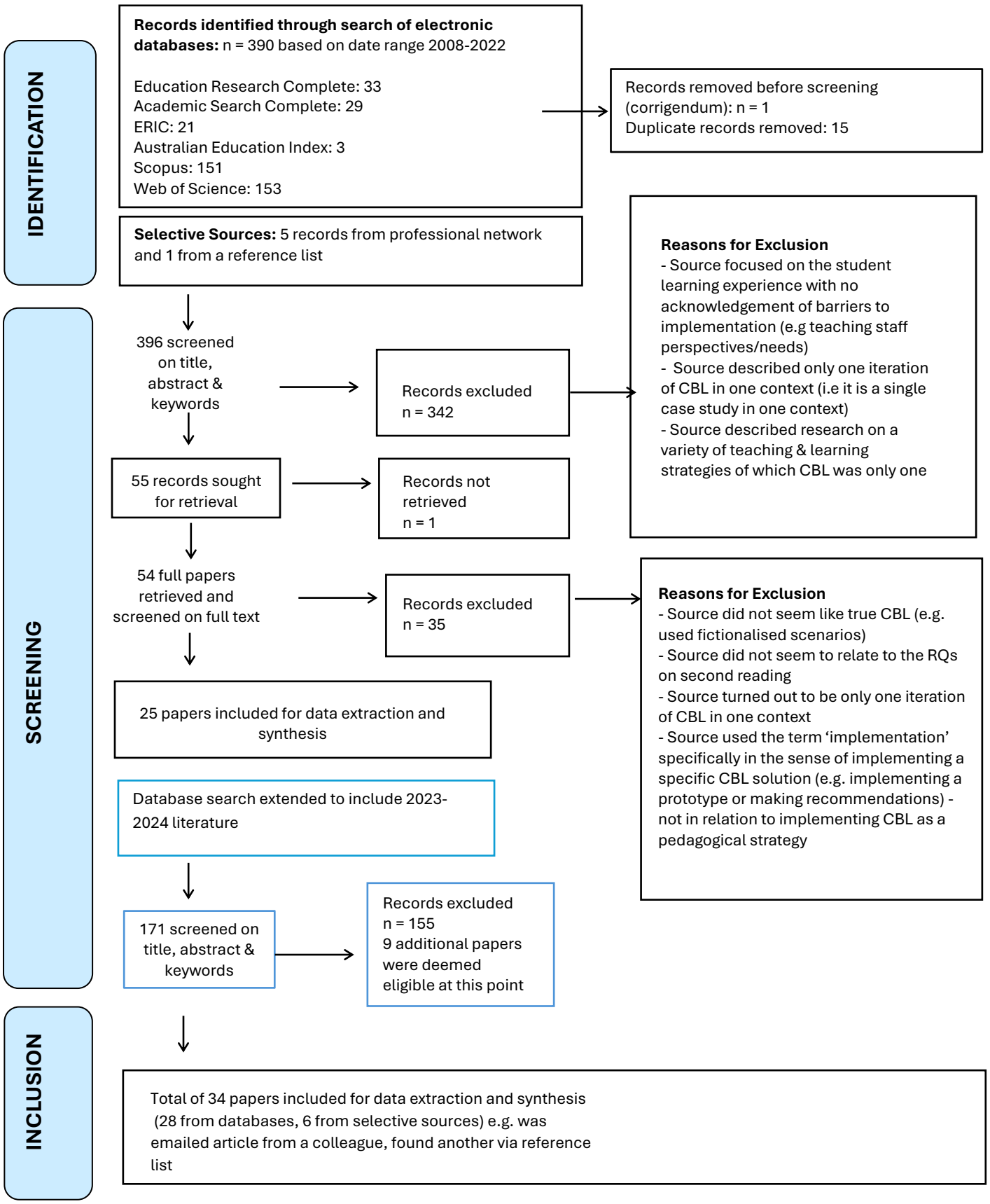
Studies that followed a recognisably CBL approach were to be included while those that were not clearly recognisable as CBL were not. The work of Membrillo-Hernández (2019) comparing the techniques and characteristics of CBL with Project-Based and Problem-Based Learning, was particularly influential in this regard. For example, one paper seemed more like Problem-Based Learning (PBL) in using what was obviously a fictionalised scenario. This was a paper that was based on a ‘Zombie apocalypse’ - a clearly hypothetical scenario - and was excluded on that basis. The sources were also examined to see if they articulated or referred to an overarching CBL framework (of any kind). Those that did not were excluded.

Terminology was also reviewed to ensure it was related to the research questions. For example, there were times when the word 'implementation' was about implementing a specific CBL solution (e.g. implementing a prototype or recommendations within a company), not in relation to implementing CBL as a pedagogical strategy. The papers needed to be read in full to identify those types of subtleties. Other reasons for excluding sources at this point were, for example, that the source did not seem to relate to the RQs on second reading and was very focused on a specific pedagogical aspect of CBL, such as student performance, competencies, or results in relation to a specific task with no sense of wider implications for staff or others. It was also apparent that some of the papers used the word 'challenge' in a very broad/general sense, not seemingly related to Challenge-Based Learning.

To add further rigour to the article selection process, an inter-rater reliability check was also carried out during the summer of 2023. Kitchenham and Charters (2007) advise that a single researcher (such as a postgraduate student) should consider discussing the sources that were included and excluded with their adviser, expert panel, or other researchers. In this case, I selected a sample of six papers that I wanted a second opinion on. I deliberately picked papers that I was somewhat tentative about and shared a table outlining those with my supervisors at the time to seek their input. My supervisors blind read the six papers and then we met to compare notes. This process helped confirm that I was applying the eligibility criteria as expected. Three were excluded as student-oriented, only one iteration, and irrelevant to the research questions.

The screening process, depicted in the following PRISMA flow diagram (Figure 2), outlines the overall literature selection process, the results that emerged, and the systematized approach that was applied.

Figure 2: Preferred Reporting Items for Systematic Reviews & Meta-Analyses (PRISMA) Flowchart



2.4.3 How data were extracted

2.4.3.1 The Data Extraction Form

The goal of data extraction is to focus the reading on each study and facilitate the 'extraction' of key data related to the research questions. According to Booth *et al*. (2022), it requires an in-depth reading of a study and it 'encourages you to focus on the minutiae of the report' (p. 198). To this end, a Google Form was developed and piloted to capture responses to a set of standard questions for each publication. The final form resulted in 42 questions to be applied to each publication. The full data extraction form and a summary of its development can be viewed in Appendix A.

2.5 Studies Reviewed

Table 4 provides an overview of the 34 papers that were finally selected for inclusion in this literature review. Further details about the studies, including how they were sourced, can be viewed in Appendix B.

Table 4: Summary of included studies

Year	Author(s)	Title of Publication	Type of Publication
2011	Crown, Fuentes and Freeman	A Successful Plan for Faculty Development that has a Lasting Impact	Conference Paper
2012	Crown, Fuentes and Freeman	Pedagogy for Pedagogy: Using a Wiki to Promote the Adoption, Development, and Implementation of Challenge-based Instruction in STEM Education	Conference Paper
2015	Malmqvist, Rådberg and Lundqvist	Comparative Analysis of Challenge-based Learning Experiences	Conference Paper
2018	Cruger	Applying challenge-based learning in the (feminist) communication classroom: Positioning students as	Journal Article

Year	Author(s)	Title of Publication	Type of Publication
		knowledgeable change agents	
2018	Ramirez-Mendoza et al.	Towards a disruptive active learning engineering education	Conference Paper
2019	Membrillo-Hernández et al.	Challenge based learning: the importance of world-leading companies as training partners	Journal Article
2019	Högfeldt et al.	Mutual Capacity Building through North-South Collaboration Using Challenge-Driven Education	Journal Article
2019	Félix-Herrán, Rendon-Nava and Nieto Jalil	Challenge-based learning: an I-semester for experiential learning in Mechatronics Engineering	Journal Article
2020	Koeper et al.	Turning chemistry education on its head: Design, experience and evaluation of a learning-centred 'Modern Chemistry' subject	Journal Article
2020	Rådberg et al.	From CDIO to challenge-based learning experiences – expanding student learning as well as societal impact?	Journal Article
2020	Vilalta-Perdomo et al.	Challenge-based learning: A multidisciplinary teaching and learning approach in the digital era–UoL4. 0 challenge: A CBL implementation	Book Chapter
2021	Shakila et al.	Interdisciplinary Challenge-Based Learning: Science to Society	Conference Paper
2021	Van den Beemt, Van de Watering and Bots	Variety in Challenge-Based Learning in Higher Education	Conference Paper

Year	Author(s)	Title of Publication	Type of Publication
2021	Membrillo-Hernández et al.	Implementation of the challenge-based learning approach in Academic Engineering Programs	Journal Article
2021	Gunnarsson and Swartz	Applying the CDIO framework when developing the ECIU University	Conference Paper
2022	Christersson et al.	Challenge-Based Learning in Higher Education: A Malmö University Position Paper	Journal Article
2022	Vilalta-Perdomo, Michel-Villarreal and Thierry-Aguilera	Integrating Industry 4.0 in Higher Education Using Challenge-Based Learning: An Intervention in Operations Management	Journal Article
2022	Rosén et al.	Transformation-Driving Education: Perspectives Emerging in a Dialogue between Teachers with Experiences from Challenge-Driven Education	Conference Paper
2022	Doulougeri et al.	Challenge-Based Learning in Engineering Education: Toward Mapping the Landscape and Guiding Educational Practice	Book Chapter
2022	De Stefani and Han	An Inter-University CBL Course and Its Reception by the Student Body: Reflections and Lessons Learned (in Times of COVID-19)	Journal Article
2022	Lara-Prieto and Flores-Garza	iWeek experience: the innovation challenges of digital transformation in industry	Journal Article
2022	Gallagher and Savage	Challenge Based Learning: Recommendations for the Future of Higher Education	Book Chapter
2022	Chapel and DePryck	Building a multi-tier Maturity Model for introducing Challenge Based	Conference Paper

Year	Author(s)	Title of Publication	Type of Publication
		Learning. Opportunities for teachers' professional development	
2022	Reymen et al.	Creating a Learning Ecosystem for Developing, Sustaining, and Disseminating CBL the Case of TU/e Innovation Space	Book Chapter
2023	van den Beemt, van de Watering and Bots	Conceptualising variety in challenge-based learning in higher education: the CBL-compass	Journal Article
2023	van den Beemt et al.	Taking the Challenge: An Exploratory Study of the Challenge-Based Learning Context in Higher Education Institutions across Three Different Continents	Journal Article
2023	Lara-Prieto et al.	Challenge-Based Learning Strategies Using Technological Innovations in Industrial, Mechanical and Mechatronics Engineering Programs	Journal Article
2023	Daunorienė and Ellinger	Facilitating and Hindering Aspects of Technology-Enriched Challenge-Based Learning in ECIU University, a European University International Network	Conference Paper
2023	Helker, Michel and Bots	Congruence And Friction Between Teachers' Intentions And Students' Perceptions of CBL Courses	Conference Paper
2023	Imanbayeva, De Graaf and Poortman	Challenge-Based Learning In Courses: The Implementation Continuum	Conference Paper
2024	Nizamis	Challenge-Based Learning In Practice: Redesign And Evaluation of an Interdisciplinary Minor	Conference Proceedings

Year	Author(s)	Title of Publication	Type of Publication
2024	Vasquez-Lopez, Millan-Ramos and Maldonado-Carrillo	Strategies for effective CBL implementation: from company selection to course evaluation	Journal Article
2024	García-García et al.	Developing transversal (soft) competencies in Higher Education Engineering students: the role of the Training Partners in the challenge-based learning model	Conference Paper
2024	Santos-Díaz et al.	Implementing a challenge-based learning experience in a bioinstrumentation blended course	Journal Article

Having collated the studies, the next step is analysis. This begins by presenting general, descriptive characteristics of the literature, to provide a broad overview of the scholarship drawn upon. This includes the region/country of publications, the research methodologies employed, the discipline, and the forms/duration of CBL described. Next, the perceptions of CBL in the literature are discussed through the lenses of definitions and frameworks, associated pedagogies, learning theories, and variety in CBL implementation. Literature describing barriers and enablers of CBL implementation is then synthesized to give a sense of the types of influences – both negative and positive – that are having effects.

2.6. General Characteristics and Trends

2.6.1 Geographic Distribution

The geographic location of publications indicates where most research into CBL is currently happening and if overall patterns appear to be changing. Figure 3 shows that most of the research was conducted in Europe (18/34) with South America the next most reported region (8/34) for studies on CBL implementation. Significantly

fewer studies were reported from Asian regions (1/34) although some did appear under the Multiple regions category.

Figure 3: Regional Distribution

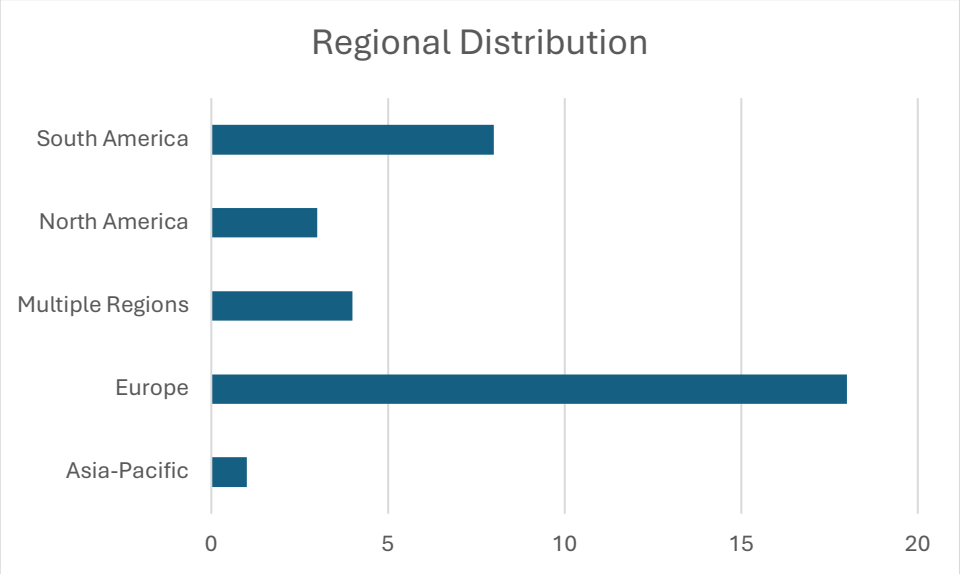
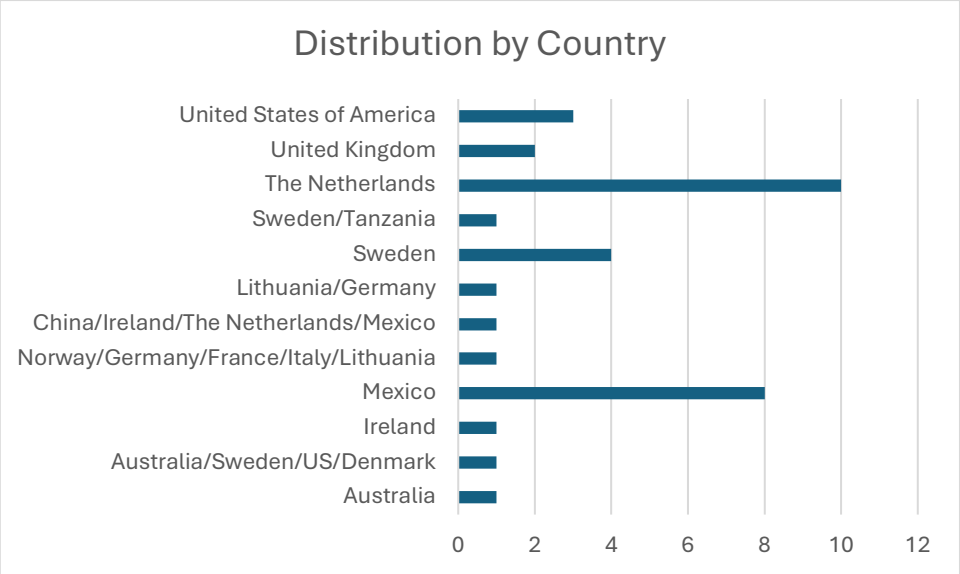


Figure 4, which focuses on distribution by country, shows that most of the studies were conducted in The Netherlands (10/34), with Mexico contributing eight.

Figure 4: Distribution by Country



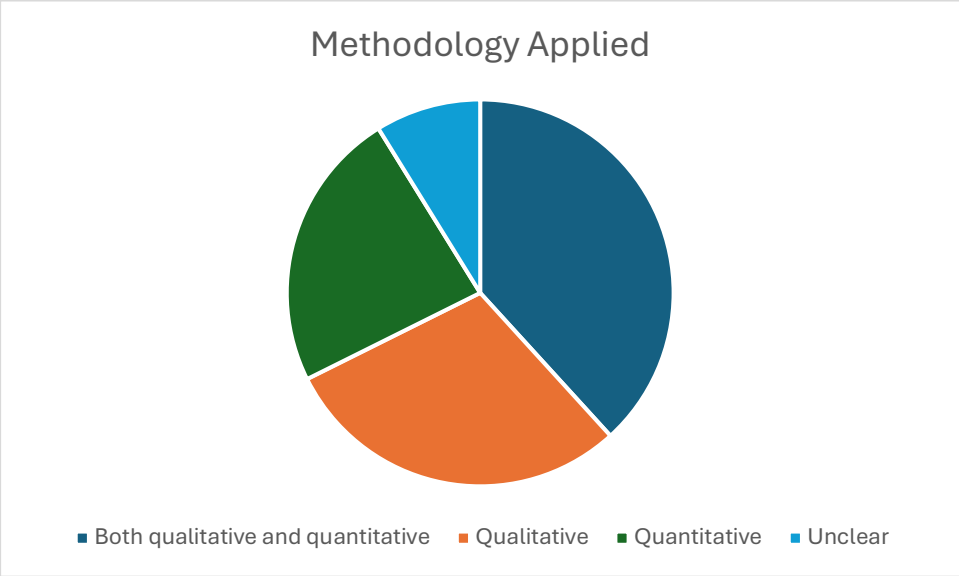
Most of the publications in this review are from European countries, signalling a change in the volume and location of research outputs that was originally dominated by the US and South America. In particular, it is obvious that significant activity and research relating to CBL is now emerging from The Netherlands. It is perhaps surprising that relatively few relevant studies to this topic have emerged recently from the US, despite it being the birthplace of Apple Inc. where one of the most influential aspects of CBL (the Nichols and Cator (2008) definition) CBL originated.

2.6.2 Research Methodologies

There have been previously expressed reservations about the rigour of research into CBL in its early days underlining the need to further strengthen the evidence base (van den Beemt, van de Watering and Bots, 2023). The methodological approaches being applied within the selected publications was reviewed, as captured in Figure 5.

Figure 5: Methodology applied

The research methodologies were split into a mix of both quantitative and qualitative mixed methods research (13/34), qualitative only studies (10/34), and quantitative only studies (8/34). In a few cases (3), the methodology was unclear.

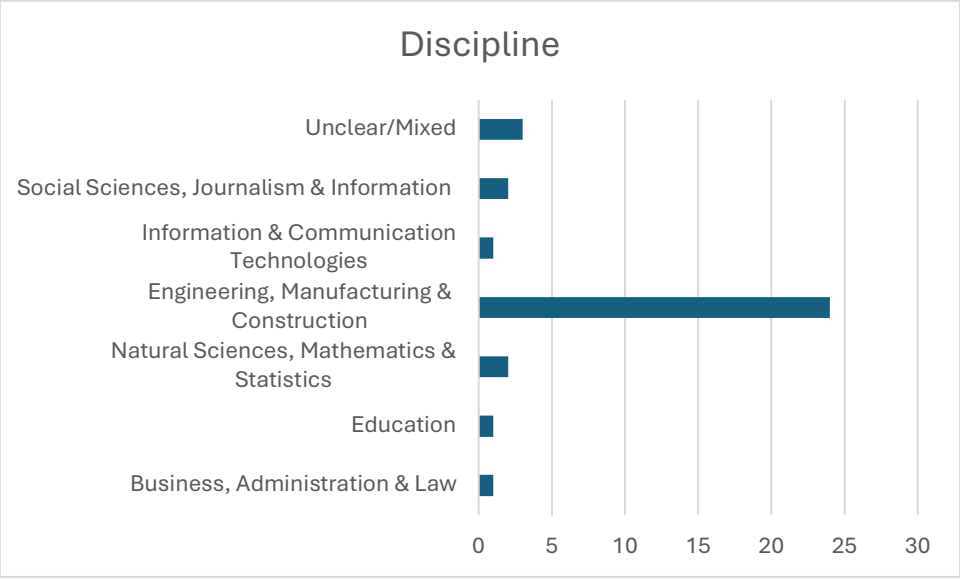


2.6.3 Disciplines

Given the emphasis on multi/inter/transdisciplinarity in the CBL literature as evidenced in this review, a focus on the disciplines involved may help to inform our understanding of the disciplines most and least active in this space. The categorisations shown in Figure 6 are based on discipline categorisations by broad field of study as per HEA statistics (Higher Education Authority, 2024). Notwithstanding ongoing debates about the nature of academic disciplines, these categorisations are in keeping with previous international scholarship (Biglan, 1973).

As can be seen in Figure 6, 24/34 publications are coming from the discipline of engineering, manufacturing and construction and there are 1-2 research papers from the five other disciplines represented. In three cases, it was not possible to identify a specific discipline.

Figure 6: Discipline of Study



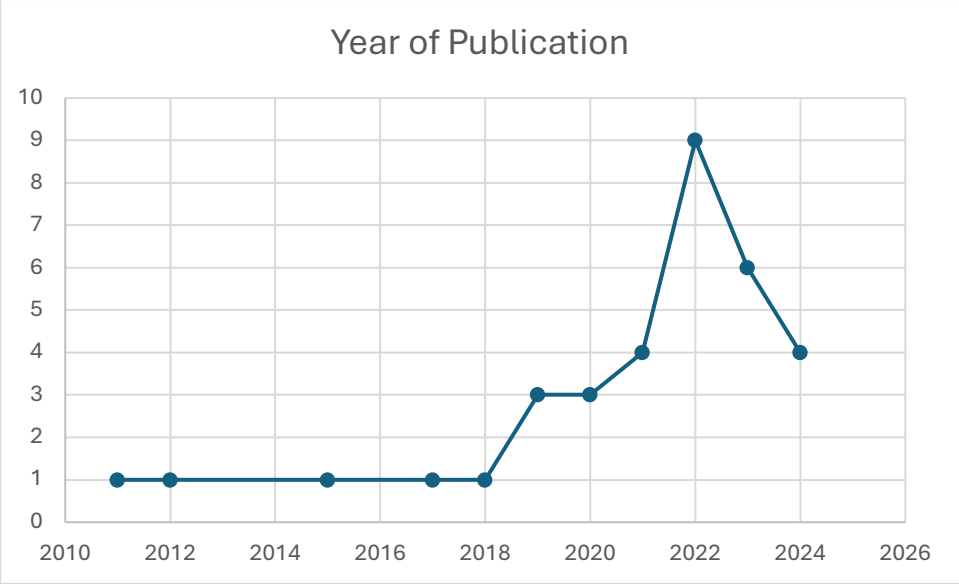
Clearly, the discipline of engineering, manufacturing and construction leads the field by some way in adoption and research of CBL. Given the multi/inter/transdisciplinarity ethos of CBL, this single discipline trend is somewhat surprising, if not a contradiction in terms. While some papers have demonstrated there is scope for implementing CBL in non-STEM disciplines (for

example, Cruger (2018) applies it in a communication and social theory course and Vilalta-Perdomo et al.(2022) with business students), it might be expected to see wider use in scenarios involving more than one discipline as was noted previously by Gallagher and Savage (2023).

2.6.4 Date/Timeframe of Publication

In this literature review, most of the featured publications were published in 2022. 4/34 of the publications were published in 2024, 6/34 in 2022, 4/34 were published in 2021 while 3/34 were released each year of 2019 and 2020. From 2011 - 2018, there was just one relevant publication each year. Note that some publications may have been published previously online, but the publication date listed in this study is based upon the published date of the journal issue which is the date also reflected in the academic databases.

Figure 7: Distribution of publications by year

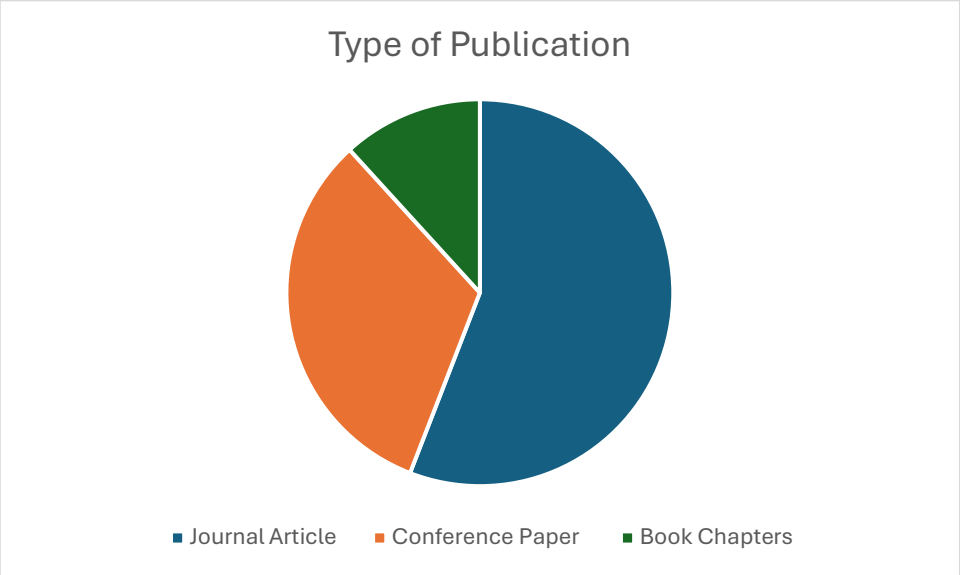


It is therefore apparent that the number of publications describing aspects of CBL implementation pertinent to this study started to increase in 2018. The number of relevant publications more than doubled in 2022 compared to the previous year and approximately a quarter of the included studies were published that year.

2.6.5 Publication Type & Focus

The type and focus of publications may shed further light on where current research on CBL is being published. The spread of publication types is outlined in Figure 8 below. The review includes mainly peer reviewed journal articles (19/34) but a notable number of publications came via conference proceedings (11/34). There have also been a number of relevant book publications recently (the review includes four relevant chapters from two books, one published in 2020 and the other in 2022).

Figure 8: Type of Publication



Most of the publications had a strong disciplinary focus (18/34), some had a broad pedagogical orientation (9/34), and some were mixed (6/34). One journal had a specific focus on sustainability.

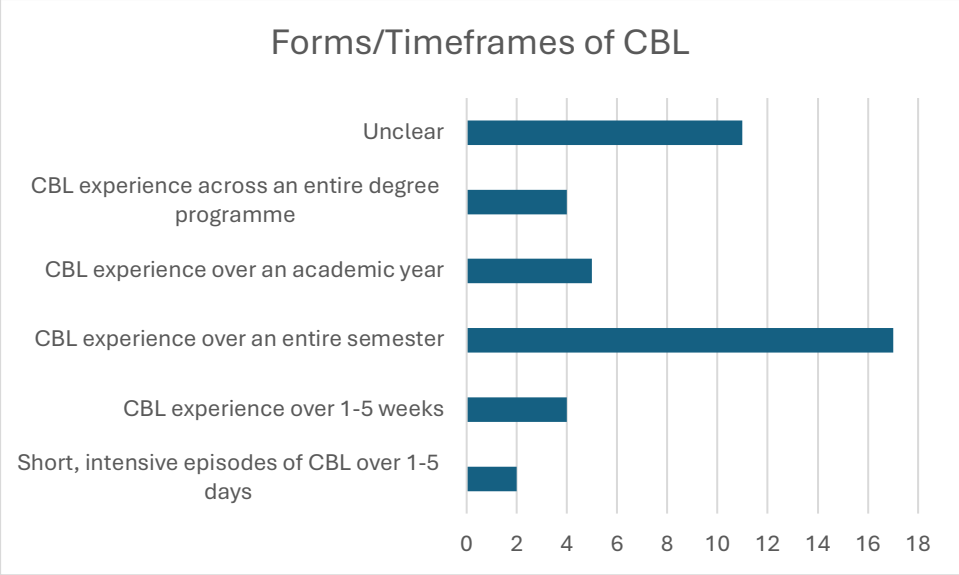
In analysing these findings, the relatively high number of conference publications is indicative of the fast-growing trend and interest in CBL and the growth of the topic as an area of contemporary research. CBL has been regularly featured at SEFI engineering conferences and recent CBL-focused international conferences (International CBL Conference 2025 and ECIU University Forum 2025) hosted hundreds of attendees. The number of recent book publications is also reflective of the demand for evidence-based research in various forms, with books being

known for their value in providing context, a focused view of an important issue, and a starting point for exploring new concepts (The Open University, 2025).

2.6.6 Forms of CBL Described

CBL can be implemented over different timeframes, typically spanning a semester in the majority of CBL courses to a few days for certain types of projects. Figure 9 highlights that most of the publications (17/34) focused on semester-long implementations of CBL (Vilalta-Perdomo, Michel-Villarreal and Thierry-Aguilera, 2022) and one paper at the opposite extreme describing CBL across an entire degree programme (Högfeldt *et al.*, 2019). Lara-Prieto and Flores-Garza (2022) describe CBL over specified innovation weeks whereas Kohn-Rådberg et al. (2020) describe a CBL experience over an academic year. Other variations were evident in CBL running over part of a semester (Santos-Díaz *et al.*, 2024).

Figure 9: Forms/timeframes of CBL



It is striking how unclear the descriptions were in terms of the duration of CBL, with 11/34 of the papers not specifying the exact form or timeframes involved. It was difficult to get a sense of how in-depth the implementations were (or not) without clarity on this point and it prompted further unanswered questions in terms of implications for staff and student workload.

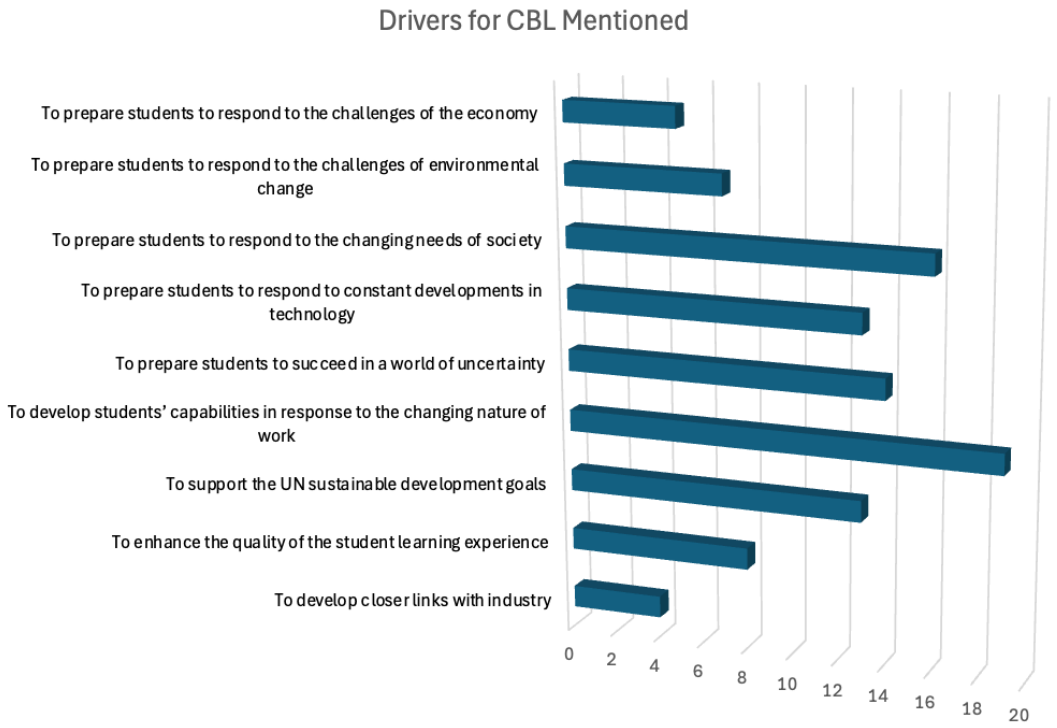
2.6.7 Drivers for CBL

Drivers might typically describe the various factors or elements that influence or catalyse implementation of a particular educational initiative (Butler *et al.*, 2018). Some institutions implement policy through various strategic drivers to encourage the use of CBL, Tecnológico de Monterrey being one example (Membrillo-Hernández *et al.*, 2021). Hyatt (2013, p. 838) describes the drivers of policy as 'expressions of the intended aims or goals of a policy'.

Several of the publications described multiple drivers behind their adoption of CBL. We can see in Figure 10 that the most frequently cited driver was use of CBL to develop students' capabilities to respond to the changing nature of work (19/34). Specific examples such as collaboration, allowing students to consolidate their learning, develop practical creative and problem-solving skills, and see the relevance of their education were mentioned.

The next most common driver in the literature related to use of CBL for preparing students to respond to the changing needs of society (16/34). This is closely followed by preparation for a world of uncertainty (14/34) and support for preparing for developments in technology (13/34) which is on equal footing with supporting the UN SDGs (13/34).

Figure 10: Drivers for CBL mentioned in publications



Explicit mention of these drivers was sought and there was a specific question in the data extraction form that listed the drivers shown in the graph. These items were drawn from a range of literature considered at the outset of the study including Membrillo-Hernandez *et al*. (2019) and Gallagher and Savage (2023). However, it should be acknowledged that a degree of interpretation was required when extracting the data as the language may not have matched exactly.

The analysis thus far shows that CBL is growing in traction in higher education to help prepare students to respond to a future workplace and a changing society. There is a strengthening research base in The Netherlands, but CBL usage is still being dominated by one discipline. This suggests that broader questions relating to the actual understanding and implementation of CBL have yet to be unpacked. The next section will explore how the literature is reporting different interpretations of CBL and the types of barriers and enablers for implementing CBL that have been recorded to date.

2.7 Perceptions of CBL in the literature

Drawing on the guiding PICO framework, this section sets out to explore how CBL is being represented in the literature under the headings of understanding CBL, barriers to CBL implementation, and enablers to CBL implementation.

2.7.1 Understanding CBL

Different ways of understanding CBL can manifest in associated definitions and frameworks, associated pedagogies and theories, and variety in implementation, as we will now explore.

2.7.1.1 Multiple definitions

CBL is being defined in various ways, sometimes referring to and supporting existing definitions (14/38) and in some cases not referring to any particular definition at all (3/38). Ten of the publications draw on a range of definitions while six of the publications have formulated their own definition or explanation of CBL.

Of the papers supporting a definition that is already in the existing literature, 7/34 refer to the definition that emerged from the Apple Classrooms of Tomorrow (ACOT) project. This definition, shown below, subsequently featured in the widely-cited white paper from Nichols and Cator (2008, p. 1). This is not hugely surprising as it is already established that this is a well-thumbed definition (Leijon *et al.*, 2022).

> Challenge Based Learning is an engaging multidisciplinary approach to teaching and learning that encourages students to leverage the technology they use in their daily lives to solve real-world problems. Challenge Based Learning is collaborative and handson, asking students to work with peers, teachers, and experts in their communities and around the world to ask good questions, develop deeper subject area knowledge, accept and solve challenges, take action, and share their experience.

Fourteen papers cited or created definitions with a sustainability focus, indicating a significant proportion using CBL in support of sustainability-related skills and competencies. For example, in the definition that follows, Malmqvist, Rådberg, and Lundqvist (2015, p.22) propose their own sustainability-oriented definition of

CBL which in turn has been widely cited and adapted by several others, including for example Kohn Rådberg *et al.* (2020), Shakila *et al.* (2021), De Stefani and Han (2022), and Van den Beemt *et al.* (2023).

> Challenge-based learning takes place through the identification, analysis and design of a solution to a sociotechnical 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.

Other definitions seem to place more of an emphasis on the use of CBL as a pedagogical innovation. This conceptualisation is cautioned against in Leijon *et al.* (2022) but is evident in the description of CBL as a 'cutting-edge approach to educational innovation' appearing in three sources in this literature review (Félix-Herrán, Rendon-Nava and Nieto Jalil, 2019; Vilalta-Perdomo, Membrillo-Hernández, *et al.*, 2022a; Vilalta-Perdomo, Michel-Villarreal and Thierry-Aguilera, 2022b). According to Vilalta-Perdomo *et al.* (2022a, p.2):

> CBL is a cutting-edge alternative to traditional teacher-centered and summative assessment education. CBL integrates traditional learning modules with real-life challenges that require innovative solutions and can be applied to a variety of subjects.

The various definitions and emphasis seem to reiterate findings from earlier literature that there is no single, consistent definition of CBL and it is being interpreted and applied in many ways. Some researchers (Gallagher and Savage, 2023; van den Beemt, van de Watering and Bots, 2023) refer to the issue of 'definitional muddying' which they describe as unhelpful to the cause of rigorously researching this approach. For example, pedagogies such as Problem-Based Learning and Project-Based Learning are described as 'close cousins' of CBL according to Gallagher and Savage (2022, p. 395), while others would claim that although they are based on active learning 'they are not similar' (Membrillo-Hernández *et al.*, 2019, p. 1104).

However instead of getting bogged down in definitional wrangling between arguably similar approaches, Rosén *et al.* (2022, p. 1) ask 'do we have to, and would we even prefer to, staying with the trouble of multitude and ambiguous

terms, and instead focus on how we can live and act co-creatively in this jungle of ideas and intentions'. Rosén *et al*. (2022) and Högfeldt *et al*. (2019) both use the umbrella term of 'Challenge-Driven Education' to encompass forms of learning where students are collaborating with other students beyond their own discipline, engaging with external stakeholders, and tackling real-world challenges involving themes of sustainable development.

2.7.1.2 Multiple frameworks

Frameworks can and should guide practice around CBL, with frameworks typically offering high-level guidance on the stages of the CBL cycle and associated student process behaviours (Martin and Bombaerts, 2024). Frameworks can also describe the characteristics of CBL that need to be considered when implementing (Gallagher and Savage, 2023; van den Beemt, van de Watering and Bots, 2023).

Three of the papers in this literature review refer to the Apple framework of Engage - Investigate - Act, as described by Nichols, Cator and Torres (2016). The paper by Kohn Rådberg *et al.*, (2020) refers to its own custom framework. It describes a three-stage process of a preparatory course on methods and tools, a problem formulation and scoping phase, and work on specific projects related to stakeholders. For Félix-Herrán, Rendon-Nava and Nieto Jalil (2019) their CBL implementation involves a somewhat customised framework. This is outlined as a 'Diagnosis' stage, a 'Proposal Development' stage and a 'Proposal Implementation' stage. The practicalities of all of these are described in depth in the paper.

Some papers present CBL as an 'educational concept' rather than a pre-defined teaching method. There are a number of papers in this review that take a similar stance in describing CBL as an educational concept that should involve consideration of three key factors: Vision, Teaching and Learning, and Support systems (Doulougeri *et al.*, 2022; Helker *et al.*, 2023; van den Beemt, van de Watering and Bots, 2023). What is notable here is that this type of high-level overarching conceptual framework for CBL implementation moves beyond the immediate practicalities of pedagogy to encompass institutional vision and support.

Similarly, instead of citing an existing definition, Chapel and DePryck (2022) describe CBL as an 'educational framework' for future proofing education. The framework they outline represents five features of CBL, encompassing Challenges, Stakeholder involvement, Collaboration, Competence development, and Flexible Learning Paths. Like Van den Beemt, van den Watering and Bots (2023), Chapel and DePryck (2022) have developed indicators to support education providers with introducing and scaling CBL and also to inform professional development activities. Chapel and DePryck (2022) have utilised Marshall's e-Maturity Model (Marshall, 2010) as a tool to assess readiness to start teaching with CBL and guide teachers' professional development.

Christersson et al. (2022) do not subscribe to a particular definition either. Instead, CBL is defined through eight elements, which the authors describe as 'keys to CBL in HE' (Christersson et al., 2022, p.6). These elements include such aspirations as using CBL to advance the role of higher education institutions in society, drawing on theories of lifelong learning, and promoting the impact of change toward a learning society. The thinking here appears more along the lines of general principles of CBL rather than a fixed definition of how CBL should look in practice. The paper explains how these elements were integrated and developed into three broad domains of Diversity & Inclusion, Co-creation and Collaboration, and Change Agents & Contextual Challenges as a framework for CBL at their institution and potentially beyond.

The fact that so many papers are unclear or offered no framework indicates how difficult it was to identify an articulated CBL framework that guided their CBL usage. It is also sometimes hard to tell if the frameworks are intended to guide the cycle of CBL within the student learning experience or the embedding of CBL within a particular setting.

2.7.1.3 Variety in conceptualisation

Van den Beemt *et al.* (2023) reiterate the complexity of the CBL definitional landscape, calling for a greater recognition of the variety in the scale and

characteristics of CBL in practice. According to Van den Beemt and colleagues, not all dimensions of CBL will be apparent in every project or course and a variety of designs and conceptions of CBL is to be expected across curricula. Van den Beemt et al. (2023) call for a 'conceptualisation of CBL that allows for discussing and researching variety in implementations' (p.2) while also suggesting certain 'must have indicators' and minimum requirements that should be present within experiences to be called CBL. They have developed a multi-faceted CBL-compass tool for staff and researchers to 'visualise the local colour of CBL in higher education institutions' (p.598).

Van den Beemt and colleagues consider the engagement of students in 'real life challenges' which are authentic to the profession and students' interests to be a core characteristic of CBL. Drawing on earlier publications (Malmqvist, Rådberg and Lundqvist, 2015; Membrillo-Hernández *et al.*, 2019; Kohn Rådberg *et al.*, 2020), they also stipulate fundamental engineering knowledge and skills alongside deep understanding and broader view (T-shaped professionals) as 'must have' and distinguishing criteria for CBL at their university.

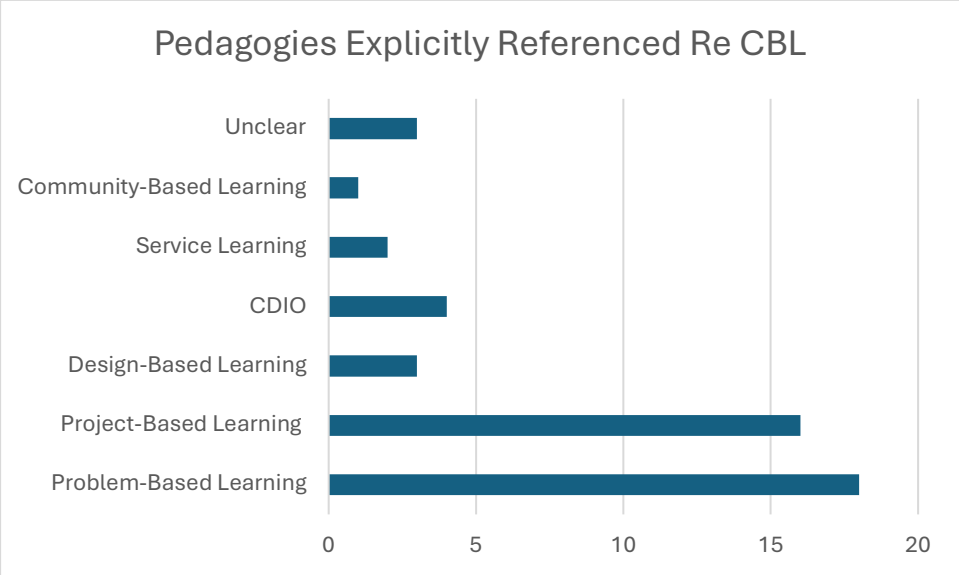
Other researchers have made proposals to suggest more granular classification schemes that can further represent variety in CBL implementation. For example, Gallagher and Savage (2023) propose a Strict, Hybrid, General classification scheme for varying depths and flavours of CBL adoption, while Imanbayeva, De Graaf and Poortman (2023) suggest use of a CBL Continuum representing possible engagement with CBL at Mild, Moderate, or Intense levels. Such possibilities for variety in conceptualisation indicate that a one-size-fits-all approach to either frameworks or implementation is unlikely to take hold.

2.7.1.4 Associated pedagogies

As Figure 11 shows, there are certain pedagogies commonly referenced in relation to CBL. Problem-Based Learning was the pedagogy most frequently mentioned in association with CBL, sometimes to draw connections (Högfeldt *et al.*, 2019; Chapel and DePryck, 2022; Gallagher and Savage, 2022) but sometimes to differentiate (Membrillo-Hernández *et al.*, 2019; Christersson *et al.*, 2022), being

mentioned in 18/34 papers. 16 papers drew connections between CBL and Project-Based Learning. Additional pedagogies included the Conceive-Design-Implement-Operate (CDIO) technique, which was discussed at some length in four papers as an approach to be learned from in terms of applying CBL. Similarities to Design-Based Learning were mentioned and some connections were made to Inquiry-Based learning. Other pedagogies mentioned to a much lesser extent include service learning, and community-based learning. The papers referencing all these pedagogies will be discussed next.

Figure 11: Pedagogies explicitly referenced in relation to CBL



Note that some papers mentioned more than one pedagogy in the main text.

2.7.1.5 Associated root traditions

Approximately three quarters of the literature in this review identified a root or source of influence regarding CBL, suggesting that most authors saw a clear link with some pre-existing tradition. Problem-based Learning was the pedagogy most frequently cited as a root tradition or source of influence in relation to CBL. Kohn Rådberg *et al.*, (2020) describes similarities between the two approaches in that teams of students are asked to design, research or diagnose a 'problem' and learning occurs through the process of working out the solution. In another paper, CBL was said to integrate other educational practices (including Problem-based

Learning), through developing common aspects such as critical thinking, problem solving, and collaborative learning (Vilalta-Perdomo *et al.*, 2022). Project-Based Learning was the next most frequently attributed root. It was mentioned several times as sharing some characteristics with CBL, for example Membrillo-Hernández *et al.*, (2019); Doulougeri *et al.*, (2022); Vilalta-Perdomo *et al.*, (2022).

Evolution or Revolution?

A number of papers paper (Doulougeri *et al.*, 2022; van den Beemt *et al.*, 2023) state directly that CBL is an evolution of multiple approaches. There were four papers that describe CBL as an evolution of the Conceive, Design, Implement, Operate (CIDO) concept (Malmqvist, Rådberg and Lundqvist, 2015; Kohn Rådberg *et al.*, 2020; Gunnarson and Swartz, 2021; Doulougeri *et al.*, 2022). This approach puts the emphasis on developing products that meet customer needs, and is a feature of engineering education (Kohn Rådberg *et al.*, 2020). CBL is said to extend this approach through including stages of problem identification and formulation; dialogue with stakeholders; and consideration of societal context and impact of an engineering product, rather than just commercial benefits. 'In addition, CBL experiences also seek to foster the ability of teamwork, and personal awareness, by considering 'values' and ethics in addition to customer needs in decision-making' (p. 23).

Evolutionary comparisons were also made with Design-Based Learning (DBL) and Design Thinking (Rosén *et al.*, 2022; Helker *et al.*, 2023; van den Beemt *et al.*, 2023). Van den Beemt et al. (2023) describe how both approaches share an ethos of generating engagement in students to become the leading actors in constructing their learning through engagement with real-world problems. 'One of the main differences between CBL and the other approaches is the focus on designing the problem, the process, and the solution, to fit with students' professional future.' (p. 2) They provide a comparative table outlining key characteristics of Problem, Project, Design, and Challenge-Based Learning but

they also note that defining boundaries between these approaches is controversial.

Some authors highlight what they see as the key differences between PBL and CBL. Cruger (2018) points out that PBL uses hypothetical exercises and that 'CBL is an amended form of PBL where problems are of a realistic, open-ended, and complex nature.' (p.89) Christersson et al. (2022) say that CBL is a further extension of PBL which they say is 'resource-demanding, instrumental, and in a way, an overly structured approach' (p. 4) while they claim CBL is more approachable, flexible, and student-centred.

Indeed some papers were at pains to highlight that CBL differs radically from approaches such as PBL and Project-Based Learning (PrBL), particularly from the standpoint of fostering close collaboration with industry (Vasquez-Lopez, Millan-Ramos and Maldonado-Carrillo, 2024). Although PBL, PjBL, and CBL may be based on active learning, 'they are not similar' says (Membrillo-Hernández *et al.*, 2019, p. 1104) who draw attention to CBL's lack of a pre-made response and the fact that the expected role of a teacher in CBL is to be coach and co-creator of knowledge. Some argue that CBL is very different to PBL and perceiving it in an evolutionary way may actually hinder conceptualisations because of the risk of educators drawing on their perceptions of PBL when applying CBL in practice (van den Beemt, van de Watering and Bots, 2023). Many implementations were originally rooted in 'regular' problem-based or project-based learning within a discipline but have then evolved to become more complex (Rosén *et al.*, 2022). Hence it is hardly surprising that a mix of interpretations abounds.

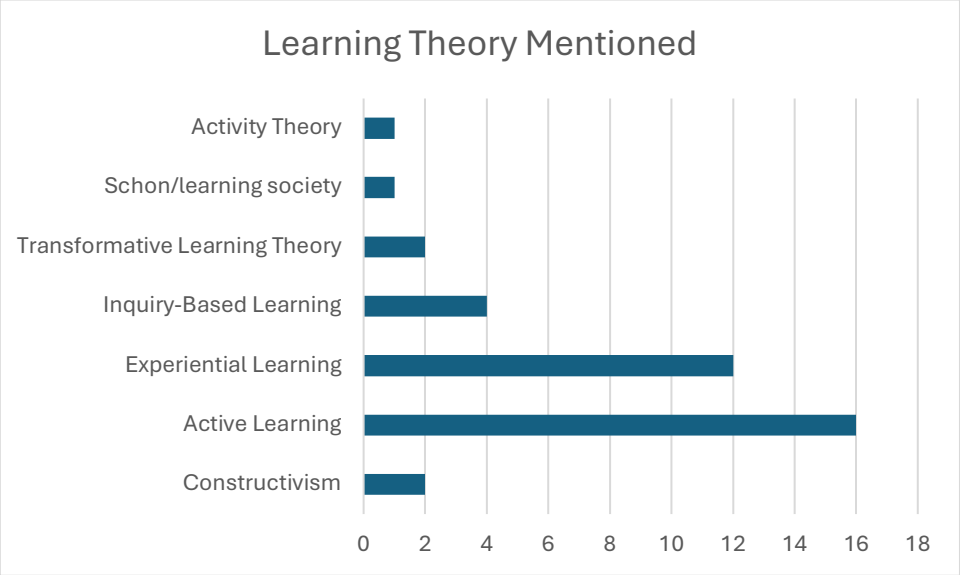
Other pedagogies

Other approaches such as Service Learning were briefly compared with CBL (Cruger, 2018; Rosén *et al.*, 2022). Cruger (2018) writes that CBL is 'closely related' (p. 89) to Service Learning pedagogy in that both approaches seek to nurture civically-engaged, community-connected students who contribute to the public good. Where she says CBL differs is through its insistence on

interdisciplinarity, various levels of student definition and direction, and emphasis on how accessible technologies or communications media can be leveraged to effect change. Community-Based Learning was mentioned as an associated concept in association with CBL in one paper (Rosén *et al.*, 2022) but there was no further detail regarding perceived similarities or differences between the two approaches.

2.7.1.6 Associated learning theories

Figure 12 Learning Theories



Carlile and Jordan (2005) describe learning theory as the distillation of others' experience, those who have thought deeply about how learning happens and have developed theories as to how learners acquire knowledge. Out of the 34 papers in this literature review, approximately two thirds showed no discernible mention of established learning theory. Two sources explicitly referred to Constructivism (Félix-Herrán, Rendon-Nava and Nieto Jalil, 2019; De Stefani and Han, 2022). Another publication (Högfeldt *et al.*, 2019) referred to concepts within Social Constructivism – such as socially-constructed sense-making and community of practice – but did not directly state that particular theory, primarily focusing on Activity Theory (Dochy *et al.*, 2021) as a framework for analysis.

There was a relatively high number of papers (16) that focused on CBL as an active learning approach and highlighted its practical, hands-on experiential learning (12) benefits. Active Learning could be described as a form of Constructivism (Freeman *et al.*, 2014; Goradia *et al.*, 2023) and indeed the phrase 'Active Learning' may offer a more accessible, simpler language for those not well-versed in the language of pedagogical theories. Given the numerous forms in which active learning approaches can be applied and their applicability to different aspects of CBL, it is not surprising to see it so prominent.

Multiple papers (12) directly refer to CBL having an origin in Experiential Learning. For example, Membrillo-Hernández et al. (2021) writes that in CBL, the objective is not the solution to the problem but the process of developing competencies and so CBL is rooted in the principles of Experiential Learning where students actively participate in experiences of open learning. However, while many of the papers mention Experiential Learning briefly, there is no detailed discussion of the theory behind it, such as a relationship with Kolb's model of Experiential Learning (Morris, 2020) or similar which might be expected.

Some connections were made to Inquiry-Based Learning, for example in Santos-Díaz et al. (2024). One paper drew on Schon's ideas from The Reflective Practitioner (Schön, 2017) and the concept of a learning society, while Transformative Learning Theory was mentioned by two (Christersson *et al.*, 2022; Rosén *et al.*, 2022). Apart from these exceptions, the majority of papers had no overt underpinning in learning theory.

Having explored various understandings about CBL reflected in the literature, we will now shift our attention to another aspect of CBL of interest–the factors that seem to be working as barriers against its effective implementation in practice.

2.7.2 Barriers to CBL implementation

Extracts relating to barriers and enablers of CBL implementation identified in the literature were compiled into a free form text field in the Data Extraction Form

(DEF). These extracts were reviewed and re-organised into five frequently recurring themes which will be discussed next.

2.7.2.1 Gaps in training and pedagogical support

As CBL is a new pedagogy to most, it can be assumed that teaching staff need to be introduced to the approach and provided with guidance on how it might be implemented in practice. A perceived lack of training and pedagogical support to prepare teachers specifically for CBL was identified as a potential barrier to successful implementation. The included literature pointed to a need for training in pedagogical aspects of CBL, including assessment (Membrillo-Hernández *et al.*, 2021), in technological factors, such as use of digital tools (Crown, Fuentes and Freeman, 2012; Daunorienė and Ellinger, 2023) and in challenge design, aligning partner and academic objectives (Félix-Herrán, Rendon-Nava and Jalil 2019, p. 2374). It remains a 'major test' to implement CBL in academia 'because most of the current teachers have been trained in content-and-teaching systems that do not include a high level of uncertainty' (Membrillo-Hernández *et al.*, 2019, p. 1112).

Some of the papers highlighted difficulty in getting the balance of structure and guidance for students right as too little or too much structure could prove problematic (Rosén *et al.*, 2022). Similarly, according to Doulougeri *et al.* (2022, p. 59):

> Students experiencing CBL for the first time need scaffolding, especially at the initial stages of the challenge, and they need to adopt an active learning attitude to navigate complex and open-ended problems. This influences teaching in CBL, where teachers need to adopt the role of a coach. Teachers struggled to achieve an optimal balance between scaffolding and guidance, and they also expressed their need for additional support and sharing of good practices.

These points seem to indicate that gaps in professional learning in CBL – in pedagogical, technological, and coaching aspects especially – need to be filled. However, based on what has been written to date, there has been little research into the specific forms or types of professional development that would be most effective or valued for those currently or prospectively teaching through CBL. For

example, Ruiz-Cantisani *et al.* (2024, p. 1) write that CBL crucially requires 'inspiring teachers (professionally trained)' (p. 1) but there are no indications as to what particular form that professional training should take.

2.7.2.2 Interdisciplinarity difficulties

Multi/ inter/transdisciplinary CBL requires students and staff from different disciplines to learn to work together in a team (Malmqvist, Rådberg and Lundqvist, 2015; van den Beemt, van de Watering and Bots, 2023). However there are 'difficulties' in achieving the ways of working required, with some admitting that 'incorporating CBL is not easily achieved due to difficulties in designing innovative inter- or trans-disciplinary ways of working in courses and program' (Christersson *et al.*, 2022, p. 11). In a paper focused on interdisciplinarity issues within nine undergraduate programmes, Shakila *et al.* (2021) highlighted a 'lack of cohesion within the teaching team' (p. 1496) and described how lecturers sought improved alignment of lectures and other activities with the intended outcomes. According to Shakila et al. (2021), tutors sought more clarity on their responsibilities for guiding the student groups while module coordinators suggested that professional support for guiding interdisciplinary education would be beneficial for all. The importance of role-modelling/valuing other disciplinary perspectives and the need to train staff on supervising interdisciplinary teams for integrating ideas and problem-solving was emphasised.

However aside from shortcomings in targeted interdisciplinary pedagogical support, other logistical issues are occurring. A study by De Stefani and Han (2022) describes a trans-European CBL project involving students from seven European universities and multiple disciplinary fields in a project focused on climate change-related risks. The structures and timetables of the university turned out to be significant barriers: 'In fact, coping with the diversity between the academic calendars and schedules, course structures, and the number of students and teachers involved in the seven universities proved to be harder than expected' (De Stefani and Han, 2022, p. 3). A range of common obstacles in

implementing interdisciplinarity – organisational culture, management bureaucracy, communication across departments, module approval issues – are reiterated by Gallagher and Savage (2022) who write that such logistical challenges are not only structural but may directly impact the pedagogical delivery of CBL.

2.7.2.3 Resistant staff

There was a recurring theme highlighting the potential barrier of staff who may be resistant to using approaches such as CBL in their teaching. It was said that innovative teaching approaches may be 'stressful to some lecturers' (Christersson *et al.*, 2022). New demands are placed on faculty as a far more dynamic, unpredictable course process can be expected than more traditional approaches. Ramirez-Mendoza et al. (2018) suggest that a certain profile of 'highly-structured' staff will not want or be suited to engaging with CBL. They say it calls for 'boldness, avidity to experiment new learning experiences, resiliency, in addition to nonlinear and non-convex thinking' while also being open to 'a flexible schedule due to the dynamics presented by the mobility between the company, the environment, and institutional life commitments' (p. 3). Similarly, Membrillo-Hernández *et al*. (Membrillo-Hernández *et al.*, 2019, p. 1110) described an 'updated teacher profile' who must, among other tasks, be 'inspiring, up-to-date, linked to the professional environment, innovative, and an expert user of information technologies'.

Some suggest the nature of the approach is simply not suitable for some lecturers. There is a need to accommodate very open, unstructured problems and teach in an inter or multidisciplinary way which may imply a need for a cross-departmental and cross-program teaching team, as seen in the example of C-Lab (Malmqvist, Rådberg and Lundqvist, 2015). Furthermore new faculty may be resistant to experiment with teaching methods because of the impact it may have on teaching evaluations (Crown, Fuentes and Freeman, 2012).

There are also disciplinary considerations that may influence acceptance of CBL. Rosén et al. (2022) note that some disciplines are traditionally very structured and

may sometimes raise objections to this type of approach. Some have said that while CBL aims to promote interdisciplinary learning, 'it may overlook the depth of subject-specific knowledge' (Santos-Díaz *et al.*, 2024, p. 3). There are also perceptions from other colleagues which may not be immediately obvious. For example, even if an experience seems to go well at the time, staff in later years subjects may not share a positive view of the experience for students (Koeper *et al.*, 2020).

2.7.2.4 Time issues

There is evidence that significant time and resources are required to plan, co-ordinate and implement CBL, posing challenges for educators in resource-constrained environments (Santos-Díaz *et al.*, 2024). For situations where high-status companies are working closely with an academic institution and with non-expert students, there is a need for 'extended sessions of descriptions, discussions, approaches, and, above all, common objectives, both professional and academic' (Membrillo-Hernández *et al.*, 2019).

Before the course even begins, it takes time to find the right partner as well as find and shape feasible challenges (Rosén *et al.*, 2022; Vasquez-Lopez, Millan-Ramos and Maldonado-Carrillo, 2024). Vasquez-Lopez, Millan-Ramos and Maldonado (2024) describe key moments in a challenge implementation, highlighting how their institution searches for and selects the external stakeholder (who they refer to as a training partner). The paper describes how companies may be contacted via colleagues who have worked previously with them, or through students doing internships, and will be at locations ideally physically located near the university. The steps involved in defining the challenge are outlined and it is clear that time is spent establishing expectations from both the academic and company perspectives from the first meeting on (Vasquez-Lopez, Millan-Ramos and Maldonado-Carrillo, 2024). Similarly, Lara-Prieto et al, (2023) describe a significant amount of work involved in logistics around planning, defining the challenge and its evaluation, physical organisation, and coaching. Vilalta-Perdomo *et al.* (Vilalta-Perdomo *et al.*, 2020, p. 18) echo the need for care, saying

that appropriate partners need to be identified well in advance and provide an explicit agreement as to their level of commitment:

> A great organization committed to work with students, but unable to provide a challenge connected to the topic investigated, or the opposite, an organization full of challenging ideas, but with no commitment, should not be considered.

In more recent literature, there is more specific information emerging about the time implications of CBL compared to traditional education methods. Santos-Díaz et al., (2024, p. 8) describe how implementing CBL:

> required around 12 h of planning before the course and constant communication between lecturers, the teaching team, and the industry training partner. In addition, lecturers had to dedicate around 35 h to tutoring students on their design projects. These critical aspects must be considered when implementing a CBL experience in any course.

2.7.2.5 Limited resources and resourcing information

From a teaching perspective, the literature describes a multiplicity of roles inherent in CBL – an academic designing and teaching role (Membrillo-Hernández *et al.*, 2019), a coaching role (Doulougeri *et al.*, 2022), an assessment role (Membrillo-Hernández *et al.*, 2021), a finder of challenges (Vasquez-Lopez, Millan-Ramos and Maldonado-Carrillo, 2024) – but it is frequently unclear as to who or how many individuals are performing such roles and who is doing what. This is likely to vary considerably from one context to another, depending on how the institution is funded and how embedded CBL is as a curriculum practice. Only one paper in the review provided details of the scale of the teaching team in different challenge examples. Malmqvist, Rådberg and Lundqvist (2015) describe teacher teams ranging from 'small' to 'moderate, multidepartmental + specialist supervisors related to subject areas' to 'large & including admin staff' (p.11). The latter included 12 teaching assistants for its intake of 400 students per year.

The literature indicated that physical resources available from institutions and stakeholders may need to be carefully considered. It may be the case that more investment and negotiation is required for aspects such as prototyping tools and use of maker spaces (Doulougeri *et al.*, 2022). An immersive week of activities with

a global company such as happens in iWeek (Lara-Prieto and Flores-Garza, 2022) means a significant effort in terms of planning, logistics, and costs related to transportation and project materials.

Surprisingly, there was little discussion in the papers of the challenges of large class sizes, although this is something that has come up in professional conversations outside of this literature review, perhaps indicating that not many of the authors were dealing with that constraint. Imanbayeva *et al.* (2023) does mention factors such as class size, course boundaries, and long-term curriculum goals as factors influencing the desired intensity of CBL. Another exception is Reymen *et al.* (2022) who write about the potential barriers to upscaling. This paper describes how running a CBL course with 20-30 students seems straightforward and some lecturers can manage up to 100, but anything beyond that would present major logistical challenges (e.g. requiring more space, sessions, and teaching support staff).

Implications of these barriers

Certain barriers are perhaps to be expected when implementing any new pedagogical innovation. Limited time, strained resources, and lack of engagement (or opportunity to engage) with the required professional development are not unique implementation issues. However, when implementing CBL, additional issues regarding the external stakeholder relationship, the demands of multi/inter/transdisciplinarity, and the very different roles expected of the teacher have not been sufficiently problematised to date. The next section will continue reviewing the literature to explore if any potential enablers addressing these and other implementation issues may have come to light.

2.7.3 Enablers to CBL implementation

The following are potential enablers to implementation of CBL drawn from the literature in this review. These can be broadly categorised under five main themes.

2.7.3.1 Appropriate and ongoing professional learning

Several papers call for adequate training and supports for a substantially different way of teaching (such as Membrillo-Hernández *et al.*, 2019; Shakila *et al.*, 2021; Doulougeri *et al.*, 2022). For example, in a survey by Chapel and DePryck (2022), it was found that the majority of the CBL course co-ordinators who responded wanted educational support or training when engaging with CBL. When asked about the type of support considered useful, personalized educational support and the provision of pedagogical resources in the form of literature and guidelines were most desired. Staff also seem to value professional development opportunities via CBL pedagogical training, peer intervention sessions, and webinars, a combination which is similar to preparatory training and weekly peer feedback sessions described elsewhere to help prepare teachers for engaging with CBL (Doulougeri *et al.*, 2022). Practical help with technology-enhanced learning and course redesign was also commonly requested (Chapel and DePryck, 2022), which is in keeping with advice from Daunoriene and Ellinger (2023).

The need for greater support to transition from content expert to coach was evident in staff seeking more guidance with the coaching aspect of teaching specifically (Chapel and DePryck, 2022). Doulougeri et al. (2022) suggest that prior training and peer feedback would help teachers adapt to the new pedagogy while van den Beemt et al. (2023, p. 33) suggest that potential resistance could be addressed with 'schooling and ongoing support'.

Some papers provided descriptors of specific professional learning activities they had designed and facilitated. Crown, Fuentes and Freeman (2011) describe tightly-structured workshops and follow up days where participants were encouraged to make their work public and leave legacies that others new to the space could build on. The same authors also referred to collaborative websites/wikis that they developed as a repository of CBL content, a means of enabling public sharing, and as an aid to brainstorming ideas for challenges (Crown, Fuentes and Freeman, 2012). The latter paper also briefly makes the point that faculty may be more inclined to adopt pedagogy that they have experienced themselves. To this end, Nizamis (2024) suggests running a whole day CBL

Creathon (similar to a hackathon) which offers the opportunity for students, external stakeholders, and teachers to experience a low-stakes taste of CBL in one day. It also creates a space for stakeholders to test out CBL without a long-term commitment, potentially building up network opportunities for future engagements (Nizamis, 2024) .

There are hints in the literature that peer learning approaches such as peer observation of teaching, co-teaching, and team teaching (Reymen *et al.*, 2022; Santos-Díaz *et al.*, 2024) may be of particular benefit in professional learning of CBL. Rosén et al., (2022) highlight the promising opportunities for mutual learning and collaboration between teachers where teachers can jointly observe, reflect upon and compare outcomes. Similarly the team work in an internally-labelled CBL i Semester has contributed to a better working, personal and collaborative environment among colleagues (Ramirez-Mendoza et al., 2018).

2.7.3.2 Support for enabling interdisciplinarity

Institutional barriers to working across disciplines should be considered at the course design phase (Gallagher and Savage, 2022). Like Shakila (2021) and van den Beemt et al. (2023), Nizamis (2024) claims CBL is a very good fit with interdisciplinary education but it requires an initial investment that may take some time to pay off. Nizamis (2024) suggests that a low number of students is desirable for initial application along with a balanced ratio between technical and non-technical students. Previous iterations of their interdisciplinary course revealed that teachers were unclear how students were using their workshops/lectures in their outputs and there needed to be ongoing discussions about the relationship between learning outcomes and assessment in this type of interdisciplinary degree. This paper suggested practical ideas for useful supports such as regular meetings and collaborative learning for the teaching community involved (Nizamis, 2024). Notably, in contrast to De Stefani and Han (2022), timetabling and logistical issues related to interdisciplinarity were not mentioned by Nizamis, suggesting that this is perhaps a standalone course or elective.

2.7.3.3 Incentivising staff

Educational innovations such as CBL will almost always attract a small group of enthusiasts but moving beyond the early adopters to involving a wider group of educators will require change management on a larger scale. As described in section 2.7.2.3, CBL is not going to appeal to all educators. Achieving faculty buy-in is therefore a critical success factor for CBL and there are signs that recognition of the extra time involved will be necessary if CBL is to truly take root. When working closely with external stakeholders especially, there are several references to the considerable time and coordination effort required (Membrillo-Hernández *et al.*, 2019; Lara-Prieto and Flores-Garza, 2022; Santos-Díaz *et al.*, 2024). Furthermore, regardless of views on the benefits or otherwise, expecting faculty to attend training on their own time means that 'only those who are truly motivated and have an interest will pursue training' (Crown, Fuentes and Freeman, 2011, p. 22). Undoubtedly benefits such as positive student feedback and evidence of improvement in learning gain offer promising evidence of CBL impact (Membrillo-Hernández *et al.*, 2019; Reymen *et al.*, 2022; Helker *et al.*, 2023), but other extrinsic motivators at the university level were not strongly evident in this literature review.

Some suggestions recommend a more centralised approach to challenge and external stakeholder selection. Gallagher and Savage (2022) suggest organising and structuring collaborations with extra academic actors at a high level that all schools and faculties can avail of potential collaborations with external organisations. Nizamis (2024) suggests that universities set up 'proper matchmaking between industry and academia' and that 'practitioners can look for help in recruiting challenges externally, in local business incubators, NPOs, and even companies that connect companies with teachers' (p. 9).

2.7.3.4 Student partnership culture

De Stefani and Han (2022) emphasised the value of a students as partners approach based on their experience within the Arqus trans-European programme.

They described a special role assigned to students to support synchronising of common activities. Students were trained up to act as moderators and mediators between the co-ordinators, teaching staff and learners of the partner universities to help ensure consistency between the various courses and promote communication flow. In this interuniversity project, involving students as co-creators suggested promising possibilities for students to influence course design and evaluation, and contribute more tangibly to identifying societal challenges.

Democratising the learning experience may also help to redress the thorny question of how much structure and guidance CBL educators should provide. Van den Beemt, van de Watering, and Bots (2023c) discovered that it seems to be easier to achieve a balance between openness and scaffolding when teachers act as coaches and co-learners and co-creators. Furthermore, according to Reymen *et al.* (2022) there are also promising opportunities for students experienced with CBL to play a supportive role in coaching younger students. According to this chapter, peer-to-peer learning has the benefit of freeing up staff time but more importantly, may help to embed a model where students are partners in teaching, researching, and influencing educational change. It is also worth noting that a high percentage of staff in the Chapel and DePryck (2022) study requested more professional development on students as co-designers, which may be revealing that this is an area of wider interest also.

2.7.3.5 Articulating the vision

More publications appear to be emerging on how CBL is permeating the institutional vision and strategy (Reymen *et al.*, 2022; van den Beemt *et al.*, 2023; Doulougeri *et al.*, 2024). While including CBL as a strategic goal of an institution is no guarantee in itself of innovation or collaboration (Chapel and DePryck, 2022), it has been shown to bear fruit in certain circumstances. Van den Beemt et al., (2023) describe a mix of top-down and bottom-up approaches across four institutions that have been implementing CBL. Of direct relevance, they warn that a 'top-down system can become chaotic if there are no support tools for faculty

and students, which requires a considerable investment of resources in training instructors accustomed to a non-student-centered teaching system' (p. 16).

Implications of these enablers

What has come through strongly is that certain things need to be in place for CBL to be established as a pedagogy: There needs to be adequate and ongoing professional development, even more so to support coaching and multi/inter/transdisciplinarity. Little appears to have been written about ways to recognise and incentivise time-consuming CBL implementation in practice. A culture of close partnership with students coupled with a clear strategic vision may help to operationalise CBL.

2.8 Proposed Conceptual Framework

In the Introduction to this chapter, I referred to West and Martin's (2023) argument that literature reviews tend to have two goals: firstly, convincing the reader of what we already know, and secondly, arguing for what we should do or think about this topic. Circling back to this idea, there is a promising role for an emerging conceptual framework at this point to help make such objectives more explicit. This may be particularly important as Ravitch and Riggan (2017, p. 5) define a conceptual framework as 'an argument about why the topic one wishes to study matters, and why the means proposed to study it are appropriate and rigorous.'

According to Berman (2013), doctoral study necessitates thinking at the highest level in a way that needs to be 'organised and accessible' (p. 2) to the student themselves, their supervisor(s), and their examiner(s). Ngulube and Mathipa (2015) make the point that a conceptual framework shows the relationship between concepts and their impact on what is being investigated. They also write that concepts are abstractions, ultimately acting as labels that we ascribe to the world we are attempting to make sense of.

Conceptual frameworks can be applied and presented in different ways, ranging from a purely visual representation of a study's organisation or main theoretical tenets, to a somewhat conflated 'off the shelf' theoretical framework, to a way of

linking multiple aspects of a study such as researcher interest and goals, positionality, context and methods (Ravitch and Riggan, 2017). Miles and Huberman (1994, p. 18) write that it explains 'either graphically or in narrative form, the main things to be studied – the key factors, constructs or variables – and the presumed relationships among them.' Ngulube and Mathipa (2015) emphasise that the conceptual framework needs to inform the research questions, methodologies and data analysis. In keeping with the idea of responsiveness to the research experience (Ravitch and Riggan, 2017), it also offers a 'self-audit facility to ensure cohesion and appropriate conceptualisation of research conclusions' (Leshem and Trafford, 2007, p. 101). Having competed the literature review, a discussion about the conceptual framework now appears appropriate as in 'unfolding inductive research the conceptual framework may appear following a survey of theoretical perspectives (the literature)' (Leshem and Trafford, 2007, p. 100), a position echoed by Antonenko (2015).

The conceptual framework of this study is based on a concept mapping approach which potentially offers a 'picture of what the theory says is going on with the phenomenon you are studying' (Maxwell, 2012, p. 47). Concept mapping is useful for understanding and communicating the phenomena under analysis (Antonenko, 2015), helping to make implicit theory visible while allowing one to see unexpected connections, holes or contradictions (Maxwell, 2012).

Figure 13: Initial Conceptual Framework

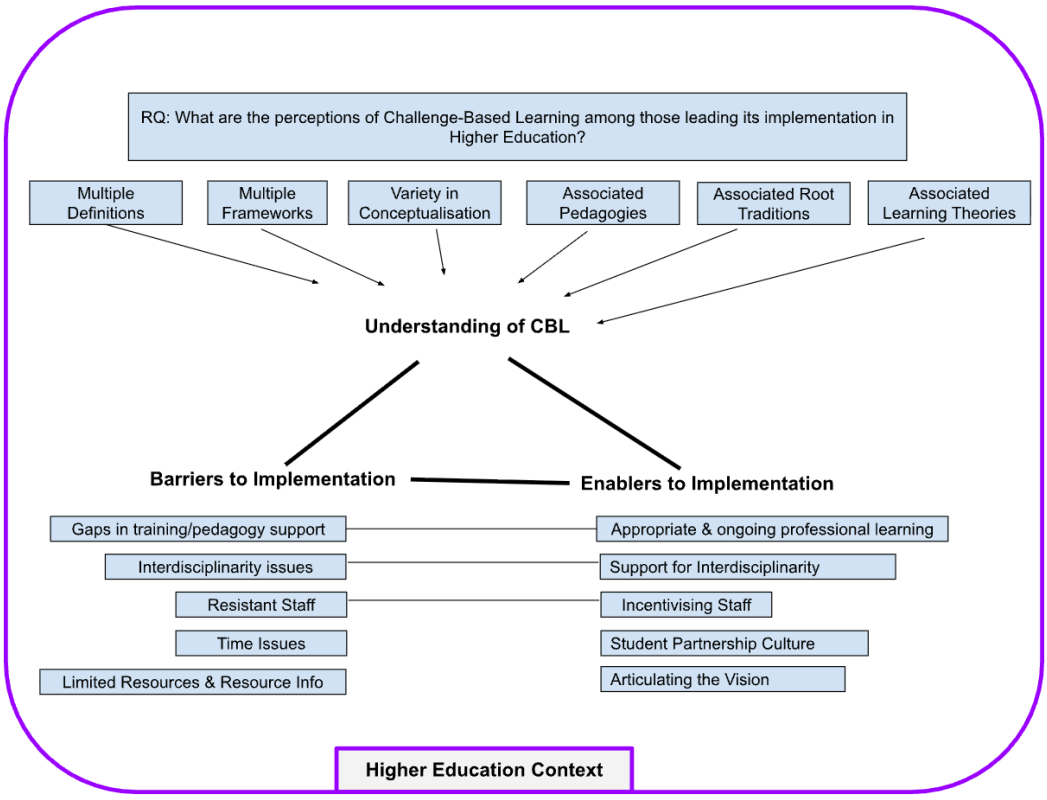


Figure 13 illustrates the array of ideas that were found in the literature as relating to the guiding question shown. The overall context for the literature review was CBL implementation in higher education. Within that, there are three central concepts relating to understandings of CBL, barriers to implementation, and enablers to implementation. Each concept has related sub-concepts. The arrows indicate an influence (for example, the multiple definitions exert an influence on the general understanding of CBL) while the connecting lines indicate a relationship or connection (for example gaps in training/pedagogical support can be addressed by appropriate and ongoing professional learning).

However, there is an absence of detail or no detail at all in some aspects of the reviewed literature that requires further development. Answers to some important questions will need to be further investigated: How do those with leadership responsibilities for CBL perceive what it means and do their understandings match or deviate from those already in the literature? What kinds of barriers and potential

enablers are affecting implementation of CBL? What is 'appropriate and ongoing professional learning' from their perspective? What can university leadership do to promote and incentivize CBL at scale? These and other questions will need to be explored and my preference is to hear it first-hand from those driving CBL within their institutions within the context of ECIU. The history, rationale, and execution of the research approach will therefore be discussed in the next Chapter Three: Methodology.

2.9 Chapter Summary

It is apparent that different definitions and interpretations of CBL abound in the literature, some of which are based on its Apple heritage and others that have evolved to include sustainability-related and other concerns. Several papers suggest that certain pedagogies (such as PBL) serve as a root tradition whereas others argue that CBL is a distinctive pedagogy in its own right, albeit with different possible flavours. There are signs that those who are applying CBL in their teaching need adequate and ongoing professional learning opportunities to put it effectively into practice.

The literature has highlighted a broad range of barriers that are perceived to be hindering implementations of CBL. These include limited training and pedagogical support for implementation, interdisciplinary difficulties, resistant staff, time issues, and limited resources. The review has indicated that CBL needs significantly extra time to manage all the stakeholders involved and there may be complex course structure and timetabling issues to overcome. Possible enablers for implementing CBL include appropriate professional learning, support for inter- and multidisciplinary ways of working, staff recognition and incentivisation, integration of students as partners, and a clear strategic rationale. I will next explain the methodology adopted to progress the study forward.

Chapter Three: Methodology

3.1 Introduction

The purpose of this study is to explore the perceptions of Challenge-Based Learning (CBL) among those leading its implementation in ECIU universities. This chapter begins by describing the research question, the research philosophy, the ontological and epistemological considerations, and the personal and professional context that have influenced my interpretive research approach. It goes on to explain the decision to adopt a qualitative inquiry, justifying the choice of a case study research methodology employing semi-structured interviews. It explains why and how a purposive sampling approach was applied. Data analysis techniques, including the transcription and reflexive thematic analysis processes are outlined to provide a comprehensive picture of how the study was conducted.

3.2 The Research Question

The overarching research question driving this inquiry is as follows:

What are the perceptions of Challenge-Based Learning among those leading its implementation in ECIU universities?

The sub-research questions are as follows:

- How is the term CBL understood by those leading its implementation for teaching, learning and assessment in ECIU universities?
- What do those responsible for leading CBL initiatives in ECIU universities perceive are the barriers and enablers to its successful implementation in practice?

3.3 Research Philosophy

3.3.1 Paradigms

One of the simplest explanations of a research paradigm is that it is a set of fundamental assumptions and beliefs that informs how the world is perceived and

then acted on by the researcher (Jonker and Pennink, 2010). While such simplicity appeals, Morgan (2007) argues that it is unhelpful to see paradigms as worldviews that attempt to encapsulate everything someone thinks or believes. He claims that it is important to clarify what is contained within a worldview, namely a person's thoughts about the nature of research. After all, depending on what they believe, researchers are likely to adhere to an approach to research that reflects the beliefs they hold about phenomena and the world (Sefotho, 2015). Whether we realise it or not, our beliefs influence and drive our practice and the conduct of educational research is no exception (Crotty, 1998; Pring, 2004; Morgan, 2007; Sefotho, 2015; Gray, 2018).

Some of the best-known paradigms in research take the form of Positivism, Post Positivism, Pragmatism and Interpretivism. Positivism is based on the belief that certain knowledge can only be established through objectivity and quantification (Sefotho, 2015) and through adoption of the so-called 'scientific method' (Saunders, Lewis and Thornhill, 2023) to generate and test theories with highly structured and measurable data. Positivists claim an objectivity implying that the researcher and what is being researched are entirely separate and objective reality exists beyond the human mind (Cousin, 2009; Sefotho, 2015).

Post Positivism endorses a similar view but claims that knowledge is a result of social conditioning (Wahyuni, 2012). There is an underpinning belief that only observable phenomena offer credible data or facts and that social reality needs to be framed within a context of law or social structures. Post Positivists do not believe in strict cause and effect but recognise that all cause and effect is merely a probability that may or may not occur (Cresswell and Poth, 2018).

Furthermore, the research paradigm of Pragmatism invokes the idea of a practical, commonsense approach to research where the importance of the research is rooted in its practical consequences (Creswell and Poth, 2018; Saunders, Lewis and Thornhill, 2023). A Pragmatic approach has certain recognisable characteristics (Creswell and Poth, 2016, p. 27):

> In practice, the individual using this worldview will use multiple methods of data collection to best answer the research question, will employ multiple sources of data collection, will focus on the practical implications of the research, and will emphasise the importance of conducting research that best addresses the research problem.

Finally, Interpretivism relates to the belief that individuals with a diverse range of backgrounds, assumptions, and experiences contribute to the ongoing construction of reality through social interaction (Wahyuni, 2012). Multiple and subjective meanings, interpretations, and realities are recognised (Saunders, Lewis and Thornhill, 2023). Interpretivist researchers focus on conducting research amongst people (rather than on them), aspiring to understand the world of the participants from their point of view and embracing the value-laden aspect of this approach (Saunders and Tosey, 2012).

The premise of Interpretivism resonates with me most as a paradigm because of its recognition of the value that individuals, with all their rich and varied backgrounds/assumptions/experiences, contribute to the 'on-going construction of reality' (Wahyuni, 2012 p. 71). Multiple perspectives and a dialogue with participants are hallmarks of this ideology, features which also happen to align well with the ethos of Challenge-Based Learning.

3.3.2 Ontology and Epistemology

Every paradigm carries its own ontological and epistemological commitments representing different assumptions about reality and knowledge that in turn influence and underpin a particular research approach (Scotland, 2012). More than just abstract or theoretical notions, ontological and epistemological considerations should inform significant decisions about the overarching research design (Gray, 2018).

Various authors have described the construct of Ontology as the study of 'being' (Crotty, 1998; Gray, 2018) while Wahyuni (2012, p. 69) says that 'Ontology is the view of how one perceives a reality'. This raises some important questions. For example, does one believe in the perspective of Positivism, which argues that a

'real world' exists external to the researcher and it must be 'objectively' researched? Or does one believe in the perspective of Constructivism, which claims that reality is not an 'external' concept but is socially constructed through individuals' interactions with the world? (Gray, 2018; Crotty 1998).

This idea of admissibility and the nature of the knowledge itself raises further questions relating to Epistemology. According to Gray (2018, p. 21) 'epistemology provides a philosophical background for deciding what kinds of knowledge are legitimate and adequate'. Epistemology should represent beliefs about generating, understanding, and using knowledge deemed to be acceptable and valid (Wahyuni, 2012). In considering this, Guba and Lincoln (1994) ask what is the nature of the relationship between the knower and what can be known and how will that influence the researcher's stance? Will it be one of objective detachment and 'value freedom', and what might the answer imply about the world in which they operate?

Combining these concepts, Cousin (2009, p. 6) writes that 'Epistemology is about conceptions of the nature of knowledge and of ways of coming to know and ontology is about conceptions of our positionality in the world and the effects this has on what is knowable.' Similarly, Braun and Clarke (2013, p. 29) write that epistemology addresses the question of what it is possible to know and therefore influences what is seen to 'count' as meaningful knowledge. As Cousin describes it, this forces questions about what we see from where we stand in the research - are we actually doing the research inside the research setting or working at a distance from it? 'Do we have a transparent view on to reality or will it always be mediated by our subjectivity?' (Cousin, 2009, p. 7). The answer to such fundamental questions about ontology and epistemology will indicate the belief systems behind any given paradigm (Guba and Lincoln, 1994). Perhaps most importantly, they will govern the research approach, methodology and methods that are most appropriate to the line of inquiry (Castellan, 2010; Queirós, Faria and Almeida, 2017).

My ontological position is such that I believe reality is constructed by the individuals involved in the research project and that these multiple realities

manifest in the form of multiple perspectives and voices that I need to interpret and report as a researcher. My position is rooted in relativism, where I believe reality is 'dependent on the ways we come to know it' and that it relies on human interpretation and knowledge (Braun and Clarke, 2013, p. 26). I am unconvinced by the notion of there being a single truth and to help me understand the social world from my participants' perspective, I believe I need to interact with and have a dialogue with them. I am looking for rich or 'thick' descriptions, heavy on detail, that outline the details of the contexts of people's actions and practices in their own terms (Gibson and Brown, 2009). I accept the existence of both singular and multiple realities that are socially and experientially constructed (Guba and Lincoln, 1994; Pring, 2004). I aim to recognise the realities of the researcher, the individuals being investigated, and the realities of those who will ultimately be reading and interpreting the study. My epistemological position is such that I would like to provide participants with opportunities to engage with the process, giving them the opportunity to further review and contribute to the data such as through member reflections, described further in Section 3.6: Transcription Process.

I also recognise the impact of my 'insider-outsider research' role in the research (Yip, 2024) and describe this further in Section 3.3.3: Positionality. From an axiological or values standpoint, I have no reservations in acknowledging that this research is value-laden and that bias exists. There is frankly no research–quantitative or qualitative–that can exclude all forms of bias (Cousin, 2009; Darwin Holmes, 2020). However I strive for what Snape and Spencer (2003, p. 13) describe as 'empathetic neutrality', aiming to be as neutral and transparent as possible in the collection, interpretation, and presentation of data while conscious that full impartiality is likely impossible to achieve (Darwin Holmes, 2020).

3.3.3 Positionality

There is an ongoing debate about the nature of insider research (where researchers are studying 'their own communities' (Chavez, 2015, p. 475) and

outsider research, where researchers are not a member of the group being studied (Braun and Clarke, 2022). The debate hinges on a difference in perceived dangers of bias: according to Chavez (2015), it is argued that an insider may tend towards an overly positive stance if the knowledge, culture and experience s/he shares 'manifests as a rose-colored observational lens or blindness to the ordinary' (p. 475). An outsider perspective, it is argued by some, is optimal for its 'objective' and 'accurate' accounts (Chavez, 2015, p. 474) but it poses methodological concerns, contradictions, and ontological and epistemological impossibilities for others.

Advantages to having insider status include a potentially equalized relationship between researcher and participants, faster rapport building, and immediate legitimacy to research the field (Hanson, 2013). From a data collection and interpretation standpoint, an insider researcher will have some insight into the linguistic principles of participants, knowledge of the historical and practical happenings of the field, and be in a strong position to identify unusual, left-field occurrences (Chavez, 2015). Disadvantages of having insider status relate to its potential to obscure or overwhelm the researcher's role or goal and potential controversy regarding bias in selecting participants (Hanson, 2013), selective reporting, and difficulty with recognizing patterns due to familiarity with community (Chavez, 2015). There have also been charges of insider researchers potentially being 'too native' to the setting and therefore unable to achieve authenticity in the research (McDermid *et al.*, 2014, p. 29).

My positionality with regard to the research overall has previously been described in Chapter 1 Section 1.7.3. To attend to the methodological implications of my insider-outsider status, I needed to adopt a number of strategies. In recruiting participants, I was at the 'outsider' end of the continuum, going through a formal ECIU gatekeeping channel to source willing participants from inside and outside my organisation. This meant I was not able to 'cherry pick' participants myself and could avoid criticism of potential bias in that respect.

For most of the data gathering interviewing phase, my perspective could be described as partly 'outsider'. I am a member of staff in a university that belongs to the ECIU consortium. However, because I am not directly part of the ECIU

University project team, I did not know my interviewees in advance and was not so embedded in the finer details of work packages and project deliverables as others might be. At the same time, I have more of an understanding of the language and hierarchies of ECIU than those completely outside the project, such as from a non-ECIU university.

On the other hand, because DCU is one of the ECIU universities, my sample included a small number of colleagues whom I do know and have worked with previously. I was at the 'insider' end of the continuum when conducting those interviews. Furthermore, because I am chair of a working group established to support implementation of CBL at DCU, I have an awareness of common implementation concerns such as time and resourcing issues which may be more 'insider' leaning.

Drawing on the work of Fleming (2018), I made various efforts to mitigate the downsides of insider research. This included beginning interviews with close colleagues with a disclaimer, indicating that although the topics may have been discussed in the work context previously, participants should respond as if they were discussing this for the first time. In conducting the research procedures with institutional colleagues, I made it clear to participants that I was there in a researcher capacity and not in my usual work role. I refrained from sharing my own experiences and opinions, deliberately avoiding responding to comments that related to my day-to-day job.

I also shared the interview transcripts and draft findings with all participants to ensure I was fairly representing their perceptions and potentially offer useful insights for their own context. Keen to support a reflective opportunity for interviewees, I wanted to be careful to ensure that I was offering something useful back and not exploiting my participants for personal gain. I took measures to preserve anonymity, including the use of pseudonyms at the point of transcription. I used a rigorous, well-recognised data analysis process of reflexive thematic analysis (Braun and Clarke, 2021) and documented the analysis process that I followed. As part of this, I engaged in several practical approaches to achieving

reflexivity which are documented further in section 3.4.6. I was also careful in the write up to minimise the risk of exposing identity.

Finally, I also followed advice from Mauthner and Doucet (2003) who suggested reporting of my values, perspectives and beliefs within the research dissertation. Axiology relates to the influence of values and ethics in the research process (Wahyuni, 2012; Saunders, Lewis and Thornhill, 2023). My axiology (my values of transparency, scholarliness, and reflectiveness) informed my approach through my efforts to transparently document the research process, draw on current research related to my topic, and adopt a reflective approach throughout.

3.4 Research Methodology

3.4.1 Qualitative Approach

This is a qualitative study. According to Cresswell (1998, p. 15):

> Qualitative research is an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The researcher builds a complex, holistic picture, analyzes words, reports detailed views of informants, and conducts the study in a natural setting.

Cresswell (1998) describes a number of strong reasons why someone might undertake rigorous qualitative research. In particular, that the decision should be based on the nature of the research question, typically responding to a 'how' or 'what' question; that it is a topic that needs to be explored and theories are not yet available; and that it requires a close-up detailed view in order to provide answers to the articulated problem. S/he will need to be prepared to commit to spending considerable time in the field, analysing data, writing long passages; and be prepared to engage in a form of research that does not come with definitive guidelines and that is open to ongoing evolution and change. Braun and Clarke (2022) and Gibson and Brown (2009) say that the distinguishing factor between qualitative and other forms of research is that qualitative research is fundamentally about *meaning*.

> At its core, qualitative research is about capturing some aspect of the social or psychological world. It records the messiness of real life, puts an organising framework around it and interprets it in some way. (Braun and Clarke, 2013, p.20).

For all of these reasons, I believe that qualitative research is a good fit for me and is the most suitable approach to find answers to the research questions. Adopting the useful metaphor of a predefined package holiday booking, Braun and Clarke (2022, p. 4) describe a research methodology as a 'package of theory, method and other design elements for doing research'. They distinguish it clearly from the use of the term 'method' as a process or tool that is used to collect data and that is discussed further below, saying that a methodology is a framework within which the research is conducted (Braun and Clarke, 2013). A methodology, according to Crotty (1998, p.3) is the 'strategy, plan of action, process or design lying behind the choice and use of particular methods and linking the choice and use of methods to the desired outcomes.'

Cresswell (1998) describes five qualitative inquiry methodologies: biography, phenomenology, grounded theory, ethnography, and case study.

A biographical study is the study of one individual and his/her experiences as revealed to a researcher or discovered in documentation and archival material related to that individual (Cresswell, 1998). As I did not wish to use data from just one individual to answer research questions rooted in a dialogic process, and because I believe in the existence of a multi-perspective, changing reality that is 'constructed by social actors and people's perceptions of it' (Wahyuni, 2012, p. 71), I did not consider this a suitable approach in this case.

A phenomenological study focuses on the meaning of the lived experiences of several individuals about a concept or phenomenon (Cresswell, 1998) and is interested primarily in exploring variation in experience and understanding (Cousin, 2009). Phenomenology calls for a classification approach involving "categories of description" (Hajar, 2021) to show different ways in which participants might understand the phenomenon under investigation. These could be useful for providing a range of direct, contextually-sensitive descriptions of the phenomenon of interest (Hajar, 2021). However this idea of producing 'neatly

hierarchized categories' (Cousin, 2009, p. 187) where the researcher is expected to have 'pristine perception, make neutral observations, build objective categories and give neutral interpretations' (Webb, 1997, p. 201) raised potential difficulties from an interpretivist perspective. I believed it could run the risk of erasing more nuanced, singular conceptualisations and the approach is not typically driven by the "what is going on" type of research question (Cousin, 2009, p. 191) that was a goal of my research.

A grounded theory study aims to generate or discover a theory, which Strauss and Corbin (1998, p. 23) describe as something that is 'discovered, developed and provisionally verified through systematic data collection and analysis of data pertaining to that phenomenon'. It follows a highly structured process of open coding (disaggregation of data into units), axial coding (recognising relationships between categories) and selective coding (integration of categories to produce a theory) as described by Cresswell (1998) and Gray (2018). Because I am uncomfortable with its requirement to somehow set aside all pre-existing theoretical notions or ideas so that the analytical, substantive theory can emerge from the data (Cresswell,1998), and because theory generation is not the primary goal of my practice-oriented study, this approach was not an appropriate fit on this occasion.

An ethnography is a description and interpretation of a cultural or social group or system, typically involving prolonged observation of the group and deep immersion into the everyday lives of people (Cresswell, 1998). While the observational, anthropological nature of this approach was appealing, I decided that an ethnographic research project would be problematic in this case. In particular, it would dramatically restrict the number of possible research settings to enable immersion in a research setting 'for at least a couple of weeks' (Cousin, 2009, p. 109). Because of the European-wide nature of my study, and the fact that I live in Ireland, this approach was not considered feasible for my research due to the extended time in the field that would be required.

Another methodology that I considered was action research. According to Gibson and Brown (2009) action research involves the development of an action or intervention to address a particular problem while examining the impact on participants. In this case, the research and the analysis happens cyclically with continuous dialogue and it typically involves both practitioners and participants as researchers (Gibson and Brown, 2009). However, I could not feasibly work closely with members of potentially 14 institutions within an EdD timeframe. While it is an approach I could consider in a future study, the action research requirement to work with members within my own organisation through iterative cycles did not suit the broader, multi-perspective and multi-institutional type of study I wanted to conduct on this occasion.

3.4.2 Case Study Methodology

Therefore for this study, I have applied a case study as a methodology. According to Cresswell (1998, p. 61), a case study is an exploration of a 'bounded system' or case(s) over time through detailed in-depth data collection involving multiple sources of information that are rich in context. Merriam (1998, p. 29) describes what is distinctive about the case study methodology:

> Particularistic means that case studies focus on a particular situation, event, program, or phenomenon. The case itself is important for what it reveals about the phenomenon and for what it might represent.

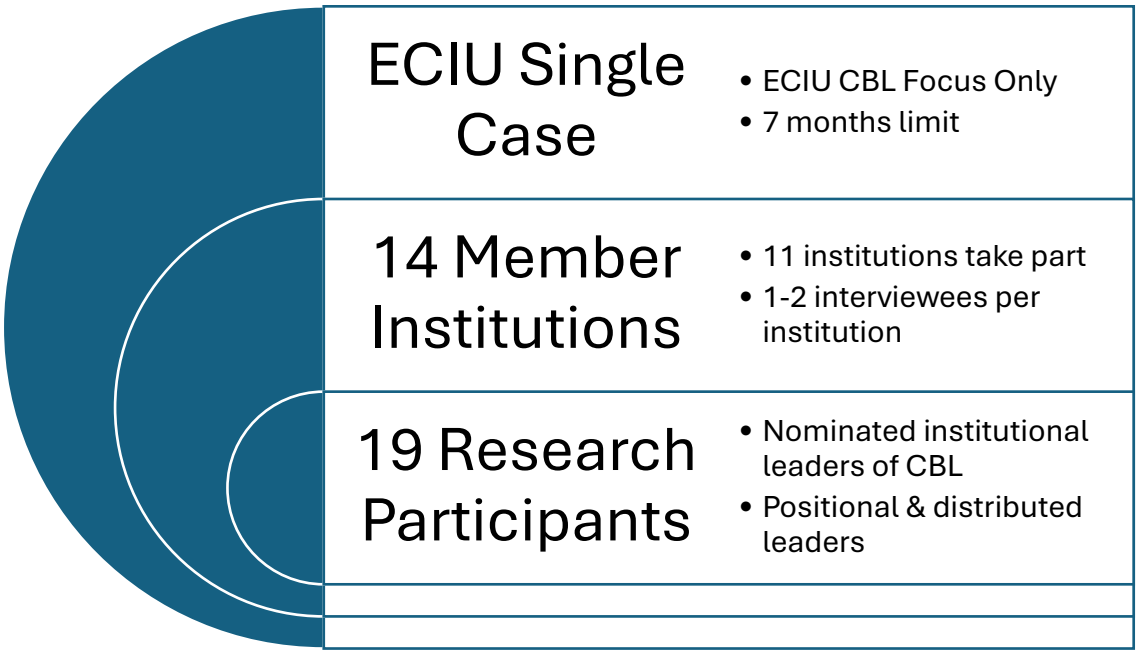
Case studies are also descriptive in yielding a rich, thick description of the phenomenon under study and heuristic in illuminating the reader's understanding by bringing about new meaning or extending/confirming what is already known (Merriam, 2009; Yazan, 2015). A case study is about the examination of a single phenomenon (Thomas and Myers, 2015) and there are variations thereof. An instrumental case study is used to provide insights into an issue and it is important to note that the 'case itself is of secondary interest, it plays a supportive role, and it facilitates our understanding of something else' (Stake, 2005, p. 437). I believe that mine is an instrumental case study (Stake, 1995; Silverman, 2022) because the case is being used instrumentally to illustrate the issues relating to the

implementation of CBL. It is a 'within-site' study (Cresswell,1998, p. 61) and it is focused on a single specific activity–implementation of CBL–within the ECIU context. Merriam (1998) similarly describes a case as 'a thing, a single entity, a unit around which there are boundaries' (p. 27). She sees a case study as something that can be applied very broadly and may encompass a program, an institution, a person, a process, or a social unit, only limited by the need to ringfence what is under inquiry. According to Thomas and Myers (2015, pp. 3–4):

> Case studies are analyses of persons, events, decisions, periods, projects, policies, institutions or other systems which are studied holistically by one or more methods. The case that is the subject of the inquiry will be an instance of a class of phenomena that provides an analytical frame – an object – within which the study is conducted and which the case illuminates and explicates.

Each study has 'a subject of interest (a person, place, event or phenomenon) and an analytical frame within which it is studied' (Thomas and Myers, 2015, p. 11). The 'bounded system' (Simons, 2009) of this particular case study is the ECIU network of partner universities and the object of the study is perceptions of CBL among those leading its implementation within that context. In defining the boundaries of the case, I considered physical borders, population, range of activities and time span (Cousin, 2009). The system is bounded by the fact that only ECIU universities are included and the duration of approximately 7 months of data collection. Multiple sources of information are collected through multiple interviews to offer an in-depth, detailed picture of the case. Figure 14 depicts the research design and the boundaries of the case:

Figure 14: Overview of Case Study Design



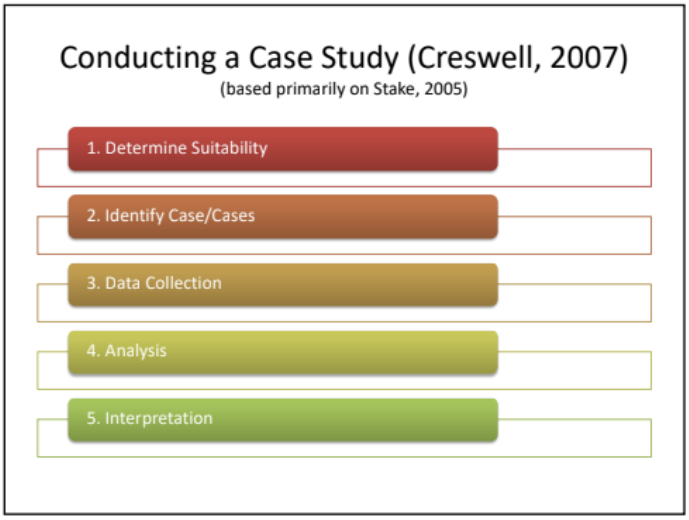
When conducting a case study, it is important to define the unit of analysis. While a case study may be embedded within a particular location (in this instance, the partner institutions within ECIU University) the location itself is not necessarily an important part of the analysis. What is more significant for this study is the focus on staff who have experience with leading and implementing CBL. So the case is a group of staff leading CBL within ECIU partner institutions who I am researching in their contemporary, natural context. This case provides a suitable context for the research questions to be answered – namely, how educational leader participants understand CBL and what they believe are the benefits and barriers to CBL implementation in practice.

Therefore, there are several attributes of the case study methodology that drew me to this approach. A case study is well suited to the needs and resources of the small-scale researcher, as it is flexible enough in timeframe and method to be conducted in days, months, or over several years and can be written up in forms and lengths appropriate to the timescale (Simons, 2009). Given that I expected to give several months to the data gathering and analysis processes but was unsure exactly how long it would take due to participant availability, this flexibility appealed. Furthermore, a key benefit of the case study methodology is the fact

that it enables the experience and complexity of initiatives to be studied in-depth within their socio-political contexts (Simons, 2009) so is well suited for inquiries into processes and relationships (Cousin, 2009). Given the anticipated complexity of the relationships, particularly with respect to barriers and enablers to CBL, an in-depth approach that recognised the individuality of different contexts was preferred. Case study is an established methodology for studying multiple perspectives and multiple sources of information in a real-life context (Cresswell, 1998; Simons, 2009), which are factors directly relevant to my research. Case study is also an established methodology with respect to CBL research (van den Beemt, van den Watering and Bots, 2021) and as noted by Gallagher and Savage (2023, p. 1141), the descriptive case study is 'the most common methodology observed' in their exploratory literature review of CBL.

There is no simplistic, prescriptive design for case study research because it tends to be 'messy terrain' which requires a nose for an emerging focus (Cousin, 2009, p. 137). While I wish to avoid the risk of rigid 'methodolatry' described by (Chamberlain, 2012, p. 6), this case study broadly follows the framework as outlined in Figure 15.

Figure 15: Framework for conducting a case study



3.4.3 Sampling Decisions

For maximum transparency, there are important decisions relating to sample selection that need to be articulated. 'It seems essential to be explicit about these,

rather than leaving them hidden, and to consider the implications of the choice for the way that the qualitative study can be interpreted' (Curtis *et al.*, 2000). The six criteria proposed by Miles and Huberman (1994) appear relevant for the development of a sampling strategy, particularly their criteria focusing on the need for the sample to generate rich data on the phenomenon under investigation, enable analytic generalizability, and represent a feasible project.

Purposive (or purposeful) sampling is an approach to sample selection that offers the potential to select information-rich cases for in-depth study, cases about which one can learn a great deal on matters of central importance to the study (Merriam, 2009). Purposive sampling helps to identify a case as it illustrates a process or feature in which we are interested and requires us to think critically about the parameters of the population being studied (Silverman, 2022). Purposive sampling proves that our interviewees were not simply selected on the basis of convenience when what is needed, as Cresswell (1998) says, is a case or cases that show different perspectives on the problem, process, or event being studied.

A purposive sampling process was adopted to ensure that a sample of those in CBL leadership roles within ECIU universities would be invited to participate in the study. Once ethical approval from DCU was achieved (which was in June 2023, DCUREC/2023/111, see Appendix K) a four-step process was followed.

1. The ECIU Secretary General was approached to brief them about the study and seek approval to proceed.
2. Following this approval, the 14 ECIU Institutional Co-ordinators of the time were then approached (see the Recruitment Advertisement in Appendix C. The list of coordinators is publicly available on a website). These individuals were emailed and asked to:
    a. Respond on whether their institution would be willing to participate in the study and advise on any institutional approval processes that would need to be followed
    b. Nominate two leaders of CBL implementation from their institution who would be suitable candidates for potential interview
3. The nominated individuals were then approached. They were emailed to invite them to participate in the study and it was acknowledged in the email that details were sourced as above. Recipients could choose to ignore or respond to the email. A Plain Language Statement (PLS) was attached to

ensure that participants could make an informed decision on what is involved should they agree to participate. See Appendix E.

4. If they agreed to participate, interviewees were then provided with an Informed Consent Form (ICF) and an Interview Guide of proposed questions (see Appendices F and D).

The Recruitment Advertisement requested nominees with a diverse profile, and if possible, to respond with names within a 2 week timeframe. It contained wording that said: 'For as broad a representation across leadership levels as possible, please consider diversity in gender, age, and role/responsibilities when nominating participants.' A list of potential benefits to participation and the Plain Language Statement (PLS) was attached to encourage responses and provide an overview of the focus and objectives of the study. Responses were received at various points. When I did not hear back within requested timeframes, I followed up again with a reminder. From October 2023 to April 2024, I conducted a total of 19 interviews drawn from 11 of the ECIU partner universities. Two institutions did not respond. One responded to say that they were unfortunately unable to commit due to workload pressures. Eleven institutions responded positively with names.

Upon receipt of their names and email addresses, all the nominees were contacted to arrange suitable dates, times and locations (including online) for the interviews. The PLS, the interview guide and the informed consent form were distributed to all interviewees. For those I heard back from, a suitable date was confirmed.

3.4.4 Participant Profile

A broad range of leaders of CBL were nominated, not all of whom have senior management positional roles. In some cases, based on those who responded to follow up emails, two nominees from the participating institution were interviewed. In some cases, one individual was interviewed. A total of 19 interviews were conducted.

Care has been taken to avoid identifying individuals who, as part of the REC approval process, were advised that efforts would be made to protect their anonymity as much as possible. Roles included ECIU Institutional Co-ordinators,

Senior Strategic Learning and Teaching roles, ECIU Work Package Leads and Contact Points, and ECIU Teamchers. To indicate the range of leadership levels represented within this study, and provide a broad sense of what those roles involve with respect to CBL implementation, a brief overview of role responsibilities is summarised in Appendix G.

3.4.5 Ensuring Trustworthiness

Morgan and Ravitch (2018) describe the notion of trustworthiness as an overarching concept in qualitative research that conveys the procedures researchers employ in pursuit of quality, rigor, and credibility while ensuring congruence with epistemological and ontological beliefs. 'The trustworthiness section of a study typically asserts why the findings and implications can be viewed as acceptable and of worth to the reader by making the methodology and methods that undergird the study transparent (p.3). While sometimes mistakenly confused with the concept of 'validity' and the particular connotations of truth and objectivity that are associated with that, trustworthiness in qualitative research takes a different tack: in this case, trustworthiness focuses on describing the context of the data collection and the methods through which data is generated rather than its inherent 'truthfulness' (Gibson and Brown, 2009, p. 59).

Lincoln and Guba (1985) and then Guba and Lincoln (1989) are credited with suggesting a terminology of trustworthiness more fitting to qualitative research and that I believe also suits the single researcher characteristic of this study. They describe ideas of **credibility**, **transferability**, **dependability**, and **confirmability** as key tenets (Hamberg *et al.*, 1994). Credibility relates to the plausibility of the research findings (Tracy, 2010) and the extent to which readers or co-researchers can have confidence in the findings and recognise themselves in the study based on the researcher's interpretation (Tobin and Begley, 2004; Nowell *et al.*, 2017).

Lincoln and Guba (1985) have suggested a number of techniques to achieve credibility including activities such as prolonged engagement in the field, persistent observation, data collection triangulation, researcher triangulation, peer debriefing for external visibility into the research process, and referential

adequacy as a means to check preliminary findings and interpretations against the raw data (Nowell *et al.*, 2017).

To support the credibility and trustworthiness of my approach, I have shared work-in-progress research openly, to ensure that my thinking benefits from the insights of others. Approaches such as sharing drafts with supervisors and presenting plans for literature reviews at conferences such as EDEN 2023 (Gormley 2023a; Gormley 2023c), the DCU Postgraduate Research Unconference 2023 (Gormley, 2023b) and also 2025 (Gormley, 2025) have enabled public visibility into this work along with the capacity for healthy interrogation of same.

Lincoln and Guba (1985) also suggest that credibility can be achieved through a process of member checking data, findings, and interpretations with participants. This idea of member checking–also known as participant validation, respondent validation, member validation, verification (Morgan and Ravitch, 2018) and member reflection (Tracy, 2010)– is a systematic process of engaging the study participants with the data, findings and/or analysis of a project to see if it accurately reflects their lived experiences while simultaneously gathering new data that may spur richer and deeper insights. Lincoln and Guba (1985) describe member checks as:

> The process of continuous, informal testing of information by solidifying reactions of respondents to the investigator's reconstruction of what he or she has been told or otherwise found out and to the constructions offered by other respondents or sources, and a terminal, formal testing of the final care report with a representative sample of stakeholders. (p. 77)

Credibility in qualitative research is also achieved through a variety of practices, including thick, detailed description that offers in-depth illustration of culturally situated meanings (Geertz, 1973), triangulation or crystallization, and multivocality in the form of multiple and varied voices and/or member reflections (Tracey, 2010). Member reflections offer an opportunity for sharing and dialogue with participants about the study findings. Not only do they allow for taking findings back to the field, they potentially go further and offer an opportunity to garner more useful and interesting data which might throw new light on the

investigations. ‘As such, member reflections are less a *test* of research findings as they are an opportunity for *collaboration* and reflexive *elaboration’* (Tracy, 2010, p. 844). [Author's emphasis in italics].

Gibson and Brown (2009, p. 60) point out that even when triangulation is referred to in Qualitative research, it is important to be clear on its purpose as ‘an attempt to gain detailed understandings of research settings, practices or participants, and not an attempt to *verify* the findings of one method with another [Author’s emphasis in italics]. Therefore I prefer the term 'Crystallisation' which differs paradigmatically from ‘Triangulation’ in that it does not insist upon demonstrating a more valid, singular truth and instead aspires to ‘open up a more complex, in-depth, but still thoroughly partial, understanding of the issue’. (Tracy, 2010, p. 844)

To return to the three other criteria for trustworthiness suggested by Lincoln and Guba (1985), the idea of transferability is important. Transferability is about applicability or extrapolation to other contexts. ‘Transferability is achieved when readers feel as though the story of the research overlaps with their own situation and they intuitively transfer the research to their own action’ (Tracy, 2010, p. 845). The researcher is therefore responsible for providing sufficiently thick descriptions to enable readers to make informed decisions as to the relevance and transferability to their own context (Lincoln and Guba, 1985; Nowell *et al.*, 2017).

Dependability in terms of trustworthiness is achieved through maintaining a rigorous process of auditing, documenting, and evidencing the work undertaken such as through raw data, field notes, transcripts and reflexive journalling (Lincoln and Guba, 1985; Nowell *et al.*, 2017). ‘Dependability can then be demonstrated through an audit trail, where others can examine the inquirer’s documentation of data, methods, decisions and end product (Tobin and Begley, 2004). Documentation of thought processes and decisions is at its heart as ‘…lack of documentation impairs the ability to report on nuanced and reflexive research’ (Olmos-Vega *et al.*, 2023, p. 249). Reflexivity is a core component of dependability and the audit trail, requiring inquirers to keep a self-critical account of the research process, including their internal and external dialogue (Tobin and Begley, 2004). As Gough and Madill (2012) advise, researcher subjectivity can be

monitored through writing a research journal documenting reflections on, reactions to, and adjustments made during the research (e.g., topic choice, theoretical preference, interpersonal dynamics).

The fourth and final criterion of confirmability relates to 'confirming' that the researcher's interpretations and findings have been derived from the data, not the researcher's imagination, and it is possible to see how conclusions have been reached (Tobin and Begley, 2004; Nowell *et al.*, 2017). According to Guba and Lincoln (1989) confirmability can be demonstrated when credibility, transferability, and dependability are all achieved.

3.4.6 Maintaining Reflexivity

Reflexivity involves a disciplined practice of critically interrogating what we do, documenting how and why we do it, and considering how all these factors influence our research (Braun and Clarke, 2022). In a literature-synthesised definition, Olmos-Vega et al. (2023, p. 241) describe it as a set of 'continuous, collaborative, and multifaceted practices through which researchers self-consciously critique, appraise, and evaluate how their subjectivity and context influence the research processes'. A reflexive approach urges the researcher to take responsibility for their own situatedness within the research and the effect that it may have on the setting and people being studied, questions being asked, data being collected and its interpretation (Berger, 2015). Similarly, Gibson and Brown (2009) define reflexivity as a process of reflecting on the role of the researcher in the construction of both meaning and data.

Therefore engaging in a process of reflexivity can potentially help me unpack the assumptions and blind spots I may have so that I can prove my trustworthiness as a researcher in how I have approached, conducted, and reported this study. I am not attempting to neutralize the impact of subjectivity - in fact, I want to signpost it by speaking in the first person as much as possible - but I am attempting to acknowledge and recognise it as something that can potentially be capitalised upon as an asset rather than a weakness, so to speak. I can see how some,

especially those with more Positivist orientations, might question how bias is addressed - although there are more researchers supporting the value of reflexivity in quantitative research (Jamieson, Govaart and Pownall, 2023) - so I am also committed to non-defensively addressing critiques. Having read some rather limited attempts confined to positionality statements, for example, I recognise the potential perception of reflexivity as a form of self-indulgent 'narcissim' that comes across as more focused on the researcher than the researched (Olmos-Vega et al. 2023, p. 248). So I will remain committed to staying close to the participants' voices in the analysis especially, balancing their quotes with my interpretation. Further to that, I can see, not without some justification, that reflexivity can lead to a 'hall of mirrors' effect (Lynch, 2000) where it can actually inhibit overall progress and could cause me to get stuck in eternal self-questioning mode. I attempted to counteract this by remaining close to the research questions throughout and also deferring some decisions (such as the gathering of further data) until other important parts of the manuscript were analysed and written up.

Walsh (2003) describes 'turning back upon oneself' as the hallmark of interpretive research. He suggests that there are four overlapping and interconnected key aspects of reflexive processes: **personal, interpersonal, methodological**, and **contextual**. Personal reflexivity is focused on the researcher and how his/her attitudes and indeed presence shape the research project (Walsh, 2003). It calls for the researcher to reflect on the assumptions, expectations, reactions and unconscious responses to contexts, data and participants that may be at play, dispelling the 'fantasy' of objectivity (Finlay, 2002; Walsh, 2003). According to Olmos-Vega et al. (2023), personal reflexivity needs to go well beyond a statement or CV-style description of the researcher's background and should include descriptions of how prior motivations and experience may influence decisions made throughout the project.

Interpersonal reflexivity focuses on the relational nature of research, drawing most attention to the researcher-participant interaction and how that unfolds (Walsh, 2003). With interpersonal reflexivity, it is important to be thoughtful about recognising participants' unique knowledge and perspectives and take care with

how they interpret our questions (Olmos-Vega et al., 2023). It is also important to recognise that I may occupy something of a power position as an interpreter of their views so I needed to ensure that I could manage the effects of this dynamic on participants and myself (Olmos-Vega et al., 2023). This involved making sure that participants could influence the duration of interviews, that they were given maximum flexibility as to the date and time that suited them, and that they could review and amend their transcripts after the interview had taken place.

Methodological reflexivity requires a 'requires a willingness to seek out amidst one's qualitative data those aspects that contradict or threaten the coherence of one's conclusions. Hence methodologically reflexive researchers must critically examine and document both what "fits" and "doesn't fit" with their presuppositions' (Walsh, 2003, pp. 59–60). Since alignment with a specified paradigm and theoretical framework implies opening and closing certain methodological possibilities, it is important to declare such allegiances but also remain open to change as the project - and unforeseen circumstances - proceeds (Olmos-Vega et al., 2023).

Contextual reflexivity is about locating a study within its cultural and historical context (Walsh, 2003; Olmos-Vega *et al.*, 2023). It involves asking questions about how aspects of the context - in my case, the context of ECIU - might be influencing the research and the people involved. For example, over the course of the study there were times I informally met participants who were genuinely interested in finding out how the study was going and who else had been interviewed and I needed to be careful about maintaining anonymity and progress while sharing whatever updates I could.

Perhaps reflexivity is best described as an attitude, rather than a set of procedures, as Walsh (2003) suggests. In the following section I describe the various ways in which I attempted to enable critical reflection of my approach throughout the study and maintain a reflexive record of key decision points. At some points, my efforts have been methodical and systematic but true to a commitment to be open to change, I have also responded to serendipitous moments, especially at times

when I wanted to quickly capture an understanding or a decision point, before I forgot it.

3.4.6.1 Research diary

I maintained a research diary/journal throughout the study as a tool to support reflection on and documentation of real-time insights and ideas (Lynch, 2024). This took various forms but primarily was maintained through a handwritten notebook (Nadin and Cassell, 2006) where I documented my reflections on what I was doing on a particular day and what thoughts and questions were occurring to me as I did it. This diary was maintained almost every day that I worked on the study. It culminated in three A5 notebooks capturing conversations with my supervisors, further questions on papers or books I was reading, or activities I was engaged in, or sometimes random thoughts. Figures 16, 17 and 18 show some rough extracts from various diaries over the years.

Figures 16 and 17: Extracts on why doing a literature review, its purpose, and some thoughts on participants' priorities that came up at the point of data analysis.

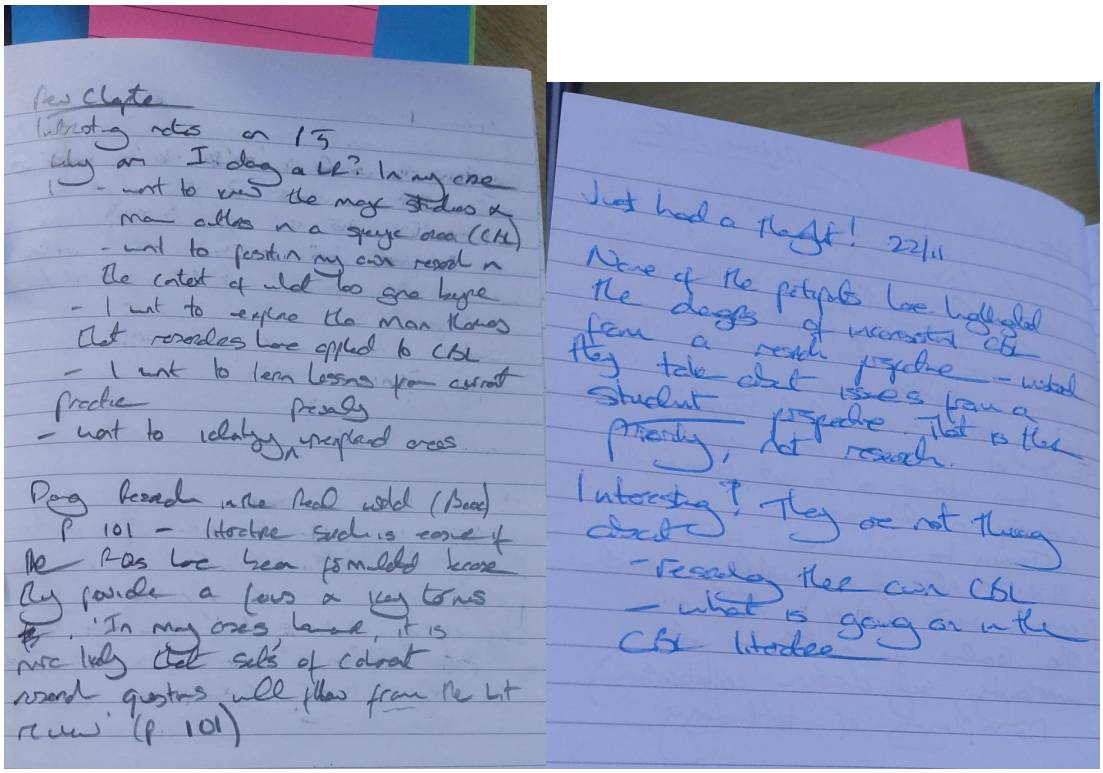
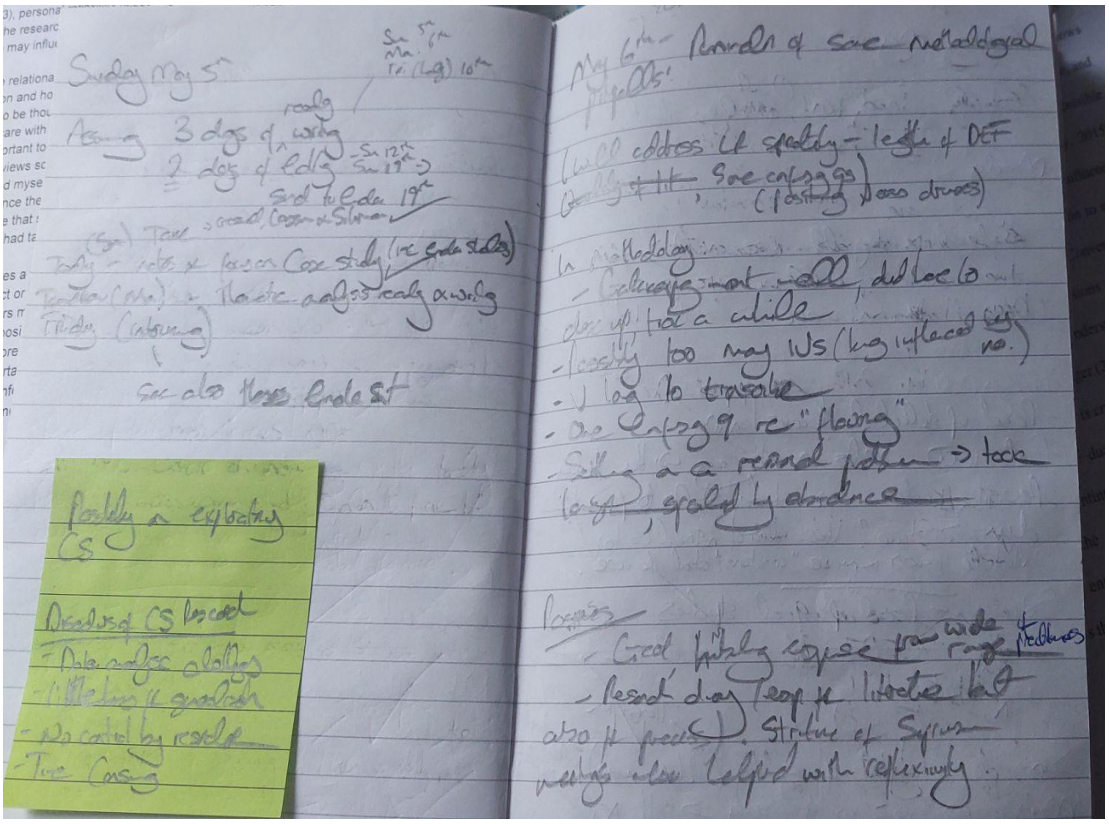
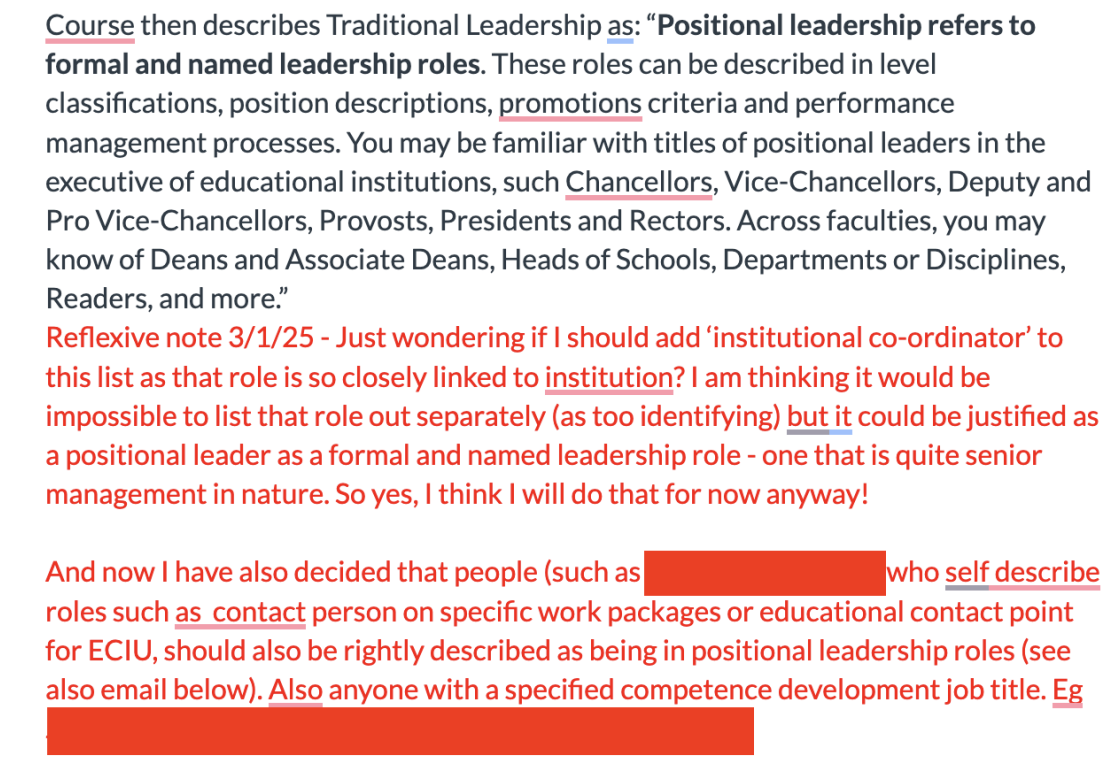


Figure 18: Notes capturing some of my reflections on some issues with the interview method and the length of the Data Extraction Form (DEF)



I also documented key decision points or particularly troublesome points in Google Docs where I reflected on what I suspected were particularly important matters in more depth. This type of reflective writing helped me to think through the issue by documenting what was confusing me and what I proposed to do about it. For example, the notes that follow in Figure 19 (which have been name redacted) capture my confusion and decisions about how to describe the various roles:

Figure 19: Deliberations over role titles and maintaining anonymity while still providing background context about those participating


Course then describes Traditional Leadership as: "**Positional leadership refers to formal and named leadership roles.** These roles can be described in level classifications, position descriptions, promotions criteria and performance management processes. You may be familiar with titles of positional leaders in the executive of educational institutions, such Chancellors, Vice-Chancellors, Deputy and Pro Vice-Chancellors, Provosts, Presidents and Rectors. Across faculties, you may know of Deans and Associate Deans, Heads of Schools, Departments or Disciplines, Readers, and more."
Reflexive note 3/1/25 - Just wondering if I should add 'institutional co-ordinator' to this list as that role is so closely linked to institution? I am thinking it would be impossible to list that role out separately (as too identifying) but it could be justified as a positional leader as a formal and named leadership role - one that is quite senior management in nature. So yes, I think I will do that for now anyway!

And now I have also decided that people (such as [redacted] who self describe roles such as contact person on specific work packages or educational contact point for ECIU, should also be rightly described as being in positional leadership roles (see also email below). Also anyone with a specified competence development job title. Eg [redacted]

3.4.6.2 Critically interrogating the data

I was conscious of the need to critically interrogate my thinking and unpack my assumptions throughout the project, but this was particularly important at the data analysis stage where I needed to consider and perhaps challenge my subjectivity or run the risk of confirmation bias. As I was attempting to make sense of the data, I needed to deeply engage with what participants were saying but also maintain a certain distance where I was able to see the wood for the trees. Therefore, I made a decision at the data analysis stage to adopt a consistent set of prompts as I engaged with the 19 transcripts as part of Phase 1 of Braun and Clarke's (2022) six phases of Thematic Analysis. The purpose of these questions was not to provide a rigid set of questions to be fully answered there and then at the point of reading, but to provide nudges and reminders towards things to think about as I read the transcripts. 'The purpose of questioning is to facilitate depth

and (authors' emphasis) distance in engagement (Braun and Clarke, 2022, p. 44). Therefore as part of my effort to critically engage with the data, I asked myself the following questions, drawn from Braun and Clarke (2022), noting my responses on each transcript:

- Why might I be reacting to the data in this way?
- What ideas does my interpretation rely on?
- What different ways could I make sense of the data?

By asking myself these questions when I reread the transcripts, I tried to unpack why might they be making sense of things this way (not another way), while also noting connections and contrasts between what different interviewees were saying. Below are some examples of my critical interrogation notes (which were originally noted on the printed transcript):

> He mentions that none of the definitions emphasise the role of the educator as a mentor or guide rather than the owner of the answer - interesting! I also noticed more of an emphasis on CBL research here. I think he may have misinterpreted the 'flavouring' question. Glad to see him raise the course space issue, which I recognise. Wonder if lack of recognition may be a theme?
>
> Struck by student-driven aspect, they are really talking the talk. Quite strong on process focus and not too concerned about the value for the stakeholder. Has some research experience of CBL. Mentions, honestly, some external stakeholder disappointment. I am not hugely surprised as it sounds like students have much more freedom to source challenges than I've seen elsewhere. Recognition is key (a recurring theme).

3.4.6.3 Member reflection

Collaborative reflexive practice can and probably should involve collaboration with research participants (Olmos-Vega et al., 2023). The term 'member checks' has been questioned somewhat from a 'meaningful coherence' standpoint for its suggestion about ascertaining/correcting the truth of an account (Tracy, 2010, p. 848). It has been suggested that the term 'member reflections' is more coherent as it does not aim to establish a single source of truth, and it provides opportunities for adding data, deeper reflection, and greater complexity.

Two rounds of member reflections were undertaken. In round one, I ensured that the transcript of each interview was sent to participants to give them the opportunity to add further or change anything. No changes were requested and responses from participants expressed interest in seeing future findings.

In round two, following analysis and write up of findings, I shared the draft Analysis chapter along with a video summary of same. The video summarised the key themes of the research through a narrated PowerPoint: https://youtu.be/WL3aNYp537E This was a 10 minute video that presented the draft analysis in multimedia mode, giving participants the opportunity to engage with it in a shorter space of time, if they wished. There were 10 responses to this offer – three apologised and said they would not have time to read, two said they would read but did not respond further, one said they had read the document and it was 'ok', and four responded in more detail. All of those four were complimentary, describing it as a 'solid' piece of work (P17, P15) that represented their views and two others suggested it was interesting and had potential for journal or conference publication (on the CBL defining characteristics (P8) and the thematic analysis, respectively (P2). The use of the video was described as 'very helpful' by one participant (P11).

> Thank you for sharing the draft and the video summary. I've reviewed both and can say that I agree with the findings — I recognize myself in what you've captured. It's solid work, and I'm happy with how my views have been represented. I have no further comments. (P17):
>
> I am happy that my voice is included. Whilst I cannot remember exactly what I said there was nothing in this chapter that jarred with me, that I would have concerns about in terms of my contribution. (P8)

There were no requests for changes to the analysis. However one respondent expressed interest in finding out more about differences that emerged:

> Maybe it's in a different chapter, but something I'm always interested in is comparison and difference. I get the sense that participants had fairly similar viewpoints. It may not be appropriate for your thesis, but were there differences along institutional or discipline lines? (P11)

The second round of member reflection was conducted as a form of triangulation, to avoid potential risks of 'anecdotalism' and ensure that selected excerpts were

not included uncritically as convenient examples of certain viewpoints (Silverman, 2022, p. 435). The provision of an opportunity for the participants to comment on whether or not they saw themselves in the findings, a technique suggested by Lincoln and Guba (1985) to support credibility, was taken up by some, as described above. This triangulation activity allowed participants to cross-check the data and corroborate or refute my interpretation, offering a chance for input into how they are represented. While no edits were requested on this occasion, if participants had made requests for clarification or change, their comments would have been reported in the thesis.

3.4.6.4 Conference Presentations

I attended the EDEN doctoral symposia in 2022 and 2023 which were opportunities to present my work-in-progress research to a panel of external educators. In 2022 I shared my initial context, research problem, proposed methodology, and draft research questions, as shown in Appendix H. I summarised the feedback I received from the panel at that time in an email to my supervisors. They broadly concurred with the feedback and added suggestions on ways of handling the presentation of definitions, the tendency for CBL/PBL conflation and the need to keep a focus on perceptions, practices, and experiences of CBL (rather than the more nebulous 'impact'). In 2023, I had further refined my study and went back and presented progress again, based on the abstract shown, including an overview of the research journey to date.

In addition to the doctoral symposia at EDEN, in 2023, I also presented on 'Implementing Challenge-Based Learning: What the emerging literature says' (Gormley, 2023a). An extracted slide from the presentation is shown in Appendix I.

In 2023, I also presented at the DCU Institute of Education Unconference for research students on 'The Challenge-Based Learning Literature: A Preview of Perceptions' (Gormley, 2023b). I recall being asked about countries where CBL was most popular and also for examples of challenges that might be undertaken. I also presented again at the Unconference in 2025 when I was reaching the end of

my thesis. I recall being asked probing questions about the number of interviews I had undertaken which was a useful critique to reflect on.

In 2024, I contributed to the Research on Walls postgraduate research event. This competition required an interesting photographic image representing my research to be shown as part of a visual exhibition of research projects (DCU Graduate Studies Office, 2024). The image itself is shown in Appendix J.

3.5 Research Method

Cognisant of my epistemological commitments and the wise advice to avoid methodological rigidity (Chamberlain, 2012), I have chosen a method that, in my view, offers an effective and manageable way to explore the research questions through the case study described. As described previously, I am using a fully Qualitative research approach and have chosen to draw upon multiple sources of information (Cresswell, 1998) in the form of multiple in-depth interviews using a process which will be described next.

I did not seek to triangulate my data with another method. According to Silverman (2022, p. 169) 'collecting multiple datasets may not allow time to analyse any one dataset thoroughly' and there is not a 'whole story' to be told about any given phenomenon. I am conscious that there are some perceived limitations to adopting an approach that appears to rely on a single source of data. However, it could also be argued that there are many examples of educational case study research that exclusively employ the method of interviews in the literature (Schneider *et al.*, 2022; Lyng *et al.*, 2024; Manninen, 2024).

3.5.1 Semi-Structured In-Depth Interviews

I conducted 19 semi-structured in-depth interviews with participants who have experience of leading and implementing CBL. Given that this study sought to ask a specific group of people questions about their perceptions and experiences of implementing Challenge-Based Learning, the choice of interviewing as a method of data collection seemed appropriate (Gibson and Brown, 2009). The research seeks to

explore meaning and perceptions to gain deeper understanding, and in-depth interviews can explore the shared understandings of a particular group of individuals (DiCicco-Bloom and Crabtree, 2006). I therefore sought a style of interviewing that would encourage the interviewee to share rich descriptions of phenomena that I would subsequently interpret to explore meanings and life experiences (DiCicco-Bloom and Crabtree, 2006). The objective of methods that involve asking direct questions of participants is to foster a discourse that offers insight into the research questions at the heart of the study (Gibson and Brown, 2009).

An interview is generally understood as a verbal exchange in which one person, the interviewer, attempts to acquire information and understanding of another person, the interviewee (Rowley, 2012).The semi-structured interview was chosen as the most suitable choice of method. The semi-structured interview is where a list of questions is prepared in advance and all questions are asked but the order and the wording of those questions can be changed where contextually appropriate (Gibson and Brown, 2009). Semi-structured interviews are referred to as semi-structured because the interview tends to be structured around a pre-selected set of themes which are intended to guide the interview. Unlike a purely structured interview, semi-structured interviews are intended to provide room for the interviewer to adapt and add to the questions in the interview guide if the need presents itself (DiCicco-Bloom and Crabtree, 2006; Cousin, 2009; Priyadarshini, 2020). After all, if the interview is intended to be a site of co-constructed meaning-making, then interpretations should be clarified and probed further along the way.

Gray (2018) describes the interview as a favoured approach where the research objectives are based upon understanding experiences, where probing of responses may be required, the response rate is important, and there is a potential for English language issues. Other methods such as document analysis and focus groups were considered. With little of this topic - particularly the barriers and enablers for CBL implementation in institutions - available in the way of published literature, a document analysis seemed unlikely to reveal the specific actions and recommendations that this study aims to develop. The same is true of institutional websites which tend to be more positively focused and there is little published data,

either scholarly or grey literature, on the leadership implementation aspect of CBL. Focus groups were also considered. Focus groups also offer the ability to conduct a group conversation with multiple perspectives (Queirós, Faria and Almeida, 2017) and indeed have a further benefit in enabling observation of group dynamics, including participant interactions and shifting opinions, if that is relevant to the research objectives (Cousin, 2009). However based on a cost-effectiveness investigation relative to achieving thematic saturation as quickly as possible, Namey et al. (2016, p. 435) found that one-to-one interviews offer better 'bang for the buck' than focus groups. Furthermore, given the intention to explore institution-specific questions, the in-depth interview offered more scope for a perhaps freer and longer conversation about individual understandings and opinions. The interview format was therefore identified as the optimum way of tapping into multiple perspectives on an emerging topic from a variety of institutions with a continuum of CBL leadership and implementation experience.

Interviews do have some disadvantages. They are time-consuming and relatively high-cost compared to other methods. In calling for more use of observational methods in educational research, Evans (2019) also highlights the limitations of data collection methods that depend upon participant's memory recall. However there were advantages in terms of richness and depth in directly asking the participants specific questions about their perceptions and their thinking on barriers and enablers to CBL implementation. 'Semi-structured and in-depth interviews provide the opportunity to 'probe' a response, where you want your interviewees to explain, or build on, their previous answers', (Saunders, Lewis and Thornhill, 2023, p. 450). Of course a survey could have been used but that method would be highly dependent on the quality of the answers and follows a rigid structure that does not permit asking further what a person meant in responding to questions (Pring, 2004). It is also problematic in that it doesn't capture the emotions or behaviours of the participants (Queirós, Faria and Almeida, 2017).

The one-to-one interview also offered a degree of flexibility in the timing of the conversation in that it could be rearranged at short notice if necessary. I was very flexible about this and in arranging suitable times, on several occasions assured

participants that it was fine to reschedule the interview time if needed. So long as it was undertaken within the 7 month timeframe of this element of the project, this did not pose any issues and helped ensure that participants would be as relaxed and hopefully as forthcoming as possible for the conversation. The questions I intended to explore were copied into semi-structured interview guide as a basis for the interview conversation (Jamshed, 2014). Regarding the questions themselves, these were very much drawn from perceived gaps in the literature, areas where there was little consensus or little written at all.

The questions were designed to develop in complexity over the course of the interview, starting out with simple background informational-type questions, moving to a more probing discussion about definition(s) of CBL, and closing with a number of questions about the barriers encountered and recommendations for wider implementation. The purpose of the initial phase, which is usually somewhat apprehensive, is to get the interviewee talking and settled in (DiCicco-Bloom and Crabtree, 2006). The full interview guide of 19 questions is included in Appendix D. As is typically the case with semi-structured in-depth interviews, these were open-ended questions with other questions emerging from a dialogue between interviewee and interviewer (DiCicco-Bloom and Crabtree, 2006).

Some of the questions (questions 6-9, inclusive) were posed through a variation on the cards-based approach described in Rowley (2012). For this, a selection of definitions of CBL were presented in four quadrants on screen (as shown in Figure 20) to act as prompts and enable discussion of participants' reasoning for certain choices.

Figure 20: Selection of CBL definitions

Definition 1	Definition 2
"Challenge Based Learning is an engaging multidisciplinary approach to teaching and learning that encourages students to leverage the technology they use in their daily lives to solve real-world problems. Challenge Based Learning is collaborative and handson, asking students to work with peers, teachers, and experts in their communities and around the world to ask good questions, develop deeper subject area knowledge, accept and solve challenges, take action, and share their experience." (Nichols and Cator, 2008, p.1)	"CBL is a cutting-edge alternative to traditional teacher-centered and summative assessment education. CBL integrates traditional learning modules with real-life challenges that require innovative solutions and can be applied to a variety of subjects…In this sense, CBL is usually characterized as an active and experiential learning approach (Gallagher & Savage, 2020) which follows a multidisciplinary approach that encourages students to leverage technology used in everyday life to solve real-world problems (Pornpongtechavanich, Eumbunnapong, & Piriyasurawong, 2021)." (Vilalta-Perdomo *et al.*, 2022, p.2)
Definition 3	**Definition 4**
"A challenge-based learning experience is a learning experience where the learning takes place through the identification, analysis and design of a solution to a sociotechnical problem. The learning experience is typically multidisciplinary, takes place in an international context and aims to find a collaboratively developed solution, which is environmentally, socially and economically sustainable." (Malmqvist, Kohn Rådberg and Lundqvist, 2015, p.4)	"Challenge-Based Learning (CBL) is a process of collaborative engagement with peers, academics, and stakeholders to develop solutions to real-world social, technological, environmental and economic challenges of urgency and significance. CBL is a distinctively learner-driven pedagogy where learners, with the support of academics, define the dimensions of the challenge to be worked on. Throughout the process learners are given opportunities to acquire the necessary knowledge and skills to propose solutions for the challenge in question." (CBL Working Group, 2022)

This approach was also intended to present participants with various definitions which they may or may not have been aware of previously. In other words, it helped to reduce the risk of relying on memory alone. In line with my Constructivist orientation, and mindful of the variety of prior knowledge and experience participants may have, I also provided an opportunity to suggest alternative definitions to those shown. Ten of the participants (just over half) offered suggestions in response.

3.5.1.1 Pilot Interview

A pilot interview with one person was conducted over Zoom to test the questions within the proposed interview guide. All questions were put to the respondent who understood and was able to answer them all within the allotted time. In my follow up email to this person, where I shared the transcript, care was taken to ensure no assumptions were made on this point: 'If any of the questions confused you (or you had to read them a number of times to understand) please do let me know. All feedback welcome.'

The interviews were intended to take place within 60 minutes max. The pilot interview went well and reassuringly, the questions were answered in under an hour (46 minutes). One aspect this did prepare me for was the need to have the definitions slide ready on screen to avoid unnecessary delays at that stage of questioning.

3.5.2.2 Interview Process

The interview guide was sent on in advance so that interviewees would have time to read the range of pre-prepared questions, helping to 'equalize the relationship and engage in that "conversation with a purpose" or Socratic dialog' (Simons, 2009, p. 48). My intention was to prepare questions and/or discussion topics in advance and generate follow-up questions during the interview (Salmons, 2012). I thought this particularly important given the request to consider and comment on a selection of definitions. However, time was also allowed for participants to read or re-read the four definitions presented during the interview itself. Probing questions were also used to check understanding. In line with Jamshed's (2014) advice, I created an interview schedule of core questions/topics in advance to help keep the interview focused and on task. I also recorded the sessions as 'hand written notes during the interview are relatively unreliable, and the researcher might miss some key points' (Jamshed, 2014). I took a semi-structured approach so I had the freedom to pick up on points raised.

In October 2023, the interviews commenced. The majority of the interviews took place over Zoom (because of geographical locations across Europe) while those at my own institution took place in-person. Indeed it is only with the advent of online video interview technology that I was able to consider a research project involving such diverse/heterogeneous and geographically disparate interviewees (Villiers, Farooq and Molinari, 2021). As a side effect of the Covid pandemic, I assumed that all participants would have been comfortable with web conferencing. There is growing evidence that online interviews have many positive aspects such as convenience and inclusivity and should not be relegated as a lesser option than face-to-face experiences (Wakelin, McAra-Couper and Fleming, 2024). Another

significant benefit of the online web conferencing platforms is their ease of use for transcribing the sessions - which were all recorded - and the built-in transcription function was a useful starting point for the transcription process. Being able to capture both the video recording and transcription at the same time proved an efficient way to collect data while also providing an opportunity 'to relive the interview' when later transcribing and analysing the data (Wakelin, McAra-Couper and Fleming, 2024, p. 5). However a downside of Zoom was a 'choppy purview' (Oliffe *et al.*, 2021) due to dropping internet connection in one interview which caused a few minutes of a delay and perhaps some missed verbalisation. One respondent preferred not to download Zoom, and notified me in advance, so that interview was conducted via Teams.

Given my familiarity with the DCU interviewees, I decided to conduct the local interviews on-site. According to Cresswell (1998), with one-to-one interviews, the researcher needs individuals who are willing to talk and share ideas and s/he needs to determine the optimum setting for this to take place. As Warren (2012, p. 6) describes, the 'social situation' of interviews involving acquaintances is different to that involving strangers and her points about attempting to be both jocular and 'interviewer-ish' with colleagues resonate. In all situations, I attempted to build rapport with the interviewee to establish a safe, reflective space and a sense of trust and respect for the interviewee and the information to be shared (Cousin, 2009; DiCicco-Bloom and Crabtree, 2006). I wanted to create the reflective opportunity I referred to in my recruitment notice so I repeated this aspiration at the start of interviews. Care was taken to design the interview guide to promote a good conversation by easing participants into the more complex or challenging questions (McGrath, Palmgren and Liljedahl, 2019). I also allowed a few minutes at the start to remind them I was aware of their time pressures and that I was going to keep well within time. I also offered another opportunity to confirm that they were ok to proceed and were comfortable with the session being recorded.

3.6 Transcription Process

For the online interviews, I used the cloud-based audio transcription feature in Zoom as a starting point for the transcription process. For the in-person interviews, I used DCU approved software (e.g Office 365) to support the transcription process.

A transcript is a representation of a piece of data that has been collected (Gibson and Brown, 2009). Working with the generated transcript files, I listened back to the audio from the recorded interviews, as a means of familiarising myself with the data, capturing the nuances of the conversation, and ensuring that I had an holistic view of the data set, similar to the approach by Priyadarshini (2020). I read the Zoom-generated transcript, made the necessary adjustments to anonymise, and then listened back through all the recordings, editing the soft version in Google Docs as I went. Sometimes words were misinterpreted by Zoom which I corrected as best I could. Each transcript took approximately 4 hours to review and amend.

Transcription in this way became the first step of the analysis process, a rendering of data rather than just an attempt to represent the conversation. As various authors have said transcripts are not neutral, we include what we see as important, so the process is informed by one's philosophical and theoretical stance (Gibson and Brown, 2009; Lapadat and LIndsay, 1999). Lapadat and Lindsay (2020) write that 'Analysis takes place and understandings are derived through the process of constructing a transcript by listening and re-listening, viewing and re-viewing' (p.82). Cousin (2009, p.37) refers to the opportunity for analytical, meditative, and intimate engagement with data that transcribing can afford although she also warns against the danger of fetishizing the interview transcript as a 'stable, accurate record'. No transcript can capture all the nuances of speech which can be such signifiers of meaning (Gibson and Brown, 2009). In attempting to capture the spoken word in text, there is also a risk of where one can mistake words or phrases uttered by others (DiCicco-Bloom and Crabtree, 2006). However despite the lengthy, time-consuming labour involved in transcribing the

interviews, I would concur with its value in enabling very close attention to and indeed immersion in the aspects of the data that related to my research questions. As Gibson and Brown (2009) indicated, transcription enabled me to focus on data and begin to note particularly relevant or interesting features.

The participants' own transcript was shared back to each participant as a form of member reflection to share the researcher's interpretation of the conversation and provide an opportunity for participants to contribute further, if they wished (Candela, 2019). In round one of the member checking process, participants were invited to read the transcript and make any changes desired. One participant responded to enquire about the tool used but no specific changes to the transcript were requested. All recordings and transcripts are stored securely in DCU Apps Google Drive and were not accessible to anyone apart from my supervisors and myself.

3.7 Anonymity

Steps have been taken to preserve the anonymity of participants. This is in keeping with common practice for researchers to change the characteristics of study participants in order to protect their identities (Wiles *et al.*, 2008). Anonymity can relate to whether a person has participated in the research effort, anonymity of a person's actual responses, and not publishing names or other identifying information (Scott, 2005).

Data collected from the interviews has been pseudo anonymised at the point of transcription by giving an anonymous identifier (e.g. P1) to each participant. There is a separate file listing the names of the participants against their identifier. Participant identity and the contents of this file are protected through correct and appropriate data storage (on DCU Google drive), prompt and careful data destruction (destroyed after 4 year max.) and by exercising caution with whom the data is shared (supervisors only).

In the findings and the write up, participants are only ever referred to by their anonymous identifier. The anonymity of individual participants has been protected in so far as possible but it cannot be guaranteed as participants in such a specific

sample are likely to know one another and may recognise each other's viewpoints. The PLS has made this limitation clear.

Furthermore, every effort has been made to protect the institutional identities. This was carefully handled in the writing up to minimise the risk of specific institutions being revealed. However, because the study will be transparent that the sample is being drawn from ECIU members, it will be evident that certain universities are potentially involved. Again, the PLS has made this limitation clear.

3.8 Data Analysis

> 'Qualitative data analysis is a search for general statements about relationships and underlying themes' (Marshall, 2006, p. 154).

However that apparently simple explanation does not reveal what a theme is or why a theme is considered important in the first place (Gibson and Brown, 2009). It also diminishes the detail of what lies behind the analytical process which I will attempt to explain now.

There are many approaches to qualitative analysis, each of which serves rather different purposes. 'Qualitative analysis is (or should be) a rigorous and logical process through which data are given meaning (Gray, 2018, p. 684). Thematic analysis is a process of identifying patterns or themes within qualitative data. Gibson and Brown (2009, p. 127) describe thematic analysis as the 'process of analyzing data according to commonalities, relationships and differences across a data set. Perhaps more simply, 'A theme is a pattern that captures something significant or interesting about the data and/or research question' (Maguire and Delahunt, 2017). Through analysis we describe the data and then try to deconstruct it into smaller pieces in pursuit of connecting and creating new concepts.

There are many variations of thematic analysis available, each with their own processes and assumptions. Because of my Interpretivist and Experiential orientation to research, which emphasises the meanings and experiences

articulated by participants, I chose Braun and Clarke's reflexive thematic analysis (RTA) process (2021, 2022). I was drawn to this form of thematic analysis because it emphasises the importance of researcher subjectivity, framing it as an analytic resource, while encouraging deep reflexive engagement with theory, data, and the interpretive process (Braun and Clarke, 2021). I am also drawn to its Experiential orientation to qualitative research which is focused on meaning and experience, exploring 'what people think, do and feel, and how they make sense of their realities', (Braun and Clarke, 2022, p. 159).

Because of the phenomenal level of interest in their guidance, (Braun and Clarke, 2021) have further developed their *reflexive* TA approach (emphasis authors') by describing common mistakes in published TA research. They have identified ten problematic practices that should be avoided by researchers claiming to following their approach. The questions built into the tool for evaluating thematic analysis (p. 345) were used and revisited as a guiding compass for my own approach. I also wish to articulate assumptions informing my approach to TA. For example, I agree with the authors' contention (Braun and Clarke, 2021, p. 334) that 'Demonstrating coding reliability and the avoidance of 'bias' is illogical, incoherent and ultimately meaningless in a qualitative paradigm and in reflexive TA, because meaning and knowledge are understood as situated and contextual, and researcher subjectivity is conceptualised as a resource for knowledge'.

3.8.1 Approach to the 6 Phases of Reflexive Thematic Analysis

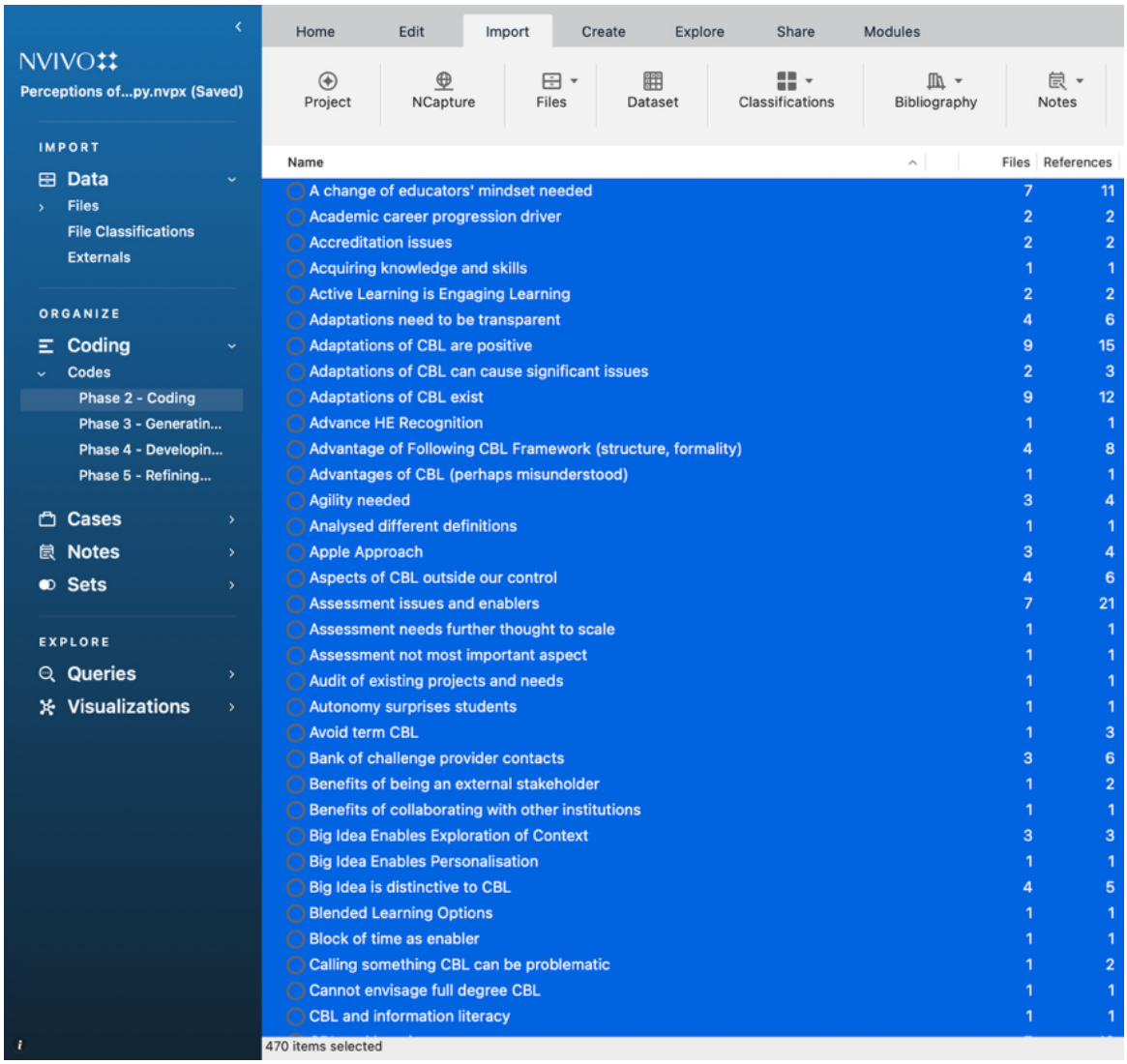
The process of thematic analysis is commonly described in recognisable stages and there are variations available to researchers to choose as they see fit. Building on their earlier work, I have applied Braun and Clarke's six-phase reflexive thematic analysis (RTA) process (2021, 2022) as follows:

Phase 1: Familiarising myself with the dataset began with transcribing, reading, and re-reading the data (in printed form), while noting down initial ideas. During this phase, I sought to reinforce trustworthiness through prolonged engagement with the data over several months, including a stage of deliberate critical

interrogation questioning as described in Section 3.6.2 and initiating a reflexive journal which was maintained throughout. Some very early thoughts on potential codes/areas of interest were jotted down on the hard copy as I read through the transcripts. It was also helpful to return to review the same interview some time after the original analysis. Such time lapse offers an opportunity to view the same material through 'new lens' (Berger, 2015, p. 230).

Phase 2: Coding which involved systematically working through the dataset 'in a fine-grained way' (Braun and Clarke, 2022, p. 35) where I went about identifying segments of data that were interesting and relevant to the research question and applied initial code labels to describe what they seemed to be saying. In line with Braun and Clarke's (2022) advice, my focus was 'specific and detailed, with coding aimed at capturing single meanings or concepts' (p. 35), largely at a semantic (linguistic or surface) level to remain close to the experiences articulated by participants, but also at a latent (conceptual) level based on the literature. The process of the research is therefore inductive i.e. a 'bottom up' approach where the data are gathered and analysed to see if patterns exist that suggest relationships between variables and from which generalisations or even theories may be constructed (Gray, 2018). Figure 21 shows a screenshot of codes in NVivo by the end of Phase 2.

Figure 21: Example of codes developed during Phase 2



I have applied an inductive logic to the project, building from the specific to the broad, focusing on the context and continually revisiting the research questions based on experiences from the field. I developed patterns of categories or themes from participants based on what they said in the interviews, not in advance of the research, and grouped them into broader themes (as per Braun and Clarke, 2022) later on. This overall approach confirms that the research process was one of emerging rather than predefined design. This work was done primarily in NVivo, a Qualitative Data Analysis Software (QDAS) package that provides tools to organise, annotate, search, connect, and visualise data and writing at different stages of the analysis process (Silverman, 2022). The transcription process led to 19 separate

transcripts based on interviews of 45-60 minutes duration. The total wordcount of the transcripts was 112, 408 words which needed to be analysed initially through a methodical process of generating codes (short descriptive and/or interpretive labels) that could be potentially informative in relation to answering the research questions. An open approach to the coding was undertaken so as not to risk foreclosing on potentially relevant concepts and ideas too early. In line with Braun and Clarke's advice, attention was paid to including enough contextual information in each code label for it to make sense standalone and ensure it provided a sense of the underlying data. This would facilitate grouping of codes into themes later. For example, instead of calling a code "Adaptations of CBL" at the outset, I added context to show that there were different facets to that data such as "Adaptations of CBL are positive" and "Adaptions to the CBL can cause significant issues" which related to different but related points being made by participants."

Again, this process required months of intense engagement with the data and because I wanted to remain as open as possible at this early stage to all potential codes and themes, it resulted in an initial set of 470 codes by the end of Phase 2. I kept reflexive notes throughout this process, highlighting areas of confusion that I would need to revisit later.

Phase 3: Generating initial themes involved an active focus on 'shared patterned meaning across the dataset' (Braun and Clarke, 2022, p. 35) whereby I grouped clusters of codes that shared a central idea or concept in common into a grouping that might contribute to answering the research questions. During this phase, I leaned more into mindmapping initial thoughts about potential codes/themes, tending to work in both NVivo and on paper to document my thoughts. Documenting and diagramming the process, even if it looked rough and messy at times, helped me to make sense of possible theme connections (Nowell *et al.*, 2017). The initial list of 27 themes is shown on the left of Figure 22. A rough early mindmap illustrates the process of recategorising and reducing the number of themes (see right of Figure 22) e.g. some initial themes were found to be primarily student-related and these were removed. Figure 23 shows the expanded node of the 'Adaptations of CBL' theme, showing all the codes associated with that

potential theme. Note that duplicate/similar codes were merged in NVivo throughout the iterative coding and theme development process.

Figure 22: Initial list of themes created in Phase 3

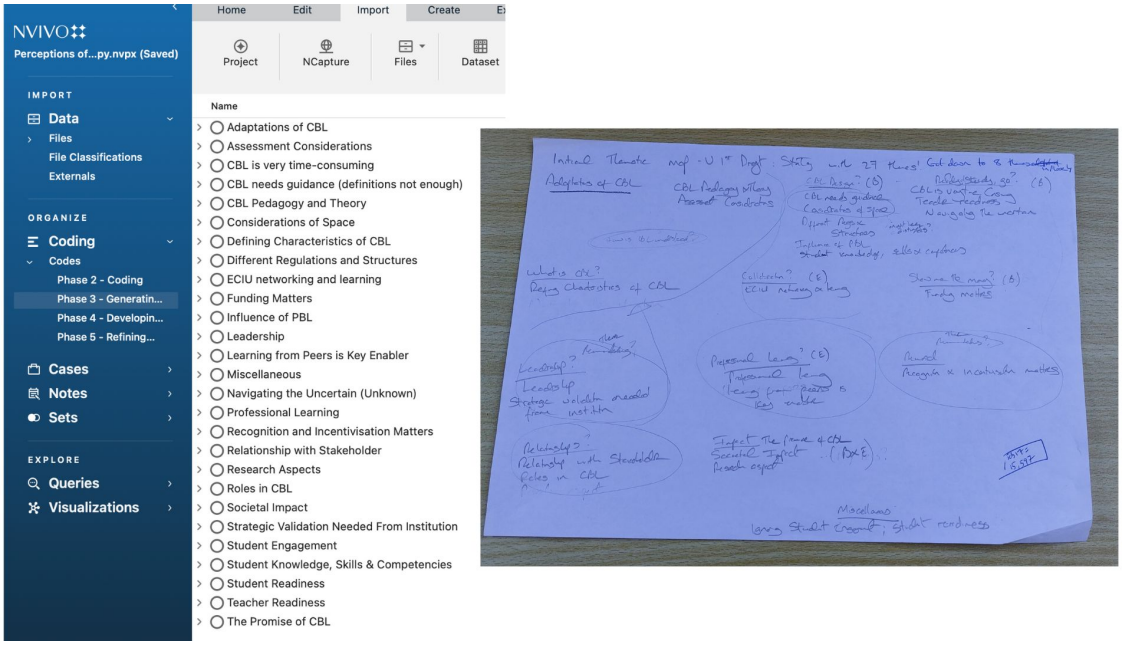
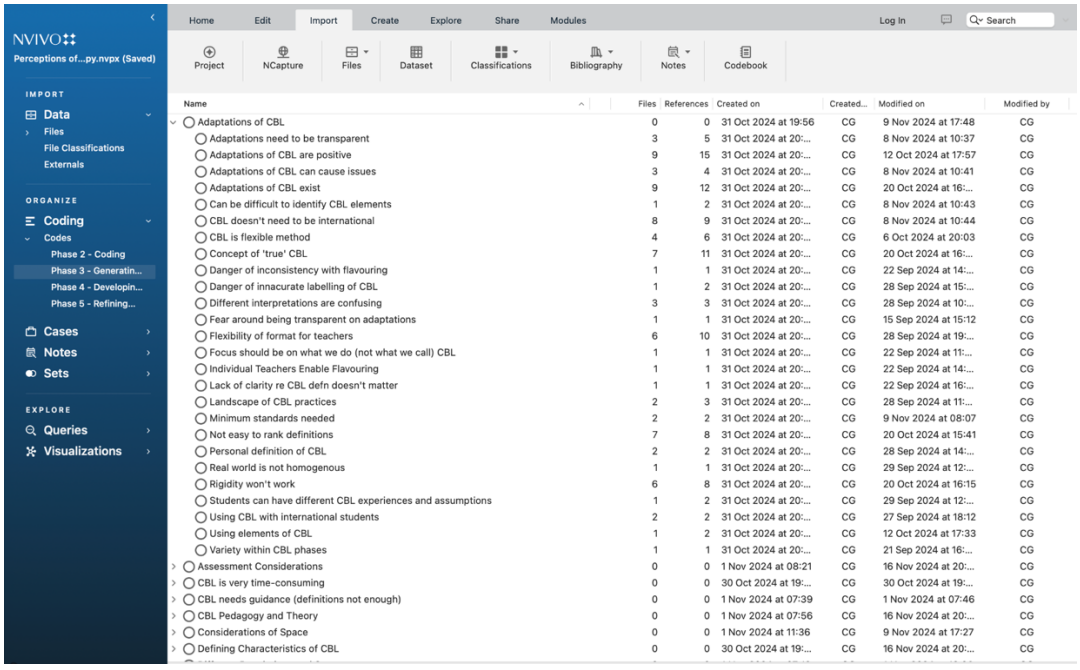
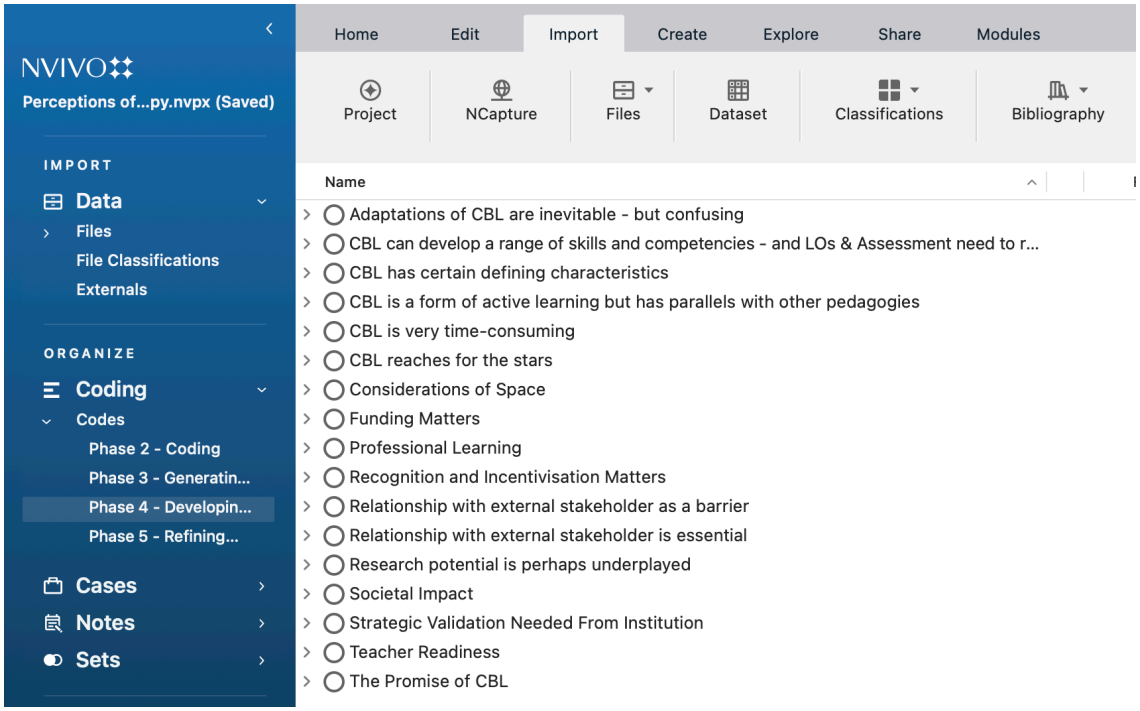


Figure 23: Expanded node of one potential theme



Phase 4: Developing and reviewing themes required me to go back to the full dataset and check candidate themes against coded items. I created an initial thematic map of the analysis. I also used a set of questions described in Maguire and Delahunt (2017, p. 3358) to help me identify the coherency of themes. They suggested that researchers should ask themselves: Do the themes make sense? Does the data support the themes? Am I trying to fit too much into a theme? If themes overlap are they really separate themes? Are there themes within themes (subthemes)? Are there other themes within the data? The checklist of critical questions described in Braun and Clarke (2021) was also useful at this point, particularly for raising questions about including too many/too few data abstracts and the need for caution about reported themes becoming topic summaries rather than fully realised themes. Figure 24 shows the list of further developed themes by the end of Phase 4. Note the reduced number of themes to 17 and that the title of the 'Adaptations of CBL' theme was changed to reflect its multi-faceted nature.

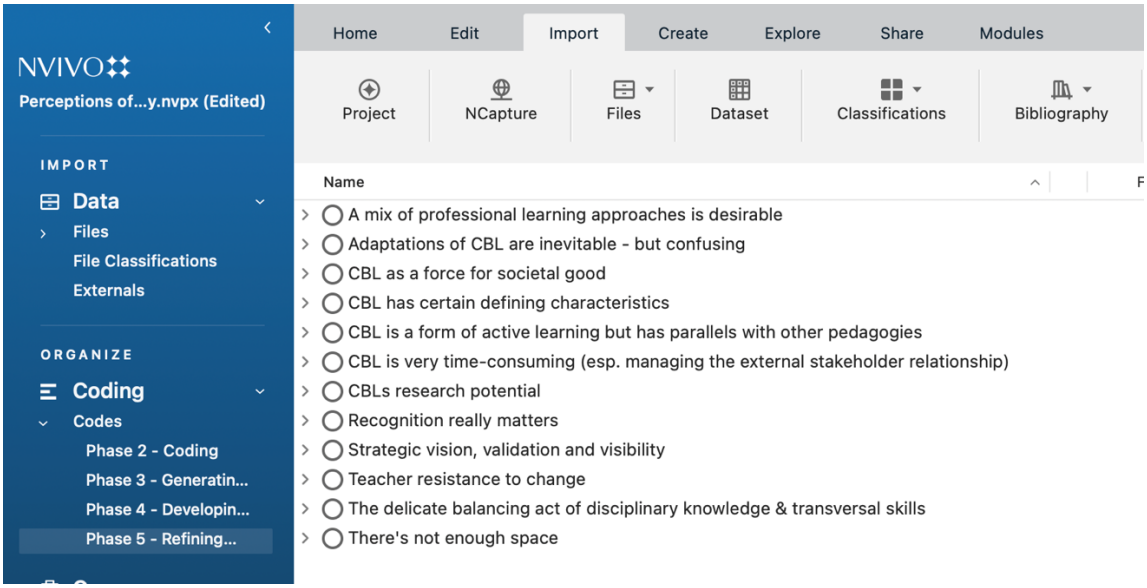
Figure 24: List of further developed themes from Phase 4



Phase 5: Refining, defining and naming themes relates to 'ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme' (Braun and Clarke, 2006,

p. 87). This is where the theme names were refined to highlight "the 'essence' of what each theme is about" (p. 92) and the drafting process with my supervisor was central to this. For example, instead of addressing the 'Managing the stakeholder relationship' issue as part of the 'Lack of Time' theme, based on his feedback, I promoted it to a theme of its own to make its story more prominent within the narrative. I also amended some of the theme and sub-theme titles to attempt to make them more engaging and direct, **Theme 10: Recognition really matters** being a case in point. Figure 25 shows the further refined themes in Phase 5 following merging of themes that overlapped with others e.g. Professional Learning and Teacher Readiness.

Figure 25: Further refined themes in Phase 5

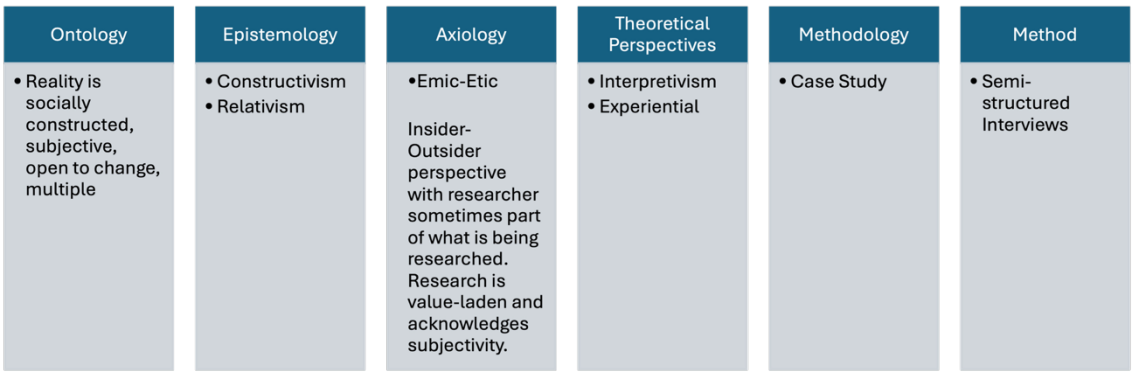


By the end of Phase 5, 12 themes remained. Note that titles and groupings of themes were still further refined during the write up phase 6 to eventually culminate in 10 themes in the final report. For example, the theme 'CBL as a force for societal good' was included as a sub-theme of 'CBL has certain defining characteristics' rather than being a separate theme. The theme 'CBLs research potential' was eventually dropped as while interesting, it did not specifically relate to the research questions. The 'time-consuming' and 'relationship with external stakeholder' themes were merged in the final version to avoid overlap and reduce wordcount.

Phase 6: Writing up, as the name suggests, was about writing and editing the report - in this case the chapters of my thesis dissertation (particularly chapters 3, 4 and 5). It involved selecting, analyzing, and writing up the most appropriate extract examples for the analysis, all the while relating back to the research question and the scholarly literature. Analytic work continued throughout this process, especially in Chapter 4: Analysis when the themes are discussed.

To summarise how all this has enacted in the current study, Figure 26 provides an overview of the assumptions, beliefs, and research components that have informed and threaded through this chapter.

Figure 26: Assumptions, beliefs, and research components in this study (adapted from Wahyuni (2012, p.70), Crotty (2015, p.5), and Gray (2018, p. 21)



3.9 Chapter Summary

Steered by the research questions, this chapter provided an overview of the research philosophy and the ontological and epistemological considerations that have influenced my interpretive research approach. It explained the methodological implications of my insider-outsider research position and outlined the elements of my qualitative inquiry, justifying the choice of a case study research methodology employing semi-structured interviews. It describes how purposive sampling was carried out and the resulting profile of CBL leaders who participated. The chapter explained how I sought to sustain a reflexive mindset and includes details about the reflexive thematic analysis processes to provide a comprehensive picture of how the data was collected and analysed. The findings of that analysis will be explored next.

Chapter Four: Analysis

4.1 Introduction

This chapter provides an overview of the analysis of data collected from 19 semi-structured interviews with those leading CBL implementation in various capacities across ECIU. As explained in Chapter 3: Methodology, this is a fully qualitative study that uses a case study methodology to gain detailed insights from a variety of perspectives. Following a process of reflexive thematic analysis (Braun and Clarke, 2021, 2022), transcripts from the interviews were reviewed. Through an active process of reading, re-reading, note-taking, coding, theming, and reflexive journaling, ten key themes were developed which will be discussed in depth. In presenting these themes, reference will also be made to some associated pedagogical literature to provide broad context.

Theme 1: CBL is a form of active learning that has parallels with other pedagogies

Of all the teaching strategies, pedagogies and learning theories discussed, Challenge-Based Learning (CBL) was most commonly categorised by interviewees as a form of active learning: 'Challenge-Based learning is active learning' (P5). Active learning presented as a gateway approach that got teachers interested in exploring CBL. It seemed that those who would have experimented with active learning methods such as game-based approaches in the past quickly saw its appeal as something new, active and original for students: 'I've always been drawn to Constructivism, active methods of learning and teaching, so CBL came as a natural, another approach' (P15). Similarly 'I'm very enthusiastic for active pedagogy and I think that CBL was a new tool that, well, is very interesting for me to apply' (P7).

Active learning is about 'involving students in doing things and thinking about what they are doing' (Bonwell and Eison, 1991, p. 5). According to Wilkinson (2019), active learning is intended to spark critical reflection in students, spurring them to take part in the construction of their own knowledge and understanding of the world through "doing." The active learning aspect of CBL is evident in the freedom that students have in CBL to choose open-ended challenges and explore the problem in the way they like (Helker *et al.*, 2025). P10 described how in CBL '…the student has to engage on the question, has to search for other small guiding questions to help her, or him, to move on to the implementation of that challenge.' In these interviews, active learning was seen as an antidote to the pitfalls of passive pedagogy, and as a useful strategy for engaging the minds of students today:

> They want to have more active pedagogy. This generation, the Z generation, clearly don't like the previous way of teaching. Well, they don't like to listen. They don't like to focus on one thing. And this kind of pedagogy, I think it's a good solution for them, to try to catch them. (P7)

Several statements indicated that CBL was viewed as one of a range of possible pedagogies offering experiences related to the professional world. For certain participants, particularly those with a long tradition or history of Problem-Based Learning (PBL) (Barrows, 1996) and/or Project-Based Learning (PjBL) (Helle, Tynjälä and Olkinuora, 2006) at their institution, that tradition became evident and exerted an influence in relation to their conceptualisation of CBL. These participants tended to couch CBL in relation to those approaches and there was a particularly strong focus on PBL. One participant referred to and endorsed a description of CBL as an 'evolution of PBL' (P2), an expression that is also described in the literature (van den Beemt, van de Watering and Bots, 2023, p. 11). However some participants referred to PBL as a somewhat narrower approach, highlighting that in PBL the learners use pre-designed problems and are frequently provided with data. They also highlighted that with PBL there may be no societal expectations, and there is typically little or no external engagement:

> In the Problem-Based Learning, depending on the field, this challenge is much more narrow, or the topic is much more narrow. And then this process of analyzing the problem and identifying problems - it's also very narrow. So there is not so much of an interdisciplinary approach, or even talking with the stakeholders, or even looking into the outside...The situated learning approach, I think that is much more marked, or should be much more in the Challenge-Based Learning than in the more traditional PBL approach. (P2)

Those who had significant experience with PBL referenced it and emphasised their pre-existing familiarity with that space. For one interviewee, tensions in reaching a common understanding of the differences between PBL and CBL were revealed as different understandings and opinions on the nature of PBL and CBL emerged within the ECIU project. 'I was putting the questions provocatively in the sense, then, What is CBL? What is actually the difference? So in all the discussions, we should not take it for granted, honestly' (P2).

The next most frequently-cited pedagogical strategy associated with CBL was design thinking (Hasso Plattner Institute of Design, 2025) with some comments indicating that interviewees saw parallels with CBL. During the preparation phase of design thinking, learners need to learn what to focus on and so they consider the specifications and constraints of the problem, reinterpret ideas, visualise and reformulate the problem (Razzouk and Shute, 2012). There is typically a 5-stage process of design thinking where designers are asked to empathize, define, ideate, prototype, and test or implement (Barile and Kelestyn, 2023; Taimur, Peukert and Pearce, 2023). Interviewees talked about how the similarities with design thinking principles became apparent 'when we come and talk about empathy, for example, and then defining' (P2). Another participant spoke about their initial impressions and how design thinking sprang to mind: 'I was really very interested in design thinking, all that methodology, and from the first glance CBL seems for me very familiar because of the similarity between these two approaches.' (P4). The use of design thinking in conjunction with CBL is also outlined by Rosén et al. (2022) who describe how design thinking was used to establish common ground, avoid over-simplification of the problem, and promote transdisciplinarity by students with very different background knowledge.

Other pedagogies were mentioned as being similar to but not the same as CBL. Approaches briefly referred to included service learning 'where the stakeholder is involved, but not as involved' (P14) and project-based learning: 'CBL can be a type of project-based learning, but with some particular principles that are different' (P9). One participant emphasised the point that they saw CBL as a means of supplementing other approaches, rather than a standalone pedagogy: 'What are elements which I think we could take out that we could enrich our current practice with? Because, I'm not looking for a big new pedagogy. But I'm looking for elements that could enrich what we are already doing.' (P17)

CBL was sometimes discussed and compared with 'traditional' approaches to teaching that were typically characterised as didactic teaching with a strong focus on lecturing. It was suggested by some participants that supplementary approaches were sometimes still needed with CBL to provide a structure and ensure key concepts such as technical topics were dealt with. Micro modules were mentioned as something that needed to be integrated into the challenges as a means of providing complementary 'formal teaching' (P10) that is 'integrated with traditional modules' (P8).

While there were relatively few explicit mentions of learning theory (Carlile and Jordan, 2005), perhaps because participants may not always be fully aware of what to name their theories of learning, it was suggested that the origins of CBL lay in Experiential Learning as 'theoretically, CBL comes from that approach' (P18). Experiential learning theory was more commonly referenced in *Chapter 2: Literature Review* as a root tradition for CBL and is explicitly referred to in 15/34 of those papers. For example, Membrillo Hernández *et al*. (2021) write that CBL is rooted in the principles of Experiential Learning where students actively participate in experiences of open learning rather than when they engage with more structured, predefined activities.

Theme 2: CBL has certain defining characteristics

As yet, there is no singular agreed definition in the literature of what CBL is (Gallagher and Savage, 2023; van den Beemt, van de Watering and Bots, 2023; Doulougeri *et al.*, 2024) .

However according to Mayer, Ellinger and Simon (2022, p. 328), the ECIU University formulated a definition that drew on a combination of earlier definitions and explanations to define CBL as a:

> ...pedagogical approach that actively engages students in a situation that is real, relevant, and related to their environment (EduTrends, 2015, p.3). It takes place through the identification, analysis, and design of a solution to a sociotechnical 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 (Kohn Rådberg *et al.*, 2020, p. 22).

Interviewees were presented with four distinct definitions of CBL on a slide (see Figure 20, Chapter 3: Section 3.5.1). They were asked to pick, rank, and discuss the definition closest to their understanding of what CBL is, thereby articulating the characteristics that particularly resonated. Table 5 outlines the choices that participants made:

Table 5: Preferred definitions of CBL

Participant ID	Most Preferred CBL Definition	Least Preferred CBL Definition	Identified Alternative CBL Definition or Explanation
1	4	3	Yes
2	4	3	No
3	4	1	Yes
4	4	3	Yes
5	4	3	Yes
6	2	1	No
7	4	1	Yes
8	4	1	No
9	4	2	Yes
10	4	3	No
11	4	3	No
12	4	3	No
13	4	1	No
14	4	1	No
15	4	2	Yes
16	3	2	Yes
17	1	2	Yes
18	4	2	Yes
19	4	2	No

The following six characteristics capture recurring patterns of discussion around the definitions shown.

Student-Centred Approach

Definition Four was selected by 16/19 participants. When the reasons why were analysed, it was the explicit description of CBL as a 'learner-driven pedagogy' that was most frequently identified as the aspect that resonated most. Definition Four is a working definition that was developed by the DCU CBL working group through exploring the ECIU website, discussions with CBL practitioners at DCU, and by reviewing various definitions from the literature, including the conceptual framework of CBL characteristics from Gallagher and Savage (2023). It was said by some participants to be the closest to the ECIU definition (P13, P14, P18).

> It's a learner-driven pedagogy. I think I didn't see that in the other ones. That the learner is able to change and decide what you want to work on. (P7)

Participants identified student autonomy in the requirement for students to pick their own challenge, one of particular and personalised interest to them, and see it through to an actionable solution of some kind. The value of narrowing things down from a very broad and open 'Big Idea' was highlighted as developing valuable skills and competencies that other more tightly-structured pedagogies such as PBL might not afford. Phrases like students being 'at the centre of the process' (P10, P14) and 'in the driving seat' (P19) were used. This approach reflects what Tang and Chow (2021, p. 2) suggest are unique and key affordances of CBL in enabling students to 'freely choose a global issue and a corresponding topic without the constraint of pre-existing rules and conditions that teachers have defined'.

Real-World Focus

The concept of CBL preparing students 'for the real world' was another prominent concept raised by the majority of interviewees and it is mentioned in three of the four definitions. The role of CBL in helping students prepare for a world of extreme complexity, where they are practising in ways that they will have to when they go to their professions was referenced by some, and is very similar to the rationale for CBL 'to expose students to a real context and real challenges' described by (Lara-Prieto and Flores-Garza, 2022). The practicality (versus theoretical), the realities of

dealing with uncertainty and time pressures, and the fact that no text book could ever mimic that experience were seen as important.

> This is something which we don't do on a regular basis at the university because we have our textbook where everything is perfect… you know everything if you study appropriately, right. In the real world, it doesn't work like this, there is this kind of magic. And if you are exposed to this magic, then you learn a lot. (P6)

> The real world is different experiences, different expectations, and in many ways creating a sandbox for students to navigate that is really beneficial. (P12)

That said, one participant was underwhelmed by the dominance of the words 'real-world' and didn't see it as a particularly compelling label, highlighting that a challenge could be real-world but also developed internally. Indeed, it may be pertinent to note that the phrase 'real world' is not universally accepted, with some academics raising objections to the suggestion that universities are not part of the real world and the possible implication that 'the world of higher education is flimsy, ethereal or simply useless' (Spierling, 2023).

External Stakeholder Involvement

In CBL, the external stakeholder – sometimes referred to as challenge provider or challenge owner (Rosén *et al.*, 2022) or extra-academic actors (O'Sullivan *et al.*, 2025) – is the organisation or company who engage in the collaborative process with learners and academics to co-create solutions of societal value. Within ECIU, these external stakeholders can be representatives from industry or the public sector who may be working in various types of roles together with learners (Mayer, Ellinger and Simon, 2022).

Closely associated with the idea of real-world authenticity was the emphasis by many interviewees on how important it is to have an external stakeholder playing as active a role in the process as possible: 'I think in the end, if you want to call it CBL, probably you want to include those external stakeholders' (P17). Comments from several interviewees indicated that a relationship with an external stakeholder was an essential component of the CBL learning process, with some arguing that close cooperation with partners is essential. The aspiration seems to be about finding 'the right contact and then executing this contact in a constructive way that is very much embedded in learning and teaching' (P15). The

strength of that ongoing, externally-oriented relationship appears to be paramount to engaging students and keeping them committed:

> I think if we don't have strong relationships with these people in society, who can help us formulate the challenges or with industry, or whatever else, policy makers.... I don't think it's going to be a real authentic experience for learners. (P8)

It was noted to be particularly beneficial that the challenge emanated from outside the classroom and so 'the action and the origin of the problem comes from someone else' (P7). In several cases, the external stakeholder was the challenge provider and in one case, the participant wanted to move in that direction:

> I would try to involve external stakeholders to being the source of the challenges. Because that does, that shifts the responsibility of thinking about the challenges....we have the society asking us, okay, we have these challenges, now with the support of your students, let's try to reach to some interesting solutions for them' (P10).

According to some interviewees, providing the 'Big Idea' was seen as a valuable function of the external stakeholder, bringing to the students 'actual challenges which are out there' (P16). Similarly, 'I ask the Challenge Provider to come, not with the exact challenge, but with a big idea about what it can be' (P4). For some, the role of the external stakeholder may be to provide expertise, e.g. via presentation or similar input. It was also acknowledged that there may well be difficulties finding and managing an appropriate stakeholder and this issue is discussed in more depth in **Theme 7: Managing the external stakeholder relationship takes time**.

Societal impact

The majority of participants in this study were drawn to CBL primarily for its potential to impact society and it was clear that that aspect truly mattered to them. This emphasis on societal impact was something that Leijon et al. (2022) advocated as a key *raison d'etre* for CBL and it was notable how evident it was in this dataset. The need to 'prepare students to respond to the changing needs of society' was also explicitly stated in 16/34 of the papers in this study's literature review. There was a sense of wanting to tap into the potential of CBL in ways that

would be positive and impactful for community, society and the planet overall. This came through in three sub themes.

Firstly, the practice of using CBL to scaffold students for complexity after they leave university was evident across a range of disciplines and contexts:

> I teach initial teacher training so I thought it was really important for my students to get in contact with this methodology before going to schools. Because also in basic education, these kind of aspects are becoming more relevant (P9)

Secondly, the sustainability aspect of CBL was recognised and in reviewing the various definitions, it was notable that a number of participants acknowledged and welcomed the word 'sustainable' which was mentioned in Definition 3. In addition, it was clear, and probably not surprising given the ECIU context, that several interviewees used CBL in connection with furthering the UN Sustainable Development Goals (SDGs).

> In the case of ECIU we are very much focused on the SDGs, the sustainable development goals. That is, again, this is another point that draws me personally because, as I told you, I want to make some positive impact in this world and working in achieving, in joining, the Sustainable Development Goals is one of my personal goals also. (P5)

But thirdly, and perhaps most significantly, the strongest sign of a pronounced emphasis in the conceptualisation of CBL by these participants was in relation to its societal remit. Participants shared their experiences of witnessing the impact that young students had on external stakeholders (such as schools) who benefitted from the students' creative thinking on education for the future. They also emphasised how important it was for students to feel able to contribute to society:

> Our students want to be part of the change, want to be part of a solution to something…the meaning of life is really more important for them rather than maybe my generation or the previous generation. They don't want to be just in the society, they want to act for the society. (P7)

There were several vivid examples cited of how CBL can contribute to student learning and growth, particularly emphasising the opportunity that CBL can offer to try out something new and take an unprecedented level of responsibility for their learning. The difference for teachers in moving away from being knowledge or

theory providers to playing the role of experts in different fields and supporting students 'when they need our help' was noted. 'This is how a university should look like, according to my vision of a university' (P1). In a similar vein, the exploratory potential for CBL to help student find out what interests them was underlined:

> It is a space where you get to develop as a person and push your boundaries and explore what's of interest to you and find 'Actually, I hate that even though I always thought I really wanted to do' it or 'This is so exciting and I never even knew it existed'... we talk about it from a rounded individual perspective: The more we add, or put confines and rigidity and structures in, the less opportunities we give for students to do that piece, which to me is, should be, one of the critical aspects of coming to university. (P12)

However the sense of growth was not limited to students. It was also interesting to note that the sense of being part of something bigger was highly motivating and energising for many staff participants. As one person noted, 'the idea of teaming together and working together towards something bigger - really, I think it's a great idea' (P14).

> What moves me, what drove me, is the fact that I feel that I am a part of something bigger that has a positive impact. So for me, challenge-based learning is something that is very crucial in my learning journey, and through which I can help especially younger generations in learning some tools and the mindset that can help them to be change makers, for example, and can help them to be the future leaders of the world. (P5)

Finally on this theme of societal impact, one participant raised the point that CBL may only mark the start of a process and that for full societal impact, there frequently needs to be further follow through. While a number of interviewees characterised CBL as innovative or an approach that can foster innovation, this participant raised the point that next steps such as entrepreneurship skills and business plan development are likely to be needed to develop a concrete solution for implementation.

> CBL is not the end of something. It is the beginning of something bigger. For me, because at the end you have a solution and you think it's finished - ehm no! After 3 or 4 years I now see it as a first step, not as a final step, it is the first step of innovation for society. (P7)

Multidisciplinarity & Collaboration

The concept of multidisciplinarity was perceived as a significant feature of CBL by over half of the participants. Some referred to interdisciplinarity and a smaller number again referred to transdisciplinarity suggesting some interchanging of this terminology, as commonly occurs (Vilsmaier, Mercon and Meyer, 2023). The collaboration and teamwork required to engage successfully in CBL was emphasised. Fundamentally, it was suggested that 'the team of the students need to be multidisciplinary, and they need to find out a problem by themselves' (P18). In particular, attention was drawn to the need for students to learn to collaborate effectively and develop common understandings and language regarding the problems at hand.

> I would like them to be able to understand different perspectives, to see the problem from different angles, and to be able to cooperate with some other people from other fields to provide the complex solution, and not one discipline solution or specific field solution to the challenge. So this interdisciplinarity, I would say, is the most important for me. (P1)

Closely associated with multidisciplinarity was the idea of 'collaboration' which was also heavily mentioned and in some cases participants noted its absence from some of the definitions. Opportunities for collaborative learning and team work in CBL were valued:

> I do like the collaborative approach, like bringing together different disciplines, and do not think we should be stubborn in one direction but get the insights of different perspectives. (P16)

Uncertainty

Across the dataset, there was a repeated emphasis on the 'uncertainty' that is often described as a core element of CBL (Ramirez-Mendoza *et al.*, 2018; Membrillo-Hernández *et al.*, 2019). Several interviewees found the concept of an open or unknown solution at the start to be a particularly interesting or attractive feature of CBL, primarily because of how it changed the teaching dynamics.

> The outcome is not predictable. Sometimes my students, they want very clear answers, and they ask, Is it good? Is it right or not? But nobody knows that. So that's why we are in this situation. That's why we're solving this challenge, because nobody knows which answer is the best, which solution is the best. (P4)

However it should be acknowledged that some interviewees did note that some colleagues would not be prepared to take such a leap into the unknown, as described further in **Theme 5: Teacher resistance to change**. It should also be noted that some participants prefer to see the emphasis on consideration of the problem, not the solution, as a defining feature of CBL. As (P2) argued, 'if we do not give the emphasis on the problem, then the solution is already a narrow thing'. Similarly,

> In CBL of course, the solution is important, but it's not only the focus on the solution: solution can be a suggestion, solution can be advice to a company toward a society. But it's not a product that someone can really implement. So focus on the problem - I like this in CBL. I see that this is something that maybe makes it distinct between the other approaches and also focusing on the process rather than the product. (P18)

This learning-as-a-process orientation is further apparent in several comments that alluded to the need to prioritise process versus product. The possibility of some tensions in the relative significance of process and product were expressed:

> In fact, we are not interested in the result of the companies. Companies for us, are our instruments to generate something new in the minds of students. If this happens, students learn. (P6)

> And also, we are more concerned with our students' competencies development, and not as much on the quality of the solution itself. And sometimes that is a problem for the partner. Because it's expecting a solution for a problem within its own institution. (P9)

Characteristics missing

Overall, several of the participants stated that they found it hard to select a specific definition as a favourite because there was some degree of overlap between the four presented. However when making their decision they all explained why they chose that one in particular, which is how student-centredness, real-world focus, external stakeholder involvement, societal impact, multidisciplinarity and collaboration, and uncertainty came through as the dominant themes.

Some weaknesses in the most preferred definition, Definition Four, were called out by P2 who said:

> I think what is missing in here is actually the principles…but there's a danger there because they have been overlapping with Problem-Based Learning in a lot of things – if they just go for the principles like the problem-orientation, the collaboration….I think they need to define the breadth or the depth of that… This is a good definition, as in short. But then, how do you design pedagogical models for a given institution based on this definition? It's not visible and that's what is lacking.

It is also revealing to note the reasons why people ranked certain definitions lower down their list of preferences. In general, Definition Three was applauded for explicitly highlighting sustainability (P4) and being close to the institutional application of CBL (P16) but was questioned for its emphasis on the international context (P5), having a solution focus (P2, P12) and that it 'can fit to different Problem-Based learning approaches and that does not show the specificity of CBL' (P1). Definition Two was praised for stipulating 'real-life challenges' and 'multidisciplinary' (P6) but questioned by others for the adjectives 'cutting-edge' and 'innovative solutions' (P8, P15, P11, P18, P19) and whether CBL always 'integrates traditional learning modules' (P16). Definition One was commended for having 'deeper subject area knowledge is part of the definition' (P17) but critiqued for focusing on technology (P8, P9) and for CBL having since evolved, particularly in terms of the need for sustainability considerations (P3, P4).

Participants were also given the chance to suggest alternative definitions, which approximately half of them did. Some participants referenced the CBL Guide (Nichols, Cator and Torres, 2016) as informing their understanding of CBL and the platform challengebasedlearning.org was noted. Others referred to definitions and websites they had found helpful when trying to learn about CBL themselves, such as a Delphi panel study by Wageningen University (Wageningen University & Research, no date) that identified the key characteristics of CBL at that university.

In a similar vein, another participant described how they would welcome a set of principles or pillars for CBL, along the lines of those sometimes suggested for PBL. They said that there were certain 'things that need to be present in the definition to be clear for me' (P7). These included the challenge (which needs to be a concrete problem), student-centredness, group experience, external stakeholder involvement, and skills acquisition. This participant also advocated for clarity

about the 'power of the possibility of the students' and wanted prominence given to the role of the educator as mentor or guide, rather than the 'owner' of the answer. This is in keeping with another participant who pointed out that:

> Something I miss out from these definitions is the part that the student is the leader and is very active and that's not clear in any of these definitions… students active and significant learning are very important key concepts, and I think CBL has those so I miss this part. (P14)

The majority of those who did not specify a specific alternative still had views on what they would like to see in CBL definitions and what they felt was missing. A number of additional phrases were mentioned as possibilities for integration such as describing CBL as 'a learning ecosystem', 'challenging conventional thinking' and 'unexpectedness'.

> Maybe what I could suggest it would be to add one more keyword which is "Unexpectedness" or something like that because it's very typical for challenges as I intend them, and I don't see it in those definitions. (P6)

Some participants referred to the literature in describing their understanding of CBL, pointing out that particular definitions were referenced on their university websites. The definitions and explanations of (Membrillo-Hernández *et al.*, 2019; Kohn Rådberg *et al.*, 2020) were particularly noted as being valuable reference points by two interviewees. Membrillo-Hernández *et al.* (2019) was said to be useful for describing the main characteristics of Challenge-Based Learning compared with PBL and PjBL and for providing scholarly references for each characteristic. The current Kohn Rådberg *et al.* (2020) definition was said to be the definition primarily informing one specific university's approach to CBL.

Some participants described how they had not just learned from but also contributed to the scholarly literature on CBL. These participants referred to definitions in literature they had contributed to. While it is not possible to directly cite those works without identifying some of the research participants, these definitions featured in peer-reviewed, collaboratively-authored publications on CBL.

Reflexive note: Looking back on my research diary at the time I was analysing the data I was reminded that I was uncomfortable including the DCU definition as I

was conscious that it might appear highly prone to bias. However I reminded myself that I included it as one of the definitions presented because all of the definitions were primarily intended as a conversation stimulus. Considering the potential bias issue made me extra aware of the need to include comments about definitional weaknesses/gaps highlighted by participants.

Theme 3: Adaptations of CBL are inevitable but confusing

While the existence of multiple variations of CBL is problematic for the researching of it as a pedagogy (Gallagher and Savage, 2023), it is also recognised that variations in practice can and do occur (van den Beemt, van den Watering and Bots, 2021; Doulougeri *et al.*, 2022; van den Beemt, van de Watering and Bots, 2023). Several of the participants in this study recognised that adaptations of CBL exist and indeed saw localisation of the method as very necessary to fit their university context. The majority saw it as a very positive aspect of the approach and indeed some said that it would be practically impossible to apply CBL without some element of 'flavouring' it to local learner, programme, and institutional needs. The flexibility of the format was seen as a major advantage with the flexibility coming through in the use of different modes (online/in person), various timeframes, different assessment practices, different types and levels of support for students, different tools, different aged students, different levels of integration within courses, and different student years.

> CBL, it has a lot of forms and a lot of formats. It can be run in different contexts, because it can be different in duration, for example, in workload, different levels of student engagement, different levels of investigation. (P4)

Indeed several went as far as emphasising that attempts to roll out fixed or rigid models simply would not work:

> Well, I'm fully in favor because I think that's the only way to do things... making them consistent with your local reality. And I've seen many, many cases in which some rules were dictated as if we all (the different universities) could do things one way. But again, there is no right way and maybe there is also no wrong way, which is an advantage and at the same time it makes things a little bit more difficult because you need to find your own model. And then once you have different models, then it's also more enriching to discuss them, confront them, and maybe learn from each other. (P6)

While the notion of customising CBL was widely accepted, a somewhat contrasting idea of there being a 'true' CBL was also evident in a significant number of the comments made. There were indications that some participants had witnessed implementations that went 'off piste' (P11) with something that was called CBL but wasn't, which reflects very similar points made by Rosén *et al*. (2022). This type of scenario might be questionable and perhaps even cause the method to 'get kind of disintegrated' (P15). 'Of course, when we have different systems and different views and different application examples, maybe it can be a little bit embarrassing and confusing' (P4).

However, there was a consensus that making adaptations was not an issue, particularly where it furthered innovative progress and the end justified the means, so to speak. One participant referred to a 'landscape of possibilities' that should be documented (P2) and another described a 'group of practices' around the different ways CBL could be embedded in curricula (P10). Some participants were somewhat relaxed about hitting every single specified characteristic if the overall ambition of transformative change was being achieved, however long that might take:

> If they don't achieve fully 100% CBL, according to the regulations of CBL, it doesn't matter. Let's try. Step by step. You have started changing. (P13)

There was a repeated sense that underpinning principles should play a strong part in ensuring that educators would stay true to its fundamentals. The importance of having minimum standards was mentioned by some who had concerns about people deviating too much from the essence of CBL. It was suggested that there should be a set of overarching principles and guidelines to guide practice. 'So long as people are adhering to them, I think we should be OK.' (P11). Similarly, there was recognition that perfection may elude and so there was a certain pragmatism to several of the responses that recognised less-than-ideal conditions at all times.

> So we need to have minimums and I feel ECIU has those and all the institutions, we try to go there. But I wouldn't say then 'oh, because the stakeholders didn't get involved in the second phase, that's not challenge-based learning'. No, it is. But it's not what we're aiming for. We'll try to do better next time. (P14)

The flexibility and potential of the format was reiterated as an advantage, firstly, from a teaching perspective. Variances in the duration of CBL and the fact that it may be sometimes appropriate to select elements from it rather than the full framework were seen as design decisions that should remain open to educators:

> So I really like that challenge-based learning can really be very, very flexible. You also in your module you can think, if you would like to do the challenge-based learning all semester. Or maybe you can have just that nano challenge or mini challenge in your subject. (P4)

There was recognition that there were multiple valid reasons for adopting only elements of CBL at a particular point or with particular students, suggesting a common-sense, context-specific approach to adaptation:

> What makes sense? So if you don't have much time, what are elements that you can take from it? Maybe not use the word CBL. But what are elements that would guide you towards it, say within a course. So from the perspective of a teacher who is new to it, or even from the perspective of a program in which you don't want to give that full complexity already to an 18-year-old who just came from high school. (P17)

From the institutional perspective, the need for customisation at the local level was highlighted and one participant said that we should not be looking for 'homogeneity' in the form of CBL being applied (P12) :

> I think that we should also be somehow flexible and let different institutions do some modification at the level, you know, of different operational levels, because we are acting in very varied contexts. (P1)

The need to be transparent about adaptations was expressed with the risks of students having very different CBL experiences and assumptions coming to the fore. A number of participants pointed out that different interpretations and applications could be very confusing - leading to 'no consistency' (P2) or a 'different set of assumptions' (P12) in the student experience. Critical to resolving this issue, according to some, was the need to be open and transparent about the adaptations or 'flavouring' that have occurred:

> I do think that we have to be more upfront about what that flavouring is. Is it a challenge that was created in house? I don't think there's a problem with that. But I think we have to be upfront with that, and if that's the case, they miss that stakeholder interaction...So the nuancing is fine, but just to call it out. (P8)

The same participant pointed to the fear that could inhibit such transparency, saying that:

> There seems to be a fear in people of calling out what their nuanced version of CBL is in case the expert comes up and says, 'Oh, that's not CBL at all'. So we kind of keep a little bit quiet about what way we use CBL. (P8)

One aspect that did seem important to retain in any adaptation was the CBL overarching framework structure. It was commonly agreed that the 'simplicity of the process based on those three stages' was appealing (P15). Another mentioned the 'clear methodology' of CBL (P4) and there was a sense that following the 3-phase framework enabled some element of formality and teacher control:

> I argued before that this is an opportunity for students to find their own ideas and follow their own path towards the solution for the challenge. But, on the other hand, bringing some of this process, I think it's also relevant, because at least you can somehow control that all the students are moving towards the end and forcing them to pass through all those phases. (P10)

It was noted that the CBL experience needed to progress in complexity for both students and teachers, something that was also identified by Van den Beemt, van de Watering and Bots (van den Beemt, van de Watering and Bots, 2023c, pp. 13–14) who talked about 'the necessity to adapt to student development over time'. Increasingly complex problems are needed, according to some participants, so that 'students always find challenges in their own development in terms of collaboration, in terms of defining problems, in terms of finding solutions' (P2).

Theme 4: The delicate balancing act of disciplinary knowledge and transversal skills

On reviewing the provided various definitions of CBL from the literature, most of the participants referred to the wording about CBL affording opportunities to 'acquire the necessary knowledge and skills'. The 'acquisition' of something new was seen as important and interviewees generally saw CBL as a suitable pedagogy for developing a broad range of knowledge, skills and competencies. The notable exception was mathematically-based subjects which were particularly called out by two participants as not being suitable for this approach:

> I still think that there are concepts that need a different approach. I cannot, realise in this moment, for example, how I can organize an introduction course on mathematics, physics, or even informatics, programming languages (that's one of my topics) only using Challenge-Based Learning because those topics need a more formal guiding, not just leaving the students 'by themselves', because we want them to pass by those specific topics in a more organized way. (P10)

> And just underlining again, I mean mathematics, for example, I do not see big opportunities there to apply challenge-based learning. (P16)

Some of the participants saw CBL as something that could be applied to a broad range of topics, potentially enabling a deeper level of analysis than might be typical of other pedagogies. '…the methodology itself, it helps to go really wide and really deep into some of the subject areas' (P4). It was evident, however, that most of the specific references around competences related to the development of transversal skills, with collaboration, critical thinking, and problem-solving being named in particular. Fewer references were made to the role of CBL in relation to disciplinary-specific skills.

Competing Tensions between Challenges and Learning Outcomes

In the midst of all the commentary about educators' aspirations for CBL and the skills/competences/knowledge it could develop, some competing tensions arose. Some comments referred to the difficulty of ensuring that the challenge would mobilise the knowledge that the teacher wanted to develop within a curricular unit. In other words, they saw a risk in students engaging with challenges that could have very little to do with the content of the course itself. This need to develop appropriate subject/discipline specific competencies through CBL, not just transversal skills, was articulated as difficult for most:

> For example, in my course, we say, CBL, Okay, we have a lot of freedom. But still, remember, that it's an energy storage course. So you have to choose any of these technologies or technology. But you have to pick one, because at the end we want to see if you learn this subject. They might come with brilliant solutions that are completely not relevant to the course… So how am I going to grade you then, you know? (P19)

> … you have also to think and to reflect on how you will be embedding, you know, subject competences. And I think that this is a huge challenge for our teachers. (P3)

This suggests that the participants in this sample were sometimes witnessing a disconnect between intended learning outcomes and the focus of the challenge itself. It was striking how relatively few references there were to consideration of desired learning outcomes and their potential role in the design process as Biggs (Biggs and Tang, 2011) would advise. 'Our teachers, they really hardly understand how to connect the methodology with subject competences' (P3). Those that did mention learning outcomes could see that there were problems afoot, particularly in informing the purpose of CBL activities within a given context.

> We cannot take for granted that they know what is a learning outcome. We cannot take for granted that they know what is constructive learning, constructive curriculum alignment. We cannot take those things for granted, we really need to teach them and use those tools in the real world. Those are powerful tools actually for them to understand what is actually the rationale... And it's part of quality of teaching, actually. (P2)

> So what are the intended learning outcomes for programs? Do they say something about interdisciplinarity and those kind of professional skills that we tend to find more important and give options to programs to work from that? I never see that. They don't start with the curriculum....if I would do anything with a program, I would always, always start with the learning outcomes. (P17)

Issues around Assessment of CBL

Assuming that learning outcomes should align also with the course assessment, then it is perhaps not surprising that there were concerns expressed around the nature of the assessment. Again, this is not an unusual issue in the educational research literature which has, for many years, described how assessment strategies can fall victim to competing priorities, trying to fulfill too many purposes at once (Boud, 2014). Questions about how and what to assess in CBL were evident and there were some strong indications that this posed issues. Some of the difficulties being raised related to issues with fair assessment of group work (individual versus group marking) and the difficulty in identifying the specific contributions of students when they are working in teams.

> It's very hard sometimes to assess the skills, like the gain of the skills by the students, because they work in teams. So they should be assessed at an individual level, but also in the team level, and sometimes it's very hard to distinguish, to split these two levels (P5).

> In CBL, we have other purposes or characteristics that we want the students to learn, like transversal skills, leadership, critical thinking, collaboration, communication, team working. These are the outcomes of CBL. But these outcomes of the CBL with the outcome of the course, to assess these kind of outcomes is a real challenge for the teachers and for us as well... what we need to, how we need to integrate these two outcomes together (P18).

There were several comments around students getting lost and the difficulty in tracking where students were in the process, particularly for the purposes of giving formative feedback.

> For me the most difficult part is we, as Teamchers or mentors in the process [need to] be able to track the students' engagement and be able to provide feedback about their deliverables. So since we do not have a previous plan on the execution of that process, it's quite hard for us to engage also in the process and be able to provide feedback and try to understand if the student is not lost in the process (P10).

However there were some positive notes about assessment possibilities. One participant highlighted the value of peer feedback as an important skill to develop. 'People need to assess each other - group members - and they have to reflect on the feedback. That's part of what we need for the real world as well' (P19). Another mentioned the freedom to do innovative types of assessments, such as Interactive Oral Assessments (Ward *et al.*, 2024). This participant particularly highlighted the positive student feedback they received saying that 'they [students] liked the form of assessment because they felt a written exam wouldn't be able to encapsulate, wouldn't be able to showcase their learning' (P11). Furthermore, one participant mentioned the use of coaches, frequently PhD students, who can check if students have completed the various phases while also ideally offering technical expertise to ensure questions are in the right direction.

Notably, two of the participants identified the potential for CBL to address some of the concerns raised by inappropriate use of GenAI tools by students. They saw CBL as a means of potentially overcoming at least some of the issues being caused by an over-reliance on traditional assessment modes. While recognising the potential value of artificial intelligence, both pointed to the personalised creative and communication aspects of CBL that GenAI could not reproduce:

> You would do challenge-based learning because it's really good in the face of GenAI because you're finding out different things and you can't get GenAI to do your essay because it's so specific to your particular context, your challenge (P11).
>
> CBL could be like an answer for the use of, the smart use of the AI tools in the learning process, because you need to be creative in challenge-based learning.....maybe AI can help you in different phases of challenge-based learning and can be enabler (P5).

Reflexive note: Revisiting my notes on this, I was reminded of how pleased I was when someone talked about constructive alignment and how important that is to quality teaching. I had to be careful to not overplay that point in my analysis so when it was expressed by a number of participants, I remember being glad it came from a number of people and felt more comfortable that it was not just a personal view of my own.

Theme 5: Teacher resistance to change

A perception of some teachers being resistant to the potentially dramatic change to practices that CBL would require was referenced by most interviewees and it was clear that the leaders in this sample had witnessed this at their own institutions. Not only is faculty resistance to substantial pedagogical change something that is already well recognised as an issue in the broader HE landscape (Tagg, 2012; Dana *et al.*, 2021), it was also mentioned in multiple papers in this study's literature review, specifically in relation to CBL implementation (Crown, Fuentes and Freeman, 2012; Membrillo-Hernández *et al.*, 2019; Christersson *et al.*, 2022; Doulougeri *et al.*, 2022; van den Beemt, van de Watering and Bots, 2023).

The need to get teachers on board at scale was pointed out: 'I would say that the success of this innovation, of any innovative project, depends very much on masses of academics' (P1). Changing to a CBL approach from more traditional pedagogies was broadly conceptualised as a relinquishment of control and not something that comes easily to most: 'the mindset change, you have to let go, content is not king' (P11). The sentiment that 'people don't like to change' (P7) was evident. There was recognition that academics needed to buy into the proposed change and that the newness/lack of familiarity with such a student-centred

approach could be very offputting. Resistance related to ‘path dependence’ (P6) and a questioning of ‘why should I use’ (P4) were also mentioned.

Related to this, it was also recognised that CBL as an approach is simply not suitable for everyone or everything. ‘And of course they are so different. Like, you know, they are people.’ (P1).

> I also think that CBL is not for all professors. It's not for all subjects. So no problem with that. We need to identify the appropriate professors. Maybe the youngest ones that typically are ready to embrace this new teaching methodology. (P6)

Nor are the reasons for possible resistance simple or clear:

> Some of them don't want to implement innovation, others don't have the time to participate in training. Some academics are very much afraid of change. (P1)

A need for more empirical evidence to support the use of CBL was recommended as ‘academic people always wanna see some kind of statistics and by introducing this at the very beginning, there are no statistics out there’. (P16) This gap in the knowledge base for evidence about the effectiveness of CBL – and the challenge that mixed forms of implementation present from a research perspective – has previously been highlighted in the literature (Gallagher and Savage, 2023; van den Beemt, van de Watering and Bots, 2023). While of course there are numerous studies on learning gain through CBL, these tend to be small-scale and focused on very specific cases. Alternative potential sources of evidence, as mentioned by a number of participants in this study, leverage positive student experiences and feedback on the CBL experience. Sometimes the results can surprise:

> If we share these final presentations with colleagues, for some of them, the surprise [is] about what students can do in this type of learning process, where they are left completely free to follow their path towards the end goal. For some colleagues, there are some surprises and this, I think, is one of the best ways to invite people to follow this idea. (P10)

It is evident that a genuine curiosity about the learning process is needed as well as ‘enthusiastic people who really get behind what is in there’ (P16). Perhaps the clearest evidence of the importance of being a good fit for a CBL educator is apparent in this comment:

> So I feel that I'm a learner, too and this is something very important to me personally, because, I'm a very curious person, and I like to learn, so for me, it's very interesting to have this interaction, not only with students, but also with the community, with the challenge providers and with other stakeholders. And so the fact that I am part of this learning process, it freaks me out!, it's something that is exciting for me because I feel that I'm part of the learning and the change process. (P5)

Teacher readiness

Teacher preparedness issues were raised. 'At some points there was a lot of enthusiasm for challenges, but nobody or, or at least too few people at the university, knew exactly what were the steps to implement a real challenge or CBL project.' (P6). In the early stages of CBL adoption, there was a shortage of case study examples from across and within disciplines, which would help explain how to work with and implement CBL.

In general, it was widely perceived that staff needed to be 'upskilled' in CBL (P11), especially for those who had limited prior pedagogical training in their repertoire. A lack of pedagogical knowledge was mentioned by some interviewees who described how they were initially very unfamiliar with how to teach using this method. One participant said that the way teachers are typically taught how to teach needs to change (P17), which is discussed further in **Theme 6: A mix of professional learning is desirable.** In another case, the interviewee said 'When I started I had no clue. So I just started reading from the ECIU documents available' (P19).

> I think the first thing is that our teachers should be prepared. They should be competent. They should trust in themselves that they can apply this approach in their classes. So I think it's very important that our teachers be ready to work with the method. That they have competence. (P4)

There were some suggestions about starting with what you know and building up expertise from there, suggesting that even imperfect efforts have value in initiating change. There were also some comments from the educators' perspective about the fast-paced nature of the process and the lack of a considered reflection time to unpack what has occurred. A process of deep reflection - despite the commitment to it in CBL frameworks - seems to take a back seat to more pressing project priorities. 'I think we just run into these things and out of them so quickly

that I'm not convinced anyone has had any chance to let it settle.' (P8). This is despite the recognition that reflective practice offers people the opportunity 'recapture their experience, think about it, mull it over and evaluate it' (Boud, Keogh and Walker, 1985, p. 19), reflective qualities that are so frequently highlighted as an essential component of CBL itself.

Theme 6: A mix of professional learning is desirable

The idea of learning by doing (Chan, 2022), which is at the heart of experiential learning advocated by Dewey (1938) and Kolb (1984) was repeated throughout the dataset. Several participants described how they learned most when they actually applied CBL for the first time in their own context. 'Learning by doing is the only way that can work, because again, it's not something that you can really teach the traditional way' (P6).

When they were learning about CBL, interviewees valued a hands-on, authentic experience of CBL that was practical and offered a chance to apply and feel the CBL format. It was suggested that educators implementing CBL 'need to walk a mile in the students' shoes' (P2) and embrace opportunities to work alongside students on a challenge:

> And another thing that helped me a lot was to participate in a challenge as a learner, not as a teacher. So I had this experience where twice I was in a team with other students and I think I was the older one. But never mind, because I really learned a lot from the perspective of students (P5).

Some participants described how engaging in CBL itself offers an opportunity to develop personal competences and grow as a teacher. There was a recognition that professional learning about CBL should be a continuous process that required ownership, a sense of professional responsibility, and ongoing engagement on the part of the practitioner. However the sometimes relatively low attendance at workshops was mentioned by one interviewee and it was said that there is a need 'to create the environment in their home school where they're seen as a valuable thing for those colleagues to do' (P12).

Some interviewees referred to papers/literature they had read as a starting point while others referred to Tecnólogico de Monterrey's work as a leader in the field. It was notable that amongst the most valued forms of CPD overall were those that enabled learning from peers within collaborative learning opportunities - in other words, not once-off, centrally-led training but something that featured follow-up and conversations with peers about possible issues encountered. Having near access to someone who is also implementing CBL was highlighted as a means to resolve dilemmas:

> But often in these workshops, I mean, it's a bit vague ... somebody who is an expert in teaching telling other teachers what they need to do. But I think, hearing this from other teachers who implemented and the way they implemented it helps more (P19).

Flexibility in the professional learning offerings and an opportunity to exercise co-creativity were seen as important. The idea of an informal community of practice where CBL practice could be shared was recommended by some of the participants who either facilitated or attended these at their institutions:

> I think that the informal group, as the community of practice, is a way to involve people with different levels of knowledge in CBL, because in [NAMES UNIVERSITY], it was very interesting...in each meeting we are like, 10 sometimes, or 12 people. And these people have different levels of knowledge. Some people are very expert. And other people have never done, like they have no experience in CBL. And what's interesting is that we involve the people also from outside the university. (P5)

This sharing of practice resonates with a broader literature that supports the idea of professional conversations about teaching as a mechanism for advancing pedagogical change (Thomson and Trigwell, 2018; Gormley, 2022).

Theme 7: Managing the external stakeholder relationship takes time

According to a recent literature survey, limited time is an obstacle to implementing CBL in a traditional setting (Perna, Recke and Nichols, 2023) but to date, there is surprisingly little written about what that time entails. The majority of participants in this study highlighted the time commitment involved in applying CBL as a

significant barrier to implementation and provided further insights into where that time was spent.

There was frequent commentary that teaching a CBL course is very atypical to the usual 5 or 10 ECTS module and it takes extra effort to organise and execute the learning process with the use of this method.

> It is a really time-consuming method. And the teacher has to also understand the flow of a methodology, the flow of the process of solving a challenge and how much time they should allocate to some of the steps of the challenge-based learning…it takes lots of time to embed and to reflect and to reconstruct the structure of your subject. (P3)

There was a particularly strong emphasis on the co-ordinating/organising aspects and how long those took to pursue with external parties. This is consistent with the detailed planning and preparatory work that is required, such as the roadmap for planning and designing, described by Lara-Prieto and Flores-Garza (2022). Amongst interviewees, there was a general consensus that while highly rewarding, the entire process is 'a really big effort', particularly due to liaising with the external stakeholder:

> If I want to start developing a challenge, I have a lot of support from [NAMES INSTITUTION] or from the other ECIU offices. But I need to contact the challenge coordinator. We need to contact the stakeholders. We need to define the challenge, and then we need to prepare and change many things. So this timing, this time, it's not recognized usually, or you always give more. (P14).

> I must admit that before starting a challenge in February, I'm working since November to prepare everything so, and I know that some of my colleagues are already very busy and anticipation of 3 or 4 months for this kind of pedagogy is not possible for them, or they are not used to it. (P7)

A number of interviewees noted that stakeholders need extensive guidance on what is needed academically and a process of negotiation and discussion may be entered into. This idea of stakeholders needing education 'on how to be in that learning process' (P4) was raised by several participants. The need to explain what CBL is and present a case to external stakeholders who are 'not used to using this type of approach' was underlined (P5). Some mentioned the need for 'clarity of what they can expect, what's expected of them and what can they expect from the students' (P11). This is neither simple nor fast, and the fact that 'it is essential to

manage the relationship with the company' to ensure academic expectations are reached is also mentioned in Ramirez-Mendoza (2018). As the following participants said:

> I think the expectation management is very much needed in there so that they [stakeholder] do not expect the perfect result out of that. So they won't get an iPhone 15 or 16, whatever it is right now, out of a Challenge-Based Learning format but different ways of thinking, different ways of tackling different issues. (P16)

> If you want the student to eventually do what you need to, or to solve the problem that you are facing, then give a lot of data, share with them a lot of data and let them find this, but don't put the words in their mouths. So yes, for them [stakeholder] I have to make it clear that you have to be general, not too specific. And that's not easy. (P19)

It is clear that difficulties can arise when the stakeholder relationship is less-than-ideal. The matter of academic equality is raised, for example, when contrasting the types of stakeholders who will generously offer lots of interaction and expertise with those who perhaps meet the student once and provide very minimal interaction. Two of the participants raised cautionary notes about the risks of working with external stakeholders, particularly where industry partners may be the primary or only form of external stakeholder involvement and where the nature of that relationship is shallow. There was a suggestion that agendas and priorities may differ for some:

> Who are your external partners? Industry? And then they are trying to green wash themselves. Using you! And this is why I'm being provocative. It's just that we need to reflect on this. (P2)

> It's kind of often an additional 'nice to have', an extra thing for them. Like in industry, if they're working on a project when something comes up, they have to drop everything and focus on that. (P11)

On the other hand, viewing companies from industry with a high degree of fear or suspicion is also problematic for some and the value of leveraging their unique perspectives was emphatically supported by at least one participant:

> One other barrier is that companies are viewed as evil, in many cases…[Some people] see companies as something which shouldn't be involved in challenges. I strongly disagree with this view for one specific reason: companies reason in a very different way compared to the university. So why lose or get rid of this richness? (P6)

The question of responsibility for finding and managing a strong external stakeholder relationship permeated a number of the responses. At one institution, the establishment of a challenges office was positively perceived ‘because it's demonstrating the institutional commitment to this methodology. It's part of the structure now.’ (P13).

Several of the other participants indicated that there can also be issues finding the right challenge provider, someone who is willing to engage from the perspective of the teacher and the university. It was said it should not be looked on as a ‘favour’, something that could lead to a rather superficial relationship. There is also the matter of what’s in it for the company and the sometimes considerable teaching support that entails.

> The stakeholder, the company who are involved, they have to gain something, they have to learn. So yeah, if we don't provide a lot of support to students, then there will not be any end result or any product. So then there will be less motivation for the companies, for industry, to be engaged. (P19)

The risks for an inadequate stakeholder relationship are serious. If it all goes wrong, it can lead to a situation where none of the parties involved are particularly happy:

> We had some problems with some groups of students, together with partners where they compromised to do something. But then they gave up at the last minute, and the partner was feeling disappointed with us. So it's tricky and it's a responsibility issue. (P9)

Reflexive note: I was reminded that I heard some of the points about the need for external stakeholder support as part of my professional role, through a workshop where this came up as a point of feedback. I was also very interested in the argument for the value of working with companies which I thought added a distinct and important perspective from a business-oriented discipline.

Theme 8: Not enough space

A recurring theme of limited space manifested in various ways across the data. The issue of inadequate timeframes was highlighted by Reymen et al. (2022) who

mentioned the shortage of time for students to fully develop their ideas and prototype. A similar view was expressed through the recurring references to the lack of space for CBL within curricula. The motivational necessity for students to have CBL experiences accredited and accessible within programmes was clear, but participants spoke of limited opportunities to provide CBL the curricular space it needed within current organisational structures. The sense of those experiencing backlash on this was quite revealing perhaps indicating an element of 'content is king' thinking (P11):

> It's so tough just to bring something new into the study programs these days because they're just crowded full. And for sure, it's tough to tell professors, teachers, whatsoever, to tell them: 'Well, we change now. So please do like 30% of challenge- based learning in your study programs now.' And they have loads of rights just to disagree with these kinds of things. (P16)

Related to the lack of space issue is the problem of differing regulations and timetables across international boundaries and the extensive administrative difficulties this raised. This issue was of particular concern to an international university network where the difficulty of aligning sessions with different timezones and semesters becomes apparent, an obstacle also identified by De Stefani and Han (2022). However it also raised questions for local timetabling approaches too and the capacity to adjust timetables to enable multi or interdisciplinarity within an institution. Institutional obstacles to teaching and working across disciplines need to be considered at the design stage (Gallagher and Savage, 2022). For example, in an earlier paper on interdisciplinary provision in higher education, university leaders have highlighted the difficulty of ensuring coherent collaboration between different disciplines and alignment of teaching and examining timetables (Lyall *et al.*, 2015).

The issue of local accreditation regulations was also discussed with notable differences emerging across different member institutions as to what they could accredit and the extent of flexibility they had to make changes to assessment, for example. One of the participants in particular expressed how 'powerless' they felt in the face of such limited ability to make change (P2). Another articulated that a

change of thinking in regard to timetabling, such as freeing up certain weeks for non-structured activities, was what was really needed:

> I don't think it's fair to say that the timetabling system doesn't let us, it's a whole mindset around being able to have a timetabling system and infrastructure, physical infrastructure, that is amenable to CBL. (P12)

The physical dimension of space

Still on the matter of space, the issue of large class sizes were seen as a significant barrier for some for implementing CBL successfully. This included both financial and sustainability considerations. The implications of massification (Hornsby and Osman, 2014) were made clear:

> It is cost effective to organize like big whole lecture halls with like 100 students participating in a boring PDF reading lecture because this is cost effective. But, as we already know, this is not how higher education should look (P1).

> I really cannot see how it's going to work with big classes. I know we can put a lot in, and we've had some lovely examples in [NAMES INSTITUTION]. And my goodness, some of those academics should be applauded at how they made it work with the massive numbers. But I just don't know if it's sustainable (P8).

While not as commonly expressed as the views above, there were some comments that the physical infrastructure could be potentially developed further to facilitate CBL and indeed active learning in general.

Theme 9: Strategic Vision, Validation & Visibility

Vision

The majority of interviewees stated or inferred that CBL needed to be embedded into the strategic priorities of every university. One of the interviewees described an institutional vision related to an overall strategy of lifelong learning and their 'dream' (P1) of close co-operation with industry as inspired by Tec de Monterrey (Membrillo-Hernández *et al.*, 2019). In another case, it was mentioned that CBL could align with and reinforce important local strategies relating to Education for Sustainable Development (ESD), academic integrity, and Generative AI. Across the board, there was a sense that CBL needed to start with the university vision and be driven by objectives suited to that context. 'It always starts with the vision, I think.

Is it something that we really want, that we really believe is needed for our education?' asks P17. There were hints that CBL needs to align closely with the strategy of the local university, and not seen as something 'coming from ECIU' (P13). The importance of approaching strategy holistically was strongly underlined:

> We should also think about that whole system at university. Not just pieces. But we should think about the whole system very, very systematically, how we can implement and how we can motivate our people to do that (P4).

There were some suggestions made about embedding CBL into every student learning experience, such as through mandating CBL at least once throughout the students' time at university. Perhaps taking a leaf out of the Tec21 educational model (Membrillo-Hernández *et al.*, 2019), it was suggested that it could be 'mandatory at least each year to implement CBL in their own courses' (P18). Other advice in a similar vein included a university-wide requirement for teachers to dedicate a set number of credits to CBL, up to 10-20 ECTS per programme was suggested.

> At least one study subject in the whole curriculum and the whole study program should be based on challenge-based learning. So I think that it could be driven by the University vision, the University study vision as well. (P3)

> I would take a radical solution to force everyone to follow a challenge…our students spend 5 years in our Institute, so I think in 5 years they could have all done one challenge during the 5 years. I think it's possible. (P7)

There were also suggestions about adopting more programmatic approaches to the design process, to minimise the effects of staff working in module silos and address the types of constraints described under **Theme 8: Not enough space**. The need for academic development expertise to facilitate programme design processes and workshops was viewed as important to furthering CBL because 'as long as people are looking at it within "my module", it is limited' (P12). While explicit mention of programme design was made by only two interviewees, it does re-iterate an ongoing sector-wide problem with limited programme design practice.

Validation

Participants spoke positively about being able to access or refer others to pedagogical experts. The existence of roles such as academic developers or educational developers and other types of mentors or 'experts in CBL accompanying them' (P13) were suggested. People who provide staff with pedagogical advice on CBL and engage in dialogue about implementing it effectively were seen as positive influences.

One participant said that 'the pedagogical robustness needs to be assured' and they called for the academic developer to be deeply embedded in the CBL design process and located in schools within faculties:

> I think it shouldn't be optional for colleagues building CBL to not engage with academic developers. In fact, I would say I would like to see academic developers involved in the programme design to build in that Year One through to Year Four [experience]. (P12)

The advantages of this type of engagement before, during, and after implementation were seen as numerous:

> I think that support, and not just from administration, not just from other teachers, but also, I think, that there should be a team, as our center for teaching and learning excellence, of people who really can provide you some answers. (P4)

> But I think, one of the, at least for our experience, one of the main [enablers] is to have the CBL expert to help them to implement CBL and also publish the evaluation of the implementation of CBL. (P18)

Apart from pedagogical advice, there was also recognition that central support could take other valuable forms. For example, one of the institutions referred to the success they had with setting up a dedicated Challenges Office that is now part of the institutional structure and that provides students an opportunity to engage with a challenge at any point in their life at the university.

Visibility

Raising the profile of CBL at the institution was perceived as important.

> CBL is not very known in the university. Despite the fact we do a lot of things, we have the community of practice, we have a web page, we try to communicate our initiatives through news letters and social media…it is a pedagogical approach which is relatively new. (P5)

It was suggested that the engaged staff could act as champions to encourage and support others in applying the approach. Indeed several recommendations were made about ways of marketing and raising awareness of CBL across the university. Suggestions included sharing of CBL microcredential successes on social media and ideas such as 'marketing about CBL, to highlight the goodness, the benefits for students but also for teachers' (P6).

Campaigns for creating an on-campus buzz and a competitive edge were also put forward:

> Maybe it needs some seminars or some competition, some competition among the teachers. We develop a challenge and have, like, festivals to make awareness of what is CBL in the first stage. (P18)

Several of the participants talked about discussions they had had with university leaders who supported and worked with them in raising awareness of and promoting CBL. One participant suggested an extensive round of engagement involving both potential external stakeholders and senior university management 'the first thing I would do is a massive round of engagement with industry, society policymakers to explore their willingness to partake and try and sell the benefits to them' (P8). As Phipps and Lanclos (2019) confirm, educators engaged in innovative practice want and indeed need to be able to trust their institutions to support their work. The idea of building a culture of trust around CBL, fostering experimentation with the approach and tolerance of failure, was perceived as very important.

> You try it first time, and you don't know how it will go, and there may be a lot of unanswered questions. So I think support from administration - let's try to be brave, and we will help you - I think that it's very important. (P4)

Theme 10: Recognition really matters

Recognition for innovative teaching practice, or the lack thereof, came through repeatedly in the interviews. There were multiple comments describing how teaching is not sufficiently recognised within academic progression and promotion career paths, particularly for time-consuming activities such as CBL. The rationale for applying CBL was largely intrinsically motivated as there were

several references to the need to ‘believe in that innovation’ (P13); 'openness to innovation’ (P3) and ‘enthusiastic teachers’ (P13). The challenge of how to stimulate such generosity of spirit was not underestimated:

> You need to find some intrinsic motivation, or to trigger some intrinsic motivation, into people in such a way that they can do the thing the right way. So with passion and so on. How you do this, phew, is a little bit difficult. But if you are a good promoter, I believe that you can really convince people, not all, not everyone, but many people that this is a good thing to do. (P6)

Little in the form of extrinsic incentives or rewards were being used to encourage adoption of CBL by teaching staff. While it was clear that teachers are typically not doing CBL in order to be rewarded, it was acknowledged that ‘it is a nice feeling to say, okay, you know what you're doing is inspiring, and it's worth telling and sharing with others’ (P14). Several interviewees took issue with the lack of teaching prominence in career development pathways, with research metrics being pointed to in particular:

> I believe that the academic progression should be more linked to pedagogical innovation and the effort that the teachers are actually doing. Because in our university, research has a lot more weight on the academic progression than the quality of teaching. And that should change. It's not actually very fair to ask so much sometimes of teachers without that recognition or that reward. (P9)

> That is an important topic. I would change the KPIs performance. That's the first thing. (P2)

While there were some mentions of financial bonuses or add-ons as a possible incentive to apply CBL, there were more reservations expressed about the use of direct financial rewards: ‘Rewards are a bit tricky. I don't know if it's money is the thing that most drives the teachers.’ (P9). Interestingly, this contrasts with the faculty development programme outlined by Crown, Fuentes and Freeman (2011) who describe an intervention where staff were given a stipend in consideration of their investment of over 20 hours in training activities. Much more commonly across these interviews, the possibility of freed up time from other duties is seen as a significant incentive.

> So to have recognized all this extra time, thinking about, you know their academic duties or other duties that they have. That's something that really they feel is motivating more than money, you know. If it's curricular, especially. (P14)

A number of other possibilities were suggested as potential incentives to implement CBL. It was suggested that public recognition of success could be incentivising and this could take various forms. For example, some interviewees mentioned the teaching awards at the institution as a means of recognising pedagogical innovation and good practice.

Show me the money

Not surprisingly, there is a widespread perception that CBL requires investment in resources in order to succeed.

> I will say first of all there is no innovation without putting money. Money is time. So it's okay to start with saying, Hey, yeah, we'll try. And we'll see. But that cannot be sustained for a long time. (P14)

According to these participants, funding needs to be directed to faculties and teachers to support staff to implement CBL. Money to fund projects, mobility, and events such as workshops (particularly catering costs) were suggested. However it was said that the academics would need to see some tangible benefit from receiving such funds, such as for recruitment of teaching assistants who could play a practical role in CBL implementation. The following extract demonstrates how potentially useful Teaching Assistants (TAs) can be:

> If the ECIU students are not in [this country] and they wouldn't be expected to come over just for this module, we found it very helpful to have a teaching assistant on the Zoom, monitoring what the students were saying and just making sure that it goes OK and even just coordinating with, you know, guest speakers and all of that... they [academics] could have support for actually delivering it, in terms of teaching assistants and maybe help with marking. (P11)

Equally, funds could be put to good use through recruiting more student ambassadors or assistants to help support CBL projects and perhaps even progress them through to implementation 'maybe by funding some students a little bit and giving them money to make it even more concrete' (P7). It was suggested that these would be students who would themselves have had experiences of CBL could work with programme teams to contribute their perspective and provide a solid rationale for CBL:

> That buy-in piece is critical and that buy-in comes from seeing the students at the heart of it. Having that student voice be central and remunerating it as valuing it, that would be the big thing that that I would do. (P12)

Finally, it was suggested that funding is needed to support the management of the external stakeholder relationship: 'We will institutionally never get CBL up and running as a thing, if we don't have a person doing that piece' (P12). There was also one suggestion that funding could potentially be put to use to fund the external stakeholder in some way, to incentivize their engagement with CBL projects. While one interviewee assumed there would not be any money to pay for external stakeholders' time, another took a contrasting view:

> I actually think it's money that you have to pay. We have to buy industry time. So I think that a barrier to making it sustainable and scalable is not having a CBL pot to be able to go to industry to say: here is say 20K for this challenge, for you to provide the challenge, for you to provide the personnel to be on the teams. Because as long as it's on goodwill, it is not sustainable at all. (P12)

4.2 Chapter Summary

This chapter has presented an analysis of the 19 interviews conducted with participants - leaders of implementing CBL in various capacities - from within the ECIU context. Through a process of active, reflexive, thematic analysis, 10 themes were generated capturing recurring patterns in the dataset.

The term CBL was generally understood and described as a form of active learning. However PBL in particular looms large in its evolving identity for participants who were particularly familiar with that approach. When discussing reactions to a predefined set of definitions of CBL, interviewees described a range of characteristics representative of CBL such as real-worldness/authenticity of the challenge, external stakeholder involvement, multidisciplinarity and uncertainty, all of which have been expressed in the literature before. However for these interviewees, it was evident that student autonomy and active leadership in the learning process were seen as particularly important characteristics of CBL.

The perception of CBL as an important force for societal good came through strongly, particularly in its emphasis on preparing students for a highly-complex society facing major sustainability concerns. It was notable how closely these views aligned with the vision of a modern university expressed by some interviewees which gives further credence to the perception that CBL is seen as more than a novel pedagogical tool. It was also evident that most, if not all, of the interviewees supported the idea of adapting or 'flavouring' CBL to the local context. Some reservations were expressed about the challenges adaptation presents but no one disagreed with the premise of adapting CBL as needed and most saw it as necessary. Some possible tensions were articulated about CBLs capacity to develop both transversal skills and disciplinary knowledge, with potential issues around learning outcomes, subject focus, and assessment coming to the fore.

Interviewees in this sample perceived a number of barriers and enablers to successful implementation of CBL in practice. Barriers were identified as the length of time that CBL takes to plan and implement (particularly with regard to external stakeholders); the resistance of some teachers to change; and the limited space available to underpin this approach. Enablers – and consequently recommendations to implement CBL at scale – were identified as a need to ensure the integration of CBL in the strategic vision, along with a senior management commitment to validate and raise its visibility throughout the institution. It was also recommended that a mix of structured and collaborative professional learning opportunities are made available to staff as needed. The pressing need to tangibly recognise the commitment and effort of those educators engaging with CBL was emphasised. The implications of these perceptions in relation to the research questions will be discussed further in the next chapter: Discussion and Conclusion.

Chapter Five: Discussion and Conclusion

5.1 Introduction

This thesis has set out to address the following research questions.

The overarching research question is:

What are the perceptions of Challenge-Based Learning among those leading its implementation in ECIU universities?

The sub research questions are:

1. How is the term CBL understood by those leading its implementation for teaching, learning and assessment in ECIU universities?
2. What do those responsible for leading CBL initiatives in ECIU universities perceive are the barriers and enablers to its successful implementation in practice?

The research context is CBL within ECIU universities. It is worth reminding that the participants in this sample were nominated leaders of CBL at their institutions which meant that they all had some degree of responsibility for influencing and guiding the practice of others. Some were teachers or 'teamchers' drawing on their own knowledge and experience of applying CBL with students within their own contexts. However, the vast majority of participants also had positional roles in relation to CBL within their institution (see profile of interviewees in Appendix G) and were sharing perspectives at a more strategic, change-oriented level.

To recap briefly on the study so far, the Introduction chapter explains why I was interested in CBL educator experiences as a research topic and the gap in the literature from the perspectives of those leading its implementation in practice. It describes my insider-outsider researcher position while introducing the context of ECIU and CBL as a pedagogy.

The Literature Review chapter describes how a systematized literature review was designed and employed so that previous studies pertinent to this research were identified, screened, and analysed. It describes key themes in the selected

literature related to understandings, barriers and enablers of CBL and outlines the conceptual framework that emerged from the synthesis.

The Methodology chapter then describes the ontological and epistemological considerations that have influenced my inductive, interpretive, and reflexive research approach. It explains the decision to adopt a qualitative case study methodology involving 19 semi-structured interviews. It also describes how Braun and Clarke's approach to Reflexive Thematic Analysis was used to support analysis of the data.

The Analysis chapter then discusses the ten key themes that were inductively developed: (1) CBL is a form of active learning but has parallels with other pedagogies (2) CBL has certain defining characteristics (3) Adaptations of CBL are inevitable but confusing (4) The delicate balancing act of disciplinary knowledge & transversal skills (5) Teacher resistance to change (6) A mix of professional learning approaches is desirable (7) Managing the stakeholder relationship takes time (8) Not enough space (9) Strategic Vision, Validation & Visibility (10) Recognition really matters

This brings us to this Discussion and Conclusion chapter where I will explore the implications of the analysis with respect to the research questions while drawing on pertinent literature. This chapter begins by directly addressing the two sub-research questions listed above. From there, the study's original contribution to knowledge will be discussed. After that, recommendations for policy, practice and further research will be presented. The limitations of the thesis will then be discussed to highlight constraints and boundaries and suggest improvements that could be made in future research activities. The chapter will close with a final, holistic reflection on the learning process and the key takeaways from my personal perspective.

5.2 Answering the research questions

The following section will address the research questions that guided this thesis, beginning with the two sub research questions and then returning to the overarching research question for this study.

5.2.1 Sub Research Question 1

How is the term CBL understood by those leading its implementation for teaching, learning and assessment in ECIU universities?

Participants identified CBL as having certain core characteristics representing what they understood CBL to be – they described it as an active, collaborative process of learning initiated by a challenge that is based on an open-ended, complex, societally-relevant issue involving an external stakeholder relationship with a public or private organisation. The general patterns reflected an emphasis on student autonomy, real-world 'concrete' challenges, an external stakeholder relationship, multidisciplinary collaborative teams, and the element of uncertainty, all described in **Theme 2: CBL has certain defining characteristics.**

Pedagogically, most see CBL as a form of active learning rooted in PBL although comparisons with PjBL, CDIO, and design thinking were made. Perhaps because CBL is still evolving in its identity, there was evidence of the influence of PBL on how participants perceived CBL. Some indicated that through previous PBL experiences (the work with external stakeholders, the focus on a 'problem'), they had been engaging in something very similar to CBL. However the broadness of the starting point and the process of narrowing down the problem from a very open 'Big Idea' was viewed as more CBL-specific.

Several efforts have already been made in the literature to explain the difference between CBL and similar-sounding types of approaches such as PBL and PjBL (Gaskins *et al.*, 2015; Membrillo-Hernández *et al.*, 2019; Sukackė, *et al.*, 2022). It appears that despite such efforts at clarification, 'What is the difference?' is still a frequently asked question. Indeed Normann et al. (2025) say that educators, even

if they see it as engaging and relevant, will sometimes struggle to differentiate CBL from PBL which suggests that the identity crisis has yet to be resolved.

These findings align with much of what has already been said about understanding CBL in the literature. We will now move to considering how some findings from the current study may extend the conversation further.

5.2.1.1 The societal impact imperative

Participants in this study attached particular importance to the societal relevance of CBL and saw it as a hallmark of this approach. CBL's potential role in achieving societal impact and tackling sustainability concerns connected with their personal values in ways that other pedagogies may not. Strongly-held values and beliefs about the university/society relationship and indeed where education is headed seem to be informing perceptions of CBL in practice. They spoke of the potential for CBL in preparing students for highly-complex futures, furthering the SDGs, and providing an opportunity for educational experimentation and societal change that students might not experience in their studies again.

For several interviewees, the question about what drew them to CBL reflected their personal vision or their aspirations for the role of a university. Questions about the purpose of the university were not directly asked. However there were powerful statements about the potential for CBL to develop students' self-directed and change agent capacities. It also revealed values about the university offering a supportive but also experimental space that is part and parcel of the 'freedom' of the university education experience (Invernizzi-Accetti, 2025). These are ideas that resonate with the concept of a 'pedagogy of deliberateness' that has at its heart a combination of critical conscious-raising; autonomy/self-directed learning; and critical thinking' (Trede and McEwen, 2016).

There was also a sense that participants saw CBL as a conduit for the university to fulfil its social responsibilities. This suggests a vision of a more socially-conscious and potentially transformative community/society engagement than might be expected of other pedagogies. The societal imperative of CBL is reflective of at least some recent definitions of CBL (Doulougeri *et al.*, 2024; Normann, Wigger

and Larsson, 2025) and perhaps has implications for the profile of educators who may be attracted to this type of ethos. This finding is possibly indicative of societal impact objectives within ECIU but it is certainly in contrast to the earlier *Leijon et al*. (2022) study that found little evidence of a societal focus in the CBL literature.

The notion that our values and underlying philosophies of teaching influence how and what we teach is not a new concept (Laundon, Cathcart and Greer, 2020; Ruge *et al.*, 2023) but it may be underlined where the teaching has a social intent. Different perspectives could manifest in different ways. For example, there may be some difference of opinion on who the external stakeholders should be (public and/or private sector?) and the extent to which they can be or should be involved in the academic and assessment process. The fact that several of these participants were personally driven and inspired by their students' desire to achieve societal impact has important implications for the motivations and actions of staff.

5.2.1.2 An emphasis on student leadership

There was a strong emphasis on student-centred characteristics in the conceptualisation of CBL. The 'learner-driven' aspect of a favoured definition particularly resonated as a key indicator of CBL, suggesting that the extent of student agency in the choice of challenge, the investigative process, and the nature of the solution is what makes CBL distinctive and appealing as an approach. For some, the learner-driven focus reflects the change in the typical teaching dynamic, with the students being clearly identified as the 'owners' of the challenge rather than the teacher, who plays more of a mentoring or guiding role.

These ideas of student ownership of the process and destination of learning have previously been discussed by Nichols *et al.* (2016) and more recently by Galdames-Caderón, Pedersen and Rodriquez-Gomez (2024) who underline the importance of creating an environment of student ownership for successful CBL. Some interviewees felt that the concept of student agency was not prominent enough in the definitions of CBL, suggesting they would like to see that student ownership and leadership aspect come through more strongly. Given this

emphasis, it is worth considering some of the terminology associated with external stakeholders. Rosén et al. (2022, p. 6) say that 'challenge-provider (and even more challenge-owner) renders the external stakeholder as the agent in defining the challenge as well as the learning, and the teachers and the students as respondents'. Care should be taken to ensure that the terms used to describe external stakeholders does not unintentionally reinforce traditionally hierarchical dynamics.

For some institutions, there may be more of an opportunity to bring students into a deeper partnership role which could model student leadership more visibly. De Stefani and Han (2022) raise the point that leveraging the input of students at all stages of the process - not just as learners but as moderators, mediators, communicators, peer assessors, and ultimately co-designers of courses and activities - was the most significant 'lesson learned' from their implementation of CBL. The data seems to suggest that the principles of student partnership (Bovill, 2020; Hassan *et al.*, 2022; Healey, 2025) are already informing how CBL happens in some contexts, particularly in The Netherlands where student coaches are commonly embedded in the CBL model. Students-as-partners in CBL, in a paid coaching/support type role, could potentially encourage more students to act as champions and provide practical support in implementing CBL. Designated students could play an active part in liaising between students and staff, potentially breaking down barriers to understanding and participation.

5.2.1.3 Language of practicality versus theory

It is notable but perhaps not surprising that participants tended to describe the practical characteristics of CBL much more than its theoretical heritage although it was clear that the ideas underpinning Constructivism, Socio-Constructivism and Experiential Learning were important influences. The most common theoretical reference was to CBL as a form of Experiential Learning, which aligns with the findings of the literature review also. The relatively rare use of the language of learning theory in describing understandings of CBL is not an issue in itself. However, it may run the risk of oversimplifying certain concepts. Drumm (2019) discusses the idea of 'folk pedagogies' or pseudo theories in a digital

education context, whereby some educators avoid relating their practice to theory at all, potentially leading to clichéd and non-critical interpretations. Where CBL practitioners do describe their practice in learning theory vernacular, it can facilitate robust research and shed further light on how learning may or may not be occurring within a CBL experience. More positioning of CBL in terms of well-established learning theories, linking pedagogical practice to theory wherever possible is necessary. It is important to highlight that professional learning opportunities should include learning theory education as it is highly unlikely to occur organically.

5.2.1.4 The adaptation/common understanding conundrum

Adaptation of CBL is perceived as both a blessing and a curse and has implications for how people understand the approach. There was strong support for the practice of customising CBL to the local context, which for some supported much-needed flexibility in the approach, but it was acknowledged that this could be causing confusion in achieving a common understanding of what CBL 'is' and how it differs from other pedagogies. It therefore seems necessary, for the benefit of both research and consistent practice, that any adaptations and hybrid modifications need to be transparent, evidence-based, and clearly communicated.

The emergence of possible classification schemes to adapt and appropriately label the implementation of CBL holds promise. A proposed scheme from Gallagher and Savage (2023) describes CBL broadly in terms of Strict, Hybrid, and General classifications. Another proposed nomenclature suggests CBL could be presented on an implementation continuum of Mild, Moderate, and Intense levels of CBL engagement (Imanbayeva *et al.*, 2023). While the wording may need further consideration, the idea of a classification scheme would help to highlight where certain aspects (such as close engagement with an external stakeholder throughout) are not yet happening. This recognition of flexibility has potential to encourage educators to start with a design that does not necessarily have all characteristics to the fullest extent, and allows them the capacity to grow in their

usage of CBL over time. As Eldebo et al. (2022, p. 805) similarly recommend, 'start small and add on until a full CBL setup is reached'.

Previously this matter of varied practices of CBL may have been discussed in terms of the research implications, but there are accuracy/integrity/professional judgement matters to consider also. CBL should be what it says it is, not bandied about as a 'buzzword' (Malmqvist, Rådberg and Lundqvist, 2015) for innovative practice or over-stated in terms of its significance. Assumptions about what is happening within a CBL experience should not be made and efforts will need to be undertaken continuously to communicate key elements within and across institutions.

To briefly summarise this section, there are a range of factors influencing understanding of CBL which may be driven by the philosophical perspectives of the socially-aware educator, the emphasis on student leadership, the practical language around CBL, and the effects of adapting the methodology to the local context. We will now move to discussing the factors that may potentially detract from and contribute to its successful implementation in practice.

5.2.2 Sub Research Question 2

What do those responsible for leading CBL initiatives in ECIU partner universities perceive are the barriers and enablers to its successful implementation in practice?

The participants' views were consistent with what the literature indicated about how gaps in professional learning in CBL – in pedagogical, technological, and coaching aspects especially – could act as barriers to successful implementation. Without adequately upskilling staff on CBL as a pedagogy and supporting the new guiding/coaching role it requires, the chances of a positive teaching and learning experience are likely to be significantly lessened. The discussion on professional learning will be returned to in the **Enablers** section.

Analysis of the data also confirmed that if CBL is being rolled out on a larger scale across the institution, to multiple curricula and disciplines, some teaching staff would not engage. Such staff may have difficulties relinquishing control (Helker *et al.*, 2025), they may be risk averse to what is a radical change of teaching, they may not feel they have the time needed for training/upskilling, and/or they just might not have the personality for such an unstructured approach (Ramirez-Mendoza *et al.*, 2018), especially without adequate evidence of return on time investment. Again, a discussion around this will continue in the **Enablers** section.

Before then, we will start the discussion by addressing the identified barriers.

Barriers

5.2.2.1 The invisible work of managing the stakeholder relationship

Participants reinforced the viewpoint that having external stakeholders involved in CBL is tremendously valuable, but it requires significant time and effort to bring to fruition. While there are multiple benefits to having external stakeholders involved as training partners, experts and/or feedback providers (Membrillo-Hernández *et al.*, 2019; Mayer, Ellinger and Simon, 2022), it has to be acknowledged that the commitment involved in working with those people or entities is substantial: from the time required to source and prepare a suitable external stakeholder through to planning and delivering the teaching and assessment with all involved, the process involves a number of simultaneously moving parts. Even in cases where students or central university units source the external stakeholders, there are still likely to be significant time overheads for the academic in educating the external stakeholder on academic requirements, CBL expectations, and the time required of students. This is not typical academic work and for those directly involved in such activity, the time required to negotiate expectations, rethink teaching approaches, and communicate and plan (Ramirez-Mendoza *et al.*, 2018; Eldebo *et al.*, 2022) is substantial, as interviewees and the literature have highlighted. For the 'curious but cautious', the 'willing but weary' and the 'embedded innovators' (Normann, Wigger and Larsson, 2025) who may see the value in CBL but are

concerned about the resources and effort needed for implementation, this represents a risk.

Furthermore, there is surprisingly little discussion in the literature of the time and network of contacts required to source challenges in the first place: faculty from some disciplines may struggle with this more than others and the existing network of the academic is also a factor in how successful this might be. A lack of contacts and networking opportunities for those with limited or no experience has been identified as an issue by Normann, Wigger and Larrsson (2025) recently and it should be recognised that these partnerships may be difficult to sustain over time.

The establishment of a dedicated Challenges office or Challenge co-ordination resources, as some institutions have in place, has been recommended as a valuable means to fulfil some of these contact needs and make the institutional commitment to CBL more visible. The work would be similar to 'The Organizer' role described in Eldebo *et al.* (2022) which focuses on 'finding challenge providers, the creation of challenge briefs, the handling of immaterial property rights issues and contracts' (p. 803). To attract external stakeholders as the source of the challenges, it is recommended to initiate a high-profile, senior management supported promotional campaign to encourage enthusiastic and committed stakeholders to get involved.

There were suggestions that the external stakeholder role could be sometimes and/or in part be performed by internal staff instead. This raises questions about how 'external' the stakeholder needs to be and if some flexibility is to be expected. There may also be times when the stakeholder may not be available as much as originally anticipated, as some interviewees and others have indicated (Mayer, Ellinger and Simon, 2022). It could also be the case that early-stage students may not yet be ready for an external level of engagement and may need further scaffolding around CBL before working directly with a partner. Furthermore, while CBL is certainly societally-oriented in ethos and this does exclude working with private industry, concerns about the potential risk of 'greenwashing' or being used in some way by outside agencies need to be reflected on and recognised.

Assessment issues

Assessment barriers also need to be considered and it was highlighted that skills assessment in CBL is a common struggle, particularly with grading individual and group contributions and the assessment of transversal skills. While stakeholder input to assessment is recommended, some participants indicated that there could be tensions between educators, external stakeholders, and students about what should be assessed. An emphasis on assessing the product (ie the actionable solution) that emerges at the end of the process might suggest that the stakeholder's interests are more important than the learning process and the competencies developed through that. However not paying sufficient attention to the needs and hopes of the external stakeholder might not lead to an ongoing relationship with that partner.

Doulougeri *et al.* (2022) recommend striking a balance between focus on product and on process which in turn suggests that further attention should be paid to the concepts of assessment *for* and *as* learning (Earl and Katz, 2006; National Forum for the Enhancement of Teaching and Learning in Higher Education, 2017). Some of the interviewees highlighted that they had very little freedom to modify assessments and it should be noted that rigidity about assessment raises significant issues for CBL, particularly in somewhat unpredictable, fast-moving situations involving external stakeholders. Therefore conversations about the purpose(s) of assessment should be held upfront. It may be helpful to leverage the concepts of Assessment *for* learning (Evans, 2013), which focuses on formative, dialogic feedback (Black and Wiliam, 2018), and Assessment *as* learning with its focus on empowering students to become self-regulated learners capable of critically evaluating their performance (Carless *et al.*, 2011). This categorisation and language offers another opportunity to locate CBL in established pedagogical theory.

5.2.2.2 Inflexible Institutional Systems, Structures and Policies

The value that participants placed on multidisciplinarity – or inter- or trans-disciplinarity – and the opportunities for integrating knowledge and perspectives it presents within CBL was evident. However the historical problem of education being organised in module silos presents an institutional barrier that is difficult to overcome (Mihai, 2025) and that can negatively manifest in the CBL experience. For example, Reymen et al. (2022) notes some students' negative experiences linked to cross-faculty communication and a struggle to engage in an interdisciplinary project while competing final year projects.

Consider, for example, the basic need of multi/inter/transdisciplinarity to get students from different faculties together simultaneously. Across disciplines, this requires detailed and sometimes impossible co-ordination of logistics such as timetables and assessment processes (Lyall *et al.*, 2015). For staff, a lack of cohesion across the cross-disciplinary teaching team and inadequate support for guiding student groups to collaborate and effectively integrate disciplines can also lead to problems (Shakila *et al.*, 2021). Therefore radical solutions may be required: One participant suggested an approach to non-timetabling that allowed everyone a period of dedicated CBL time at the end of term where nothing structured took place and everyone was available full-time. The mindset shift and scale of change that this would require at an institutional level is, of course, considerable. However approaches such as the dedicated iWeek at Tecnológico de Monterrey (Lara-Prieto and Flores-Garza, 2022), or one interviewee's suggestion to enable longer blocks of time for CBL activities and reflection in the timetable, should be given due consideration if interdisciplinarity is a serious strategic aspiration.

Consideration also needs to be given to the intended learning outcomes. It is undoubtedly demanding to integrate both disciplinary and transversal skills through CBL, particularly since its characteristic open-endedness and lack of structure sometimes makes the focus of the challenge difficult to predict precisely in advance. Clarity on the desired skills and competencies, such as outlined by

García-García et al. (2024) and Kohn Rådberg et al. (2020) is important to ensure that everyone's goals for the learning experience – be they disciplinary and/or transversal skills-related – have the best possible chance of success. This is also in keeping with Shakila et al. who based on their interdisciplinary project, recommend 'constructive alignment between all the learning objectives, activities and the assessment' (Shakila *et al.*, 2021, p. 1497).

To ensure alignment between learning outcomes, teaching activities, and assessments (Biggs and Tang, 2011), the intended goals of educators implementing CBL need to be well articulated. They need to be expressed as learning outcomes and the associated assessments need to be designed to ensure that those minimal outcomes have been met. It should not be assumed that this is already happening successfully universally (Brown, 2019) and the scale of this task should not be underestimated. We should, of course, recognise objections to the uncritical use of learning outcomes (Murtonen, Gruber and Lehtinen, 2017) but be pragmatic too about their usefulness to prospective students and their ubiquity in the systems and processes of the university.

To facilitate greater levels of multi- and interdisciplinarity, programme-level discussions and decisions need to take place at the earliest possible point as part of an agreed programme and assessment design process, as discussed further in the **Enablers** section. The use of synoptic/integrated forms of assessment (Constantinou, 2020) offers opportunities to combine and reduce the volume of assessments across a programme (Tomas and Jessop, 2019) but it should also be acknowledged that creating these synthesised, inter-connected assessments across multiple disciplines would also require further professional learning, planning, and consequently more time to implement, at least initially.

5.2.2.3 Funding/Resourcing

The need to fund greater capacity for CBL within institutions was evident and the points about buying out staff time suggest a need for further funding to be directed to faculties and teachers to support staff to implement CBL. Malmqvist, Rådberg

and Lundqvist (2015) highlight that costs across different models of CBL implementation will vary from low to moderate to high, with the size of classes and the resources available being significant factors. As discussed in **Theme 10**: **Recognition Really Matters**, funding is necessary to buy out staff time for engaging with CBL and enable further resourcing to support, potentially from students and teaching assistants. This is echoed in Normann, Larsson and Wigger (2025) who similarly identified the need for funding, teaching-hour adjustments, and policy recognition to integrate CBL effectively.

Finally, it must be recognised that as O'Sullivan et al. (2025) have described, the involvement and development of external stakeholder relationships for CBL requires a level of time, management and resourcing that is not currently being adequately supported for many institutions. Resources need to be committed to this where it is not already happening.

We will now shift focus to address potential enablers.

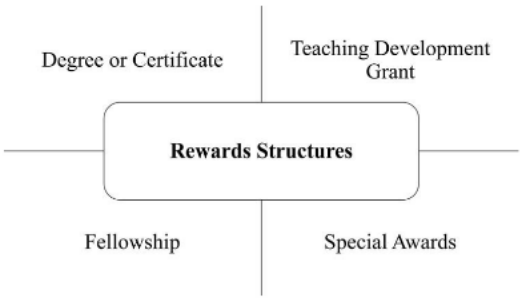
Enablers

5.2.2.4 Recognition of effort

The need to have innovative but time-consuming CBL teaching efforts recognised by the institution was highlighted by several participants who saw it as a powerful potential motivator for educators. While it would seem highly unlikely that educators are engaging in CBL for financial reward or celebrity status, that does not preclude the notion that recognition, particularly recognition of the time involved, would be welcomed. When asked to make suggestions, participants recommended a variety of ways to recognise CBL achievements, including changing of academic promotion key performance indicators (KPIs) to better recognise innovative teaching, micro credentials/badges which could be used to learn about CBL and then shared publicly as evidence of expertise; funding/grants to support specific CBL projects; special awards such as institutional teaching excellence awards or prizes; and teaching fellowship schemes within and beyond the institution that offer recognition of impactful teaching practice.

These suggestions seem to reflect the types of rewards structures offered at a number of 'flagship' universities (Jacob *et al.*, 2019) which include degree or certificate qualifications in teaching & learning, innovative teaching development grants, special prizes or awards for teaching excellence, and teaching fellowship schemes. Common types of awards as described in Jacob *et al.* (2019) are presented in Figure 27:

Figure 27: Typical rewards structures of selected flagship universities



One of the high profile CBL-specific awards from an ECIU perspective is the annual CBL Team Impact Award. (ECIU, 2025a). This is an award hosted by ECIU to recognise and celebrate ECIU University teams 'who have shown exceptional collaboration, creativity, and dedication in addressing real-life challenges' (ECIU, 2025c). Institutions can conduct their own in-house teaching excellence awards for recognising innovative practice such as those described by Scheidig and Tremp (2025). Fellowship schemes, such as that from international Advance HE, can also stimulate individuals and institutions to be recognised for quality teaching practice and leadership of teaching (Spowart *et al.*, 2016; Botham, 2018).

However, rewards structures are not necessarily perfect, infallible indicators for accurately capturing and recognising effort. Institutional teaching award schemes, while positive for highlighting the value of recognition, can be subject to critique and controversy, according to Digón-Regueiro and Sánchez-Blanco (2023). Fellowship awards have been found to have an affirming benefit (Warnes, 2021) but have also been critiqued for potentially encouraging a 'box ticking' approach to teaching enhancement (Peat, 2015).

Another possible avenue for recognition that was alluded to by some participants is engagement with the Scholarship of Teaching and Learning (SoTL) leading to published outputs in the educational research literature. SoTL can be broadly described as 'engagement with research into teaching and learning, critical reflection of practice, and communication and dissemination about the practice of one's subject' (Healey, 2000, p. 169). SoTL can be used as a framework to publish on disciplinary expertise while simultaneously developing one's abilities as an educational scholar, according to Doulougeri et al. (2024).

Since many CBL researchers and leaders have indicated that more standardised and rigorous evaluations of CBL are essential to evaluating student learning (Gallagher and Savage, 2023; van den Beemt, van de Watering and Bots, 2023; Doulougeri *et al.*, 2024) and have advised that CBL practices need to be linked more strongly to learning theory (Helker *et al.*, 2025), there would therefore seem to be promising benefits to promoting the scholarship of CBL more widely. This would help staff formally research effective practice and potentially achieve research recognition in the form of scholarly outputs. Some of the participants described how enjoyable it was to co-author various publications so it seems advantageous to further develop such activity. It would be better again if the support provided can encourage the slow and iterative route to becoming a SoTL scholar (Supple and Cronin, 2023), enabling rare opportunities for educator reflection in the CBL academic world. A strong commitment to SoTL is further supported by Doulougeri *et al.* (2024, p. 1099) who:

> Recommend collaborating with an interdisciplinary team of policymakers, teachers, and researchers to develop sound educational research that accompanies the implementation of CBL educational innovations. Sound research fulfills a double objective: on one hand, it will lead to good educational practices, and on the other, it will lead to the advancement of our knowledge and theory about which aspects of CBL work and why.

5.2.2.5 Alignment with other pressing priorities

To achieve higher levels of implementation, participants called for CBL to be prominent within institutional strategies and bolstered by promotional and supportive activities that make it clear that it is a strategic focus of the university. Clarity of purpose that aligns with institutional goals was emphasised, with Artificial Intelligence, Education for Sustainable Development (ESD) and Transversal skills being specifically mentioned, all of which are commonly featured in universities' policies and strategies. There were suggestions that various levers to encourage adoption of CBL may need to be applied but also a recognition that 'top down' approaches are best avoided.

Aligning CBL with the institution's strategic priorities should be relatively easy to achieve since it is said to support common strategic goals such as sustainability, innovation, digital competences, and collaboration (Gallagher and Savage, 2022; Perna, Recke and Nichols, 2023). GenAI and ESD were previously discussed in **Chapter 4: Analysis**. A small number of participants made specific suggestions about strategically linking CBL to GenAI, which at the time of the interviews (late 2023), was the subject of rapidly growing attention (Sætra, 2023). It is possible that discussions around Artificial Intelligence (AI) would come up more often if the interviews were conducted in subsequent years. To add to this, there is also growing evidence that CBL supports the acquisition of transversal skills and competencies, including teamwork and leadership, information literacy, and project design (Gil *et al.*, 2023) and creativity (Félix-Herrán, Rendon-Nava and Nieto Jalil, 2019). Furthermore, CBL's role in fostering student innovation, engaging students in solving real-world problems, and enhancing critical thinking and collaboration was highlighted in a recent literature review of Transversal Competencies Assessment and Pedagogical Methods for Higher Education (Osipovskaya, Coelho and Tasi, 2024).

Yet curriculum innovation will not happen 'just because it is one of the strategic goals of the institution, and it requires openness and interaction between the actors involved' (Chapel and DePryck, 2022, p. 394). Specific actions would need to be taken. Some participants suggested policies around CBL experiences such

as requiring CBL to be embedded to some extent in all programmes (not everyone agreed, some questioned its feasibility in all degrees). Other suggestions required teachers to dedicate a specified number of credits to CBL and required students to take at least one challenge over their time at university or one challenge a year. It was also suggested that CBL could offer an alternative to the internship or placement experience.

Whatever the decisions made at a strategic level, it seems clear that it would require a sustained effort of ongoing promotion and cultural commitment to bed such policies in. This might involve a number of aspects including a highly visible, discipline-specific promotional campaign to raise awareness and attract staff to the method; fostering of a creative and supportive atmosphere to encourage experimentation with CBL; and greater understanding of the student perspective on CBL (such as through funding student champions with experience of CBL who could help achieve faculty buy-in). Overall, CBL should ideally be helpful in addressing pressing problems, be 'synergistically aligned' with teaching priorities and not seen as 'another thing' that staff have to do, as one participant memorably put it.

5.2.2.6 Engaging with Professional Learning

While acknowledging the value of learning about CBL through applying it in practice, participants identified a variety of capacity-building professional learning approaches, which are described in **Theme 6: A mix of professional learning is desirable**. This includes the facilitation of workshops to provide a rationale and pedagogical basis for CBL; design guidance to help practitioners understand, design, and implement CBL; and collaborative learning from more experienced colleagues who can be called upon for advice. These professional learning activities bear some similarity to those suggested by Normann, Larsson and Wigger (2025) who proposed basic workshops, structured guidance, and examples from other teachers as a starting point for those with no prior experience of CBL.

Furthermore, Chapel and De Pryck (2022) used an adapted CBL Maturity Model at

their institution to explore teaching staff perspectives on the pedagogical support and professional development provided. Sixty-five teachers responded to questions about the type of support they considered necessary to incorporate CBL into their teaching. Personalized educational support and guidance on pedagogy, technology-enhanced learning, and course design was the most desired type of support. This was followed by provision of educational resources such as scholarly literature, formats guidance, and general guidelines, confirming the value of those supports. Learning how to coach was identified as a top priority for most participants but CPD was also requested around other topics such as the involvement of external partners, students as co-designers, societal impact, learning driven by challenges, and interdisciplinary teams. All of these resource types and topics should be considered and researched further as potential forms of support.

A diverse and flexible range of structured learning programmes – workshops, webinars, summer schools, and short courses on CBL – are already happening in most, if not all, ECIU universities to support learning about CBL. These professional development initiatives (PDIs) are typical of the 'implementing a new form of education' practice described by Stevens et al. (2023) in a study highly pertinent to CBL. Stevens et al. have developed a typology of professional development practices based on 20 institutions in The Netherlands, several of which include CBL (Stevens *et al.*, 2023). They found that when the intention is to implement a predefined new form of education (such as CBL), the professional development approach is typically to support teachers to achieve the required skills to apply it to their own teaching. As Figure 28 shows, such teaching-related initiatives often emanate from a training-centred unit and the objective is application of the innovation in teachers' practices.

Figure 28: Graphic extracted from Stevens *et al*. (2023), p. 12

Stevens et al. (2023) also describe how professional learning to support educational innovations can occur via structured learning programmes (a planned sequence of learning activities, designed to attain learning objectives) and/or a learning community (a planned and structured knowledge exchange among teachers). CBL-oriented professional learning communities are being enabled through local communities of practice described by some interviewees while centrally-facilitated events (such as ECIU 'Lunch and Learn' webinars) are also taking place. Such learning communities play an important function as spaces for teachers to share their own CBL teaching experiences and gain the kinds of practical insights from colleagues that so many find helpful. Facilitated well, they can also be used to create a climate of trust, experimentation, and openness about 'mistakes' that is important for innovation to thrive. Such spaces can potentially include external stakeholders, as some participants mentioned.

Hands-on, practical experiences of CBL are also perceived as beneficial to help to remind educators of the student experience. Participants valued CBL-based hackathons or hackathon-like Creathons as a form of professional development as they provide a rare opportunity for staff to experience CBL for themselves and walk in the shoes of their students. These positive effects have been documented elsewhere in the literature (O'Riordan and Gormley, 2023; Nizamis, 2024). Participation in these types of events, which it should be said require adequate funding and preparation time to organise (Lyons, Brown and Donlon, 2021), allows educators to experience uncertainty within a fast-paced environment first-hand, providing insights that staff can bring to the design of CBL within their own teaching.

Given the emphasis on collaborative learning, CBL could lend itself well to approaches such as co-teaching which may be new to many CBL practitioners. Co-teaching offers the potential to bring together diverse strands of expertise, make lessons stronger and more creative, and enable mutual support and complementarity (Rooks *et al.*, 2022). It can also afford new educators the opportunity to observe and experiment with new teaching strategies while learning from a more experienced colleague (Scherer *et al.*, 2020). Co-teaching could be particularly beneficial as an interdisciplinary model and as a means of fostering interpersonal relationships so appears worthy of further investigation in relation to CBL.

Peer Observation of Teaching (Gosling et al., 2009; O'Riordan, Buckley and Lincoln, 2021) and professional mentoring schemes (Shanks, 2017) are also worth highlighting in this vein as either could be done on a small, low-stakes scale and may indeed act as an initial entry point to a co-teaching model. Peer observation in education is well established in some countries through structured institutional schemes and it is 'the process of colleagues observing others in their teaching, with the overall aim of improving teaching practice' (Hendry and Oliver, 2012, p. 3) For example, there is potential for mentoring between an experienced CBL teacher and a novice CBL educator, enabling conversations and immediate contact with other educators dealing with the same issues. Similarly, there could be student-to-student mentoring where a team of CBL student mentors goes into classes where students are doing CBL for the first time and runs workshops and/or offers support as they develop their solutions. The potential for these types of learning community-based professional learning approaches within the context of CBL appears promising for those who are willing and available to engage. However, it is equally important to acknowledge that even the most enticing of professional learning opportunities will remain untapped and therefore wasteful if the intended audience is unavailable to participate due to other competing commitments. The findings of **Theme 10: Recognition really matters** may need to be considered in this regard.

5.2.2.7 Curriculum Design Support

MacNeill and Beetham (2022, p. 5) describe curriculum design as:

> All the processes of reviewing, planning and developing a course of study. This might include formal processes in departments, and mapping content to graduate outcomes or to professional bodies and standards.

While there are examples of small-scale course-level or project- level implementations, there appears to be currently very little research available describing CBL through a broader curriculum lens (van den Beemt, van de Watering and Bots, 2023; Doulougeri *et al.*, 2024). This means that there are relatively few examples in the literature describing CBL in an interconnected, progressive way across a programme.

Participants described how a siloed, module-oriented approach limits the potential success of CBL which demands a programme-level focus. CBL is not something that should be experienced only once and students should be exposed to different forms and types of CBL to develop more rounded perspectives. To design a professional curriculum, Doulougeri *et al.* describes how educational researchers, teaching staff, and university managers need to move away from single, one-off courses 'to identify sustainable learning objectives for students' longitudinal development in CBL' (Doulougeri *et al.*, 2024, p. 1096).

Curriculum design processes or frameworks may therefore need to be introduced or developed further to ensure that all the key actors within a programme talk to one another and make decisions based on the programme as a whole. Bringing academics, teaching support professionals, and students together to engage in collaborative curriculum design can potentially provide an effective means of creating CBL-based curricula. Accessible curriculum design frameworks and processes such as ABC Learning Design (Young, Clive and Perović, Nataša, 2016; Gormley, Lowney and Stone, 2023) could potentially support this process but may need to be adapted and extended to integrate CBL. The teaching, learning and assessment activities need be considered across the academic year and the overall programme of study so that they are appropriately progressing in

complexity. Only by adopting this type of approach will CBL-supporting strategies such as constructive alignment, synoptic assessments, co-teaching, and integrated use of appropriate learning technologies come to pass across a curriculum. This makes the design process considerably more complex than when applying CBL on a standalone basis but it will be essential if implementation is to ever happen at scale. Like any programme design effort, this is a delicate balancing act and both process and people need to be in alignment for this to work.

5.2.3 Overarching Research Question

What are the perceptions of Challenge-Based Learning among those leading its implementation in ECIU universities?

This study set out to explore the perceptions of CBL among those leading its implementation in universities within ECIU. It found that within that context, CBL is perceived as an educational approach that encourages students to actively lead their own learning through engaging with concrete, societally-relevant challenges, and collaborating with external stakeholders as part of multi/inter-disciplinary teams. The approach is perceived as open but also scaffolded by the teacher who plays a guiding/coaching role. Some participants were more or less interested in the end solution than others and were influenced by external stakeholder expectations. Participants were highly motivated by their students' interest in 'making a difference' to society, sustainability drivers, and their personal values and beliefs around the role of the university. CBL tended to be described in very practical language and those with a prior history of implementing PBL especially compared perceived similarities and differences. They all welcomed the flexibility of CBL in different contexts and viewed that as a positive but also recognised the need for detailed design principles to guide implementation and transparency when adaptations are made.

The barriers to implementing challenge-based learning are perceived as challenging. The time required to implement, especially the time required to source, liaise and plan experiences with external stakeholders, was viewed as

significant. Furthermore, if multi- or inter-disciplinarity is to be pursued seriously at scale, then logistical aspects across the institution such as co-ordination of disciplinary timetables and assessment practices would call for significant programme-oriented reform.

Recognition of effort – whether that be through academic progression, buy out of time, awards, fellowship or scholarship – was perceived as a positive potential enabler of CBL by rewarding those who take the leap and the time to apply this type of innovation. Professional development of CBL educators needs to be prioritised and a range of CBL-appropriate professional learning opportunities were as identified as necessary to develop the skills and competencies required. All such enablers need to be integrated through a strategic vision that helps to advance and promote the evidence behind CBL and supports and champions those implementing it in visible ways.

5.3 Back to where we started: Revisiting the conceptual framework

Having discussed the findings from the study through various lenses, it is now timely to revisit the underpinning conceptual framework and (re)consider it in relation to the overarching research question of: 'What are the perceptions of Challenge-Based Learning among those leading its implementation in ECIU universities?' The original conceptual framework that emerged from the literature indicated themes such as difficulties in defining the distinct nature and characteristics of CBL, a tendency to position it in relation to PBL, and limited discussion of learning theory. Gaps in training/pedagogy support, time, educator resistance issues, and interdisciplinarity difficulties were being reported but not in depth. Some institutions were seeing experiences with professional learning, student partnership, and a clear strategic rationale bear fruit but again, the details were scant.

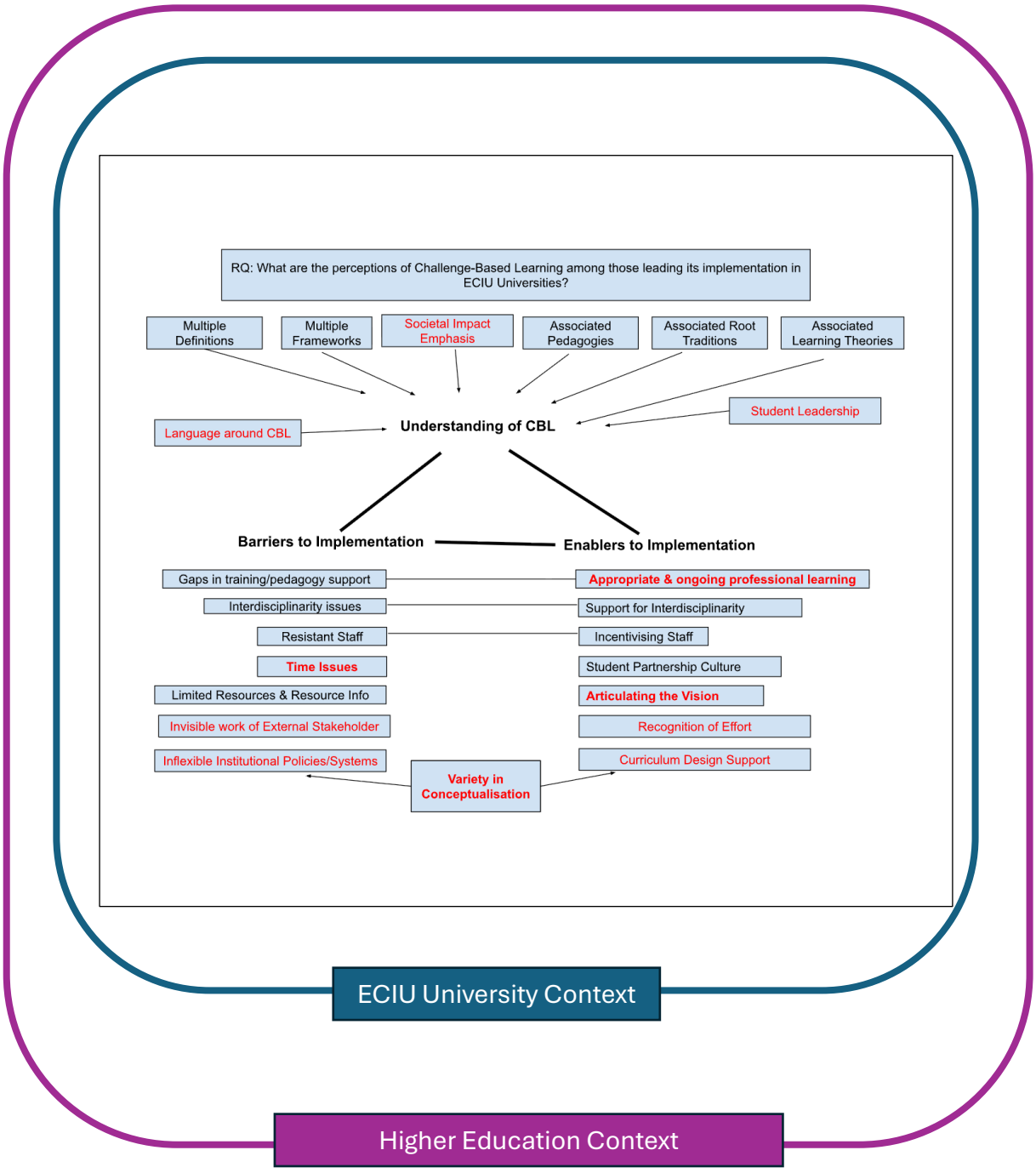
Therefore my conceptual framework proved particularly useful for pointing me towards questions that would explore the underexplored areas further. For example, I was prompted to ask participants to describe what drew them to CBL and discuss what they liked/did not like from certain definitions so I could get a sense of how they understood the term in their own words and in relation to their own contexts. The conceptual framework also indicated that questions should be posed about how CBL variety is perceived and potential incentives and actions that might further CBL implementation in practice.

The interview data reiterated certain themes from the prior literature. However, the interviewees' particular emphasis on societal impact, the rich descriptions of what typically happens with an external stakeholder relationship, and the importance of appropriately recognising effort were new concepts. Developing a framework to reflect my thinking pre and post analysis has helped me to visualise the original and the new concepts so this study's particular contribution to research can be expressed.

See the revised version of the conceptual framework in Figure 29. Figure 29 illustrates the original array of ideas that were found in the literature as relating to the question shown. As described earlier, there are three central concepts relating to understandings of CBL, barriers to implementation, and enablers to implementation. A key change in the revised conceptual framework is the narrowing of the context from the broad backdrop of 'higher education' to the bounded case of 'ECIU universities'. The updated version of the conceptual framework also has new sub-concepts indicated in red (e.g. societal impact emphasis). Where concepts repeated or further nuanced something presented in the initial conceptual framework, those items appear in **red bold** (e.g 'Articulating the Vision') to make the point that they were further developed rather than being completely new. Note that the principle of 'Variety in Conceptualisation' was moved to a centrally prominent location and has arrows pointing to both barriers and enablers, recognising the two sides to the Variety debate.

While it is important to emphasise that this is not a thesis about leadership *per se*, it is also important to recognise that different forms of leadership are being represented and the findings should be read with that in mind. Participants in this study performed a variety of leadership roles, some arguably more senior and therefore arguably more influential than others. However the findings are being presented through the prism of a contemporary view of leadership: distributed leadership (van Ameijde *et al.*, 2009; Azorín, Harris and Jones, 2020). The distributed leadership model not only recognises the contribution of positional leaders with specified learning and teaching roles, but also opens up the concept of leadership to include expertise from distributed leaders such as practitioners who guide and influence others (Jones *et al.*, 2017). Therefore the reported perceptions of CBL leaders span a continuum from those that may be considered more strategic or institutionally-oriented in nature to individual teacher-level perspectives. Perceptions of leadership could also be viewed as a combination of macro (national and international level), meso (institution level) and micro (individual teacher level) perspectives. The macro, meso, and micro framework has emerged from social science research and has been used by others in researching CBL (Dikilitaş, Marshall and Shahverdi, 2025b; Georgiou, Gallagher and Chmielewska, 2025; Helker *et al.*, 2025), educational change (SEDA, 2023), and researching the Scholarship of Teaching and Learning (Fanghanel *et al.*, 2016) as a framing device for representing different levels of the higher education system. The micro, meso and macro framework therefore offers a lens for presenting the different levels of leadership featured within this study, as illustrated further in the checklist of recommendations described in Section 5.6.1.

Figure 29: Final Conceptual Framework



5.4 Recommendations/Implications for Policy

The findings from this thesis on CBL are of relevance for a number of policies at European, national, and institutional levels – particularly those relating to funding in higher education, sustainable development, and recognition of teaching.

The ECIU University Education Strategy 2025-2028 (ECIU, 2025b) underlines the ECIU emphasis on CBL as a strategic intent to deliver distinctive, high-quality, research-led, impactful challenge-based education at European level. This strategy points to concerns about underfunding and draws from an EUA Trends report (Gaebel, Zhang and Stoeber, 2024) that describes how 70% of EU HEIs identified underfunding as one of the top three obstacles to improving learning and teaching. In Ireland, following a history of underinvestment, 'Funding the Future' (Department of Further and Higher Education, Research, Innovation and Science, 2022) was launched in May 2022 as a significant policy to address an identified funding gap of €307 million per year in the Irish HE sector. This policy report highlights how the ratio of students to staff in Ireland is higher than the European average (19:1 in Ireland versus 15.3:1 for European peers, according to Eurostat figures). It includes commitments to move the ratio in Ireland closer to European and OECD norms and ensure adequate investment to support a high-quality education sector dealing with unprecedented demographic growth. Unfortunately, at the time of writing, this fund has yet to be released. This thesis has highlighted the importance of adequately funding CBL initiatives in university settings. In an environment of severely stretched resources, the impact of such a gap on the implementation of CBL (and indeed other resource-heavy, time-consuming pedagogical approaches) is therefore 'challenging' to say the least. Addressing this shortfall should be viewed as a matter of urgency by the Irish Government.

Further to issues of resourcing, this thesis has also highlighted the centrality of sustainability education within CBL initiatives, as voiced by those leading its implementation. The ECIU University Education Strategy 2025-2028 (ECIU, 2025b) emphasises deepening expectations around educational support for sustainable development. It cites the Council of the European Union recommendation

(*Council Recommendation of 16 June 2022 on learning for the green transition and sustainable development 2022/C 243/01 (Text with EEA relevance)*, 2022) which says that member states should support educators to respond to such expectations by providing the necessary time and space to adopt innovative pedagogies for sustainable development. The findings of this thesis, which further position CBL as a sustainability-oriented pedagogy, are therefore also of relevance in highlighting the critical necessity of providing educators with adequate time, training, and space for adoption.

The ECIU University Education Goals (ECIU, 2025b) include the intention to 'develop excellent capability and strong capacity in Challenge-Based Learning among teaching staff across ECIU member institutions' (p. 5). The findings from this thesis on collaborative forms of professional learning are therefore of particular relevance to this objective. Furthermore, the findings in relation to the importance of recognising effort confirm the significance of the forthcoming framework of recognition being developed by Ireland's National HE Funding body – the Higher Education Authority and the National Forum for the Enhancement of Teaching and Learning. Currently in a consultative phase, the development of Ireland's National Recognition Framework 'seeks to address the longstanding challenge that teaching excellence in higher education is sometimes undervalued and insufficiently rewarded relative to research achievements' (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2025). Evidence from participants within the current study strongly endorses the need for a motivating approach to teaching recognition that will help institutions to recognise, reward and value teaching in a structured, systemic and transparent way.

Finally, there is strong alignment between CBL and institutional policy at DCU. DCU has committed to "pioneer a transformative student experience" (Pillar 1 of the institutional strategy) through a focus on excellent and distinctive teaching, learning and assessment. CBL is also prominently featured in DCU's most recent Teaching and Learning Strategy which says that "Distinctive, active approaches to teaching and learning will be our hallmark. We will also ensure that our offerings to

students are relevant despite an environment of rapid change" (DCU Office of the Vice-President for Academic Affairs, 2024, p. 5). This thesis supports the continued relevance and value of CBL as a distinctive, future-focused element of the DCU educational experience and includes curriculum design recommendations that can underpin programme (re)design strategies for progressive CBL.

5.5 Recommendations/Implications for Future Practice

It was recognised that adaptation of CBL is generally positive and necessary but adaptations should be carefully managed and communicated. To further communicate consistent understandings of CBL, the frameworks and CBL characteristics that are used within a context need to be clearly documented, highly visible and promoted widely. 'Must Have' indicators for CBL may need to be agreed but these should be flexible enough to accommodate changing circumstances. An ECIU and/or local classification scheme could be designed to highlight the different levels of CBL practice. Gallagher and Savage (2023) suggested 'Strict CBL' 'Hybrid CBL' and 'General CBL' to capture various levels of application of CBL. Similarly, Imanbayena, de Graaf, and Poortman (2023) describe a CBL implementation continuum consisting of 'Mild' 'Moderate' and 'Intense' levels of CBL in practice. This type of classification scheme could help to underline the need for transparency and accuracy, thereby supporting robust research while enabling some degree of educator autonomy to adapt elements if needed.

It is also recommended that the external stakeholder relationship should be supported and resourced appropriately. The establishment of a dedicated Challenges office and/or Challenge co-ordination resources is advised to liaise with external stakeholders and make the institutional commitment to CBL more visible. A bank of potential CBL stakeholders could be built up and a high-profile, senior management supported promotional campaign could help attract interest from industry, civil and public society organisations. Furthermore, to embed a

culture of CBL within the university, discipline-specific promotional campaigns should be conducted to raise awareness and attract staff to the method. For example, these could be faculty-specific events or there could be dedicated CBL promotion weeks. It is advised to foster a creative and supportive atmosphere to encourage experimentation and develop greater understanding of the student perspective.

The professional development of teachers is essential and a broad mix of professional learning activities is recommended to support implementation. CBL should be included in any mandatory staff training and it should be resourced to enable continuous, just-in-time learning about CBL. Training should help develop the skills and competencies needed to teach with CBL and should include support on learning to coach, managing the stakeholder relationship, and learning theory. Guidance materials and on-demand personalised support are both viewed as important. Sharing of practice is highly recommended so approaches such as communities of practice, co-teaching and/or mentoring from more experienced colleagues present valuable peer learning opportunities that should be explored.

Finally, the documentation of examples of CBL from different fields may help to stimulate adoption of CBL across a greater range of disciplines. Activities to introduce educational research through SoTL should be established where this concept is new or unusual and the connection between the teaching practice of CBL and SoTL could be strengthened. As Fanghanel et al. (2016) describe, SoTL is a broad concept encompassing concepts as diverse as reflection and inquiry into teaching, research-informed practice, and student partnership, all typically with the intent of enhancing student learning and disseminating analyses of practice to inform others. Engaging in CBL-related SoTL can, for example, provide a vehicle for academics to critically reflect on the strengths and weaknesses of their own applications of CBL, and potentially explore and contribute to the CBL scholarly literature and discourse. These activities were identified by participants in this study as important professional learning opportunities and they offer an important pathway towards anchoring CBL practice in the language of theory and prior research. Furthermore, SoTL outputs may be used to recognise effective CBL

practice, potentially being embedded within promotion frameworks/criteria and other rewards structures within individual institutions. For some universities, this recognition of SoTL outputs as well as disciplinary research may already be well established but for others, it may be a promising avenue to explore further. It should be acknowledged that SoTL, like CBL itself, needs to be adequately supported within institutional structures (Chalmers, 2011; Myatt *et al.*, 2018; Bull *et al.*, 2025) to build institutional and individual staff capacity. However it should also be acknowledged that SoTL outputs can take formats other than traditional journal articles. Novel approaches such as infographics (Keogh *et al.*, 2024) and visually-oriented case studies of CBL (Gormley *et al.*, 2025) may help to make its complex concepts more accessible.

5.6 Contribution to Knowledge

This thesis explores CBL from the perspective of leaders who are advocating and supporting others to apply the approach within the confines of ECIU and also their own institutions more generally. To my knowledge, this is the first study to focus on their perceptions specifically. While it has been highlighted that there are many examples of small-scale case studies on CBL (Gallagher and Savage, 2023; van den Beemt, van de Watering and Bots, 2023; Doulougeri *et al.*, 2024), there has been limited scholarship reporting institution-wide scenarios with a focus on the organisational barriers and enablers that may hinder or support implementation of CBL. Similarly, while leadership is recognised as important to the success of teaching and learning initiatives in general (Zhang, 2022; Deacon, Laufer and Schäfer, 2023), little has been written from the perspective of those leading CBL implementations specifically. This study contributes to addressing some of these gaps, synthesizing experiences from experienced CBL leaders from a range of disciplines while making a practical contribution to the scholarly evidence base.

This thesis also contributes to qualitative CBL-related research in highlighting the role of people in the process. Implementation of CBL is not just about specifying particular frameworks or definitions as if disseminating those is some kind of silver

bullet. This thesis recognises the complexity of very human factors that determine if and how someone will implement a new form of education–or not. It confirms earlier findings that student-centred learning (Galdames-Calderón, Stavnskær Pedersen and Rodriguez-Gomez, 2024; Helker *et al.*, 2025), real-world 'concrete' challenges, an external stakeholder relationship (Mayer, Ellinger and Simon, 2022), multidisciplinary collaborative teams (Gallagher and Savage, 2023), and the element of uncertainty (Membrillo-Hernández *et al.*, 2019) are key to CBL. It highlights perceptions of CBL as a pedagogy for societal impact (Perna, Recke and Nichols, 2023) which were not as apparent in previous studies (Leijon *et al.*, 2022). It is consistent with views on the need to recognise variety in implementation (Doulougeri *et al.*, 2022; van den Beemt, van de Watering and Bots, 2023). It adds further knowledge in relation to what we know about possible barriers and enablers to implementing CBL.

In line with my interpretive and co-constructive philosophy, I have tried to acknowledge multiple perspectives. This thesis explores CBL implementation in practice in eleven different institutions across Europe, synthesizing a variety of opinion and experiences beyond STEM disciplines which has been the dominant focus of CBL to date (van den Beemt, van de Watering and Bots, 2023a). The thesis adds more specific details to what is emerging about professional recognition and learning activities that might support implementation of CBL, describing potential approaches that could be further leveraged, subject to further research.

Finally, there is some methodological novelty in the data gathering method of showing participants a selection of definitions and asking them to unpack meaning around those. This is not an approach I have seen elsewhere in the CBL literature to date.

5.6.1 Checklist of recommendations

A checklist of key recommendations and considerations targeted towards leaders of CBL within any institution is summarised in Table 6. This checklist is intended to serve as a dialogic and strategic planning resource for CBL leaders at all levels to identify strengths within current implementations and highlight areas that would benefit from further attention. The framework of macro/meso/micro levels of leadership invoked in Chapter 1, Section 1.3.1 is now revisited to present recommendations considered most applicable to specified levels of leadership through the lens of that framework. This table therefore orientates the recommendations towards particular leadership levels, aiming to align as closely as possible to the most relevant level(s). It is evident that there is some overlap and duplication as levels (and the associated recommendations/considerations) may be context-sensitive and may not always be completely distinguishable from each other. When reading this table, leaders at different levels may potentially see value in reading the full range of implementation recommendations provided.

Table 6: Checklist of recommendations for CBL leaders to consider

Recommendations	**Questions and examples to guide implementation at macro/meso/micro levels of leadership**
Clarify understandings of CBL: Balance accuracy of terminology with the need to accommodate variety in implementation	• Does the institution subscribe to a particular definition of CBL and if so is it widely shared? [macro, meso] • Is sufficiently detailed and accessible CBL design guidance e.g. booklets, websites, short online courses, case studies) available and does it include guidance on the different teaching role, key learning theory and literature, assessment approaches, the learner-driven ethos, and the societal impact emphasis in CBL? [macro, meso] • Is a CBL educator going to use some or all of the phases of CBL within an implementation and how will variations be explained to students? [micro] • Have the core characteristics, including the minimum 'must haves' of CBL for the institution, been discussed and documented? [macro, meso] • Is a classification scheme indicating various possible levels/varieties of CBL implementation needed to support practice and research? If so, what should each level include? [macro, meso] • Are conversations happening about how CBL differs from and/or extends previously-established pedagogies such as PBL? [macro, meso, micro]
Illuminate the external stakeholder	• How will external stakeholders be inspired and encouraged to take part in a CBL relationship with the university? e.g. through a senior

relationship: Highlight key elements to inform necessary supports	management-led promotional campaign with industry and civil society organisations [macro, meso] ● Who will identify potential external stakeholders and how will those relationships be maintained over time? e.g. via a dedicated challenges office or external stakeholder co-ordination resource(s) [meso]; via academic personal networks [micro] ● How can external stakeholders potentially contribute to CBL experiences? e.g. as a source of feedback and expertise, as challenge originator, as co-assessor, or other [macro, meso, micro] ● How and when will external stakeholders be educated and prepared for academic expectations with CBL? (e.g. a stakeholder agreement template) [meso, micro] ● Is it clear what an 'external' stakeholder means? Is it always an entity outside the university or could they be external to the faculty or programme? [macro, meso]
Tailor professional development to CBL: Offer a mix of CBL-targeted professional learning opportunities	● What should the CBL professional learning mix include? e.g. inclusion of CBL in mandatory and continuous staff training; personalized access to pedagogical support/expertise; workshops, webinars, summer schools, hackathons/creathons; sharing of experiences through communities of practice [meso, micro]; collaborative learning from peers via peer observation, co-teaching, mentoring from more experienced colleagues [micro, meso] and/or study visits to other institutions; SoTL inquiries on CBL practice [macro, meso, micro] ● What topics should be addressed? e.g. learning how to coach; involvement of external partners; students as co-designers; societal impact; learning driven by challenges; and working in interdisciplinary teams as described in Chapel and De Pryck (2022) [macro, meso]
Recognise and Reward: Consider various ways of incentivising staff to start and sustain quality CBL practice	● How can academic staff be incentivised to implement CBL and engage with the required professional learning? e.g. integrate innovative teaching more effectively into KPIs/academic progression and promotion frameworks; create local task forces with a high degree of autonomy within schools/departments; buy out staff time for applying CBL in teaching and fund further resourcing (such as teaching assistants and student champions) to support implementation; provide more evidence-based data to prove the return on investment of teaching through CBL; showcase the learning and insights of students who have experienced CBL [macro, meso] ● What possible forms or structures of reward may be appropriate to recognise and support CBL knowledge and expertise? e.g. recognised qualifications in teaching and learning, shareable badges; funding/grants to support CBL initiatives; special celebrations such as institutional teaching excellence awards or prizes; recognition via teaching recognition/fellowship schemes such as Advance HE (Advance HE, 2025); recognition of CBL SoTL outputs in promotion criteria [macro, meso] ● What forms of recognition might CBL educators be able to pursue independently of institutional supports? e.g. SoTL inquiries, locally-relevant professional recognition opportunities, microcredentials [micro]
Develop enabling systems/structures/ policies to support CBL in curriculum design: Design CBL	• How can CBL be more effectively designed at a programme level? e.g base CBL more explicitly on the desired learning outcomes and the types of professional skills that the educator is seeking to develop [micro]; employ strategic use of CBL to avoid student overload [micro]; strengthen linking of CBL projects across curricula [meso]; mandate

at a programme level	academic/educational developer quality control in curriculum design [meso]; pay greater attention to the principles of constructive alignment [micro], ensuring learning theory is part of introductory pedagogical guidance [macro, meso] • How can multi/inter/transdisciplinarity be better supported in practice? e.g. via creative timetabling/longer blocks of time [meso]; more investment in resources to provide hands-on support to teachers around group work, multi/inter/transdisciplinarity, and assessment [meso]; CBL-appropriate spaces/infrastructure [meso]; use of synoptic and integrated assessment strategies [meso, micro] • Can existing programme design frameworks, tools, and processes be leveraged or should new ones be developed? [macro, meso] • How can CBL educators engage with others, formally and informally, in collaborative curriculum design to support a programme-level view? [meso, micro]
Articulate the institutional vision for CBL: Show commitment, culture, and connection with current institutional priorities	• What key strategic priorities will CBL be aligned with? e.g. GenAI; the institutional Teaching & Learning strategy; development of Transversal Skills; ESD; promoting a culture of student partnership [macro, meso, micro] • What approaches might help implement CBL on a wider scale across the institution? e.g. potentially require CBL in all courses while recognising disciplinary differences; mandate teachers to dedicate a specified number of credits to CBL; require students to take at least one challenge over their time at university or one challenge a year; link CBL to placement/internship experiences [macro, meso] • How can a supportive atmosphere that encourages staff to try new innovative approaches be fostered? e.g. high-profile faculty-specific promotional events; launch of a CBL year with 'no strings' exploration; sharing of presentations/success stories from both teachers and students who have experienced CBL [macro, meso]

Many of the above activities are dependent on the need for adequate funding and resourcing of CBL activity, a topic which is discussed further in Section 5.4 on recommendations/implications for policy.

5.7 Limitations of the thesis

This study used multiple sources of information within a mono research method (semi-structured interviews) to explore perceptions of challenge-based learning specifically from the perspectives of those leading its implementation.

There could have been benefits to using more than one type of data from a qualitative paradigm (Tracy, 2010; Creswell and Poth, 2018) or indeed considering a mixed methods approach (Johnson and Onwuegbuzie, 2004; Morgan, 2007).

Time, research focus, and the limitations of wordcount were issues I had to consider, particularly as 19 interviews generated significant data to analyse. Therefore I drew upon the advice of Silverman (2022) who sounded warning notes about the risks of working with multiple datasets such as the additional time required for analysis and potential paradigmatic controversy in trying to establish a 'true' state of affairs. My approach also underlined the importance of a second (post analysis) stage of member reflection which was undertaken to provide a form of respondent validation on my findings, enhance credibility, and reduce the chances of uncritical bias.

It was not a goal of this study to generalize the findings to a larger context but the principle of transferability was sought. A purposive sampling strategy was used. While this has certain advantages, it should be acknowledged that an alternative sampling approach (such as self-selection of participants) might have had different results and yielded a more diverse sample. It should also be acknowledged that the sampling strategy necessitated a small number of participants (1-2) from each institution and not every institution within ECIU participated. However, through detailed descriptions of the participants, the ECIU and pedagogical contexts, and transparency about my data gathering and analytic approaches, I believe I have established transferability whereby others can read and assess the potential relevance of the findings to their context.

5.8 Recommendations for Future Research

In view of the importance attached by participants, more work needs to be done to research the forms of recognition that are happening specifically with respect to CBL. A wider engagement with SoTL could potentially fulfil multiple objectives of CBL implementation so further research about supporting CBL SoTL activities across an institution would be timely for those in leadership roles.

Further evaluation of CBL professional learning activities (such as learning communities) would help to inform current or potential approaches. I concur with the statement from Doulougeri et al. (2022, p. 63) that:

> Professional development of teachers represents a critical component in scaling up CBL across the curriculum, especially regarding scaffolding of student learning, finding a balance between openness, and giving students structure in their learning process and finally assessment of interdisciplinary group work. Thus, future research should explore the competencies teachers need to develop to fulfill their role within CBL and how to develop these competencies.

As recent publications indicate (O'Sullivan *et al.*, 2025), there is more to be learned about the external stakeholder dynamics in CBL. As a starting point, it is recommended to carry out analysis/mapping of existing external stakeholder involvements to explore how they are currently being involved in CBL (or associated pedagogies) so that this data can inform future pedagogical practice.

Further research is needed to identify for what purpose technology is being used in CBL experiences and if technology can play more of a supporting role. Given the emphasis on technology in some published research, its educational effects should be investigated further.

Finally, the time and costs of CBL need to be researched, enabling analysis of where time is being spent by teachers so it can be appropriately resourced. This could include research on how students and teaching assistants can contribute to the experience of CBL.

5.9 Final reflection

On March 30th, 2020, in what seems like decades ago, I applied for this Doctorate in Education to help me "develop skills in research, evaluation, and high-level reflection on practice". In later years I chose the research topic of CBL as I wanted to learn more about that approach so I could support others to implement it effectively in their practice. Coming full circle in the doctoral process, it turned out that both of these motivations have become complementary to one another in more ways than expected.

When I first encountered CBL, I was working with staff in an academic developer pedagogical support capacity. It was clear that some of those staff were confused

by what CBL is, unsure of the difference between CBL and other pedagogies, and nervous of the time and effort it might entail to bring this resource-demanding approach into their teaching. When I became chair of the DCU CBL working group, I shared some of this discomfort, particularly as I was playing a leadership role on an approach that was very new to me also.

Keen to offer practical solutions that would help, I realise now that in the early days, I was focused on 'how to do CBL' at first, mainly focusing on providing documentation, workshops, and definitions as well as just-in-time individual support. As the current study shows, these are all needed but are only part of the story. The impact of the first CBL-based hackathon for academic staff at DCU in 2022 was an important moment that confirmed that experiential, collaborative professional learning was likely to be part of the implementation picture. Through my interviews with leaders of CBL at multiple European universities, CBLs potential impact on society became even more vivid but their voices also spoke of several practical and very human realities of implementation that do need to be acknowledged, recognised, and addressed. I was particularly struck by what I learned about the external stakeholder involvement and am glad to play a role in highlighting what seem to be common staff concerns. Those conversations have fortunately also validated some existing strategies – e.g. providing various forms of pedagogical support, defining CBL and how it looks and evolves at DCU, and enabling and supporting collaborative learning about CBL in multiple ways. Those should all continue, drawing on the lessons about enabling educator autonomy while clearly communicating any adaptations made.

The need for robust evidence and transparency around CBL is clear but it is also apparent that, in some disciplines, staff expertise in conducting educational research cannot be assumed. I hope that supporting staff to conduct scholarly research into CBL is something I could develop further as an academic developer. However there seems little point in developing a bank of CBL scholarship that is not read, debated, and contextualised so opportunities for staff to engage with such scholarship needs to be integrated into professional learning opportunities that will provide at least some space and time for this to happen. This is something

I intend to advocate for further as well as providing the required professional learning to support research activity into CBL and indeed other aspects of higher education.

To return to the ideas in my participant quote at the start of this thesis, I am still not sure if I have the right 'answers' and certainly there are more questions to be researched around the implementation of CBL. But I hope that informed by what I have learned through this doctorate, I can better advocate for the most impactful CBL experience possible and positively support university teachers with whatever I can offer to help make that happen.

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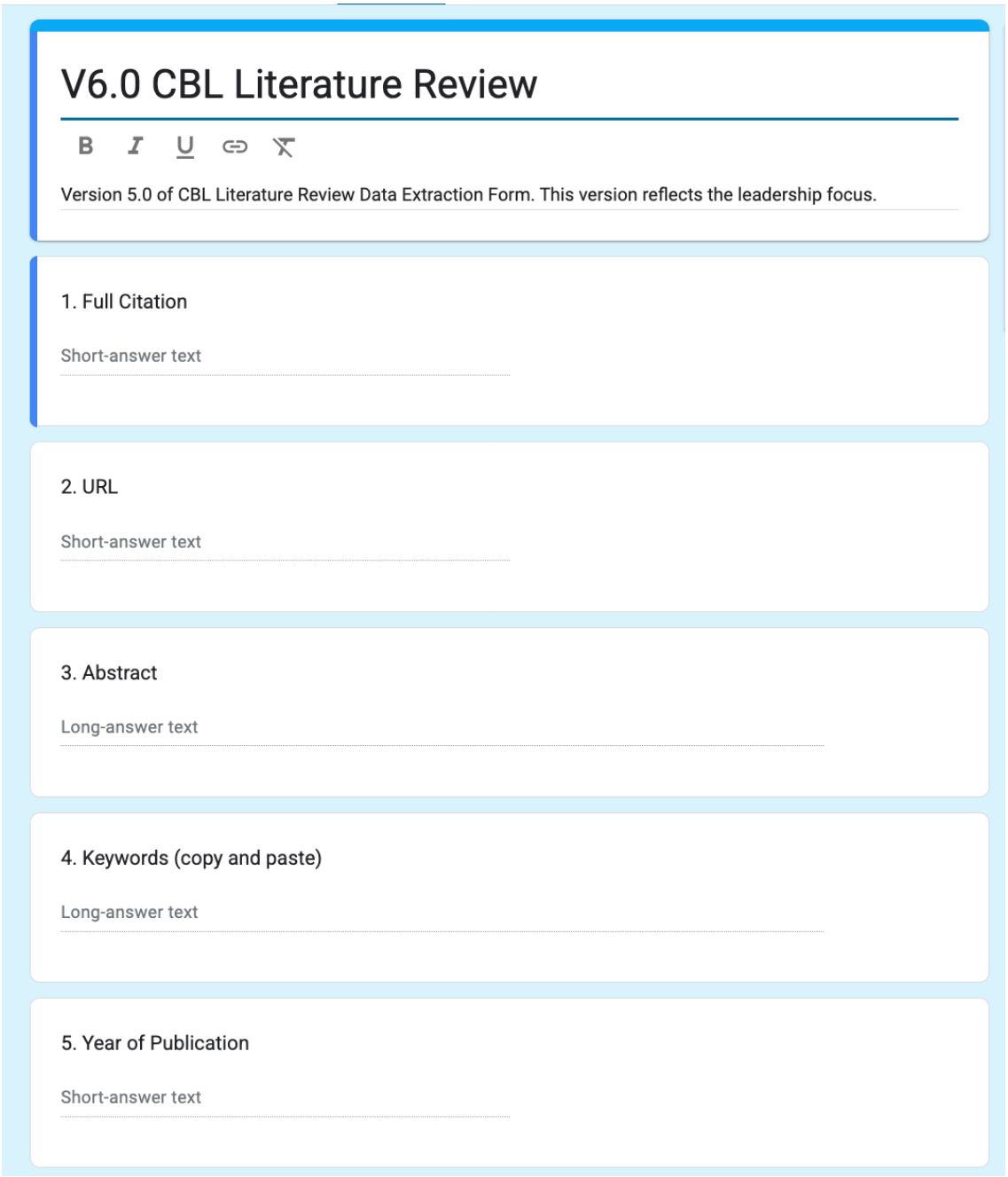
Appendices

Appendix A: Data Extraction Form

The Data Extraction Form (DEF) is presented below:



V6.0 CBL Literature Review

Version 5.0 of CBL Literature Review Data Extraction Form. This version reflects the leadership focus.

1. Full Citation

Short-answer text

2. URL

Short-answer text

3. Abstract

Long-answer text

4. Keywords (copy and paste)

Long-answer text

5. Year of Publication

Short-answer text

6. Type of Publication

1. Book
2. Journal Article
3. Conference Paper - Abstract Only
4. Conference Paper - Full Text
5. Policy Paper
6. Action Plan
7. Report
8. Discussion or White Paper
9. Other

7. Location of Study (where the study was carried out):

- [ ] Continent
- [ ] Country
- [ ] Region
- [ ] Other: .....

8. Specify Location of Study

Short-answer text .....

9. Main Purpose of Publication

1. Broad Education Focus
2. Disciplinary Focus
3. Theoretical Focus
4. Mixture of above
5. Other

10. Subject Discipline of Study (Based on **Subject discipline categorised by broad field of study as per HEA**: https://hea.ie/statistics/data-for-download-and-visualisations/key-facts-figures/)

- [ ] Agriculture, forestry, fisheries and veterinary
- [ ] Arts and humanities
- [ ] Business, administration and law
- [ ] Education
- [ ] Natural sciences, mathematics and statistics
- [ ] Engineering, manufacturing and construction
- [ ] Generic programmes and qualifications
- [ ] Health and welfare
- [ ] Information and Communication Technologies
- [ ] Social sciences, journalism and information
- [ ] Services
- [ ] Other: .....

11. Scale of Focus or Interest

1. Institutional
2. Regional
3. National
4. European
5. International

12. How is CBL defined?

1. Provides a definition
2. Supports existing definition already in the literature
3. Does not support a single definition
4. No reference to any definition

13. If offers own definition or supports an existing definition from the literature, please describe:

Long-answer text

14. What are the underlying drivers mentioned for using CBL?

- [ ] To enhance the institution's reputation
- [ ] To develop closer links with industry
- [ ] To attract more students to the institution
- [ ] To enhance the quality of the student learning experience
- [ ] To support the UN Sustainable Development Goals

15. What is the dominant positioning of CBL?

- [ ] Innovative Pedagogy Oriented
- [ ] Societal Impact Oriented
- [ ] Multidisciplinary/Interdisciplinary Oriented
- [ ] Transversal Skills & Competencies Oriented
- [ ] Disciplinary Skills & Competencies Oriented
- [ ] Unclear
- [ ] Other: .....

16. With regard to the positioning of CBL, which of the following is evident in this study?

- ( ) Single positioning angle
- ( ) Multiple positioning angles

17. What dimensions of CBL were identified in the study based on the framework presented by Gallagher and Savage, 2020? https://doi-org.dcu.idm.oclc.org/10.1080/13562517.2020.186335)

- [ ] Global Themes
- [ ] Real-world Challenges
- [ ] Collaboration
- [ ] Technology
- [ ] Flexibility
- [ ] Multi-disciplinarity
- [ ] Innovation and creativity
- [ ] Challenge Definition

18. Reports its own empirical data (where data is collected in the study rather than reporting on other literature)

1. Yes
2. No

19. Type of Empirical Data Collected

- [ ] Quantitative Data
- [ ] Qualitative Data
- [ ] Both Quantitative & Qualitative Data
- [ ] Other: .....

20. If data, what sample or source? Select all that apply.

- [ ] Teachers
- [ ] Teaching Support Professionals
- [ ] Learners/Students
- [ ] External Stakeholders e.g. Industry Partner
- [ ] Other: .....

21. If data exists, how would you rate the methodological design?

- ( ) Weak
- ( ) Moderate
- ( ) Strong

22. Any comments on methodology?

Long-answer text

23. What types of pedagogies are explicitly referenced in relation to CBL?

- [ ] Experiential Learning
- [ ] Active Learning
- [ ] Problem-based Learning
- [ ] Design-based Learning
- [ ] Project-based Learning
- [ ] Inquiry-based Learning
- [ ] Unclear
- [ ] Other:

24. Are any pedagogies identified as root traditions or sources of influence in the emergence of CBL?

- ( ) Yes
- ( ) No

25. If yes, please describe.

Long-answer text

26. What, if any, learning theories are explicitly mentioned in the context of CBL?

- [ ] Behaviourism
- [ ] Cognitivism
- [ ] Constructivism
- [ ] Socio Constructivism
- [ ] Connectivism
- [ ] None discernible
- [ ] Other: _____

27. Is it underpinned by an explicit theoretical framework?

- ( ) Yes
- ( ) No
- ( ) Unclear

28. If yes or unclear, elaborate.

Long-answer text

29. Is it underpinned by an explicit CBL framework?

- ( ) Yes
- ( ) No
- ( ) Unclear

30. If yes or unclear, provide details.

Long-answer text

31. What forms/timeframes of CBL are described?

- [ ] Short intensive episodes of CBL over 1-5 days (eg Hackathon)
- [ ] CBL experience over 1-4 weeks
- [ ] CBL experience over an entire semester
- [ ] CBL experience over an academic year
- [ ] CBL experience across an entire degree programme (>1 years)
- [ ] Unclear
- [ ] Other:

32. Does the study describe evidence of improved learning outcomes?

- ( ) Yes
- ( ) No

33. If yes, elaborate.

Long-answer text

34. What digital technologies are mentioned? (Categories drawn from Bower and Torrington (2020) typology of free web-based learning technologies)

- [ ] Text based tools (for synchronous or asynchronous discussions; note-taking; document creation)
- [ ] Image based tools (including image sharing; mindmapping; diagramming, wordclouds)
- [ ] Audio tools (for audio sharing, creation and editing)
- [ ] Video tools (for video sharing, creation and editing)
- [ ] Multimodal production tools (eg digital pinboards and presentation tools)
- [ ] Digital storytelling tools (eg online book creation; comic strips; animated video)
- [ ] Website creation tools (for individual websites; wikis; blogs)
- [ ] Knowledge organisation and sharing tools (eg file sharing sites, social bookmarking, timeline creators)
- [ ] Data analysis tools (for surveys; spreadsheets; infographics)
- [ ] 3D modelling tools
- [ ] Coding tools (eg Scratch)
- [ ] Assessment tools (eg for online quizzes)
- [ ] Social networking systems (eg Facebook, Research Gate, Academia.edu)
- [ ] Learning Management Systems (eg Moodle, Google Classroom)
- [ ] Web conferencing tools (eg Zoom, Discord)
- [ ] Other: .....

35. Does it refer to barriers and/or enablers for successful uptake or implementation of CBL?

- ◯ Yes
- ◯ No
- ◯ Maybe

36. If yes or maybe, how in depth is the description of barriers and/or enablers?

Long-answer text

37. Does the study state explicit implications for the future?

- ◯ Yes
- ◯ No

38. If yes, who or what are these implications directed towards?

1. Policy
2. Practice
3. Theory
4. Research
5. Unclear

39. What are these implications?

Long-answer text

40. Brief summary of critical interpretation (including methodology, key findings and critical reflection of contribution to knowledge) 200 words max.

Long-answer text

41. Valuable Quotes

Long-answer text

42. How did you source this study?

- [ ] From stated search strategy
- [ ] From conference/event
- [ ] From personal contact
- [ ] From a reference list
- [ ] Other:

A summarised version of the design and development process for this form is shown below, drawn from PhD symposium presentation given at EDEN 2023.

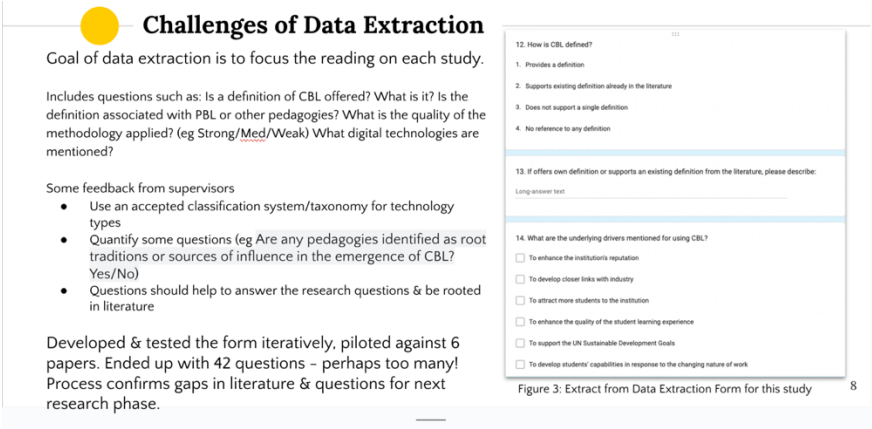


Figure 3: Extract from Data Extraction Form for this study

Appendix B: Studies included in literature review

Year	Author(s)	Title of Publication	Publication Source	How Discovered
2011	Crown, S. W., Fuentes, A. A., & Freeman, R. A.	A Successful Plan for Faculty Development that has a Lasting Impact	Conference Paper presented at 2011 American Society for Engineering Education (ASEE) Annual Conference & Exposition, Vancouver, BC.	Scopus, Web of Science
2012	Crown, S., Fuentes, A. & Freeman, R.	Pedagogy for Pedagogy: Using a Wiki to Promote the Adoption, Development, and Implementation of Challenge-based Instruction in STEM Education	Conference paper in 2012 American Society for Engineering Education ASEE Annual Conference & Exposition Proceedings. 2012 ASEE Annual Conference & Exposition, San Antonio, Texas: ASEE Conferences, p. 25.1030.1-25.1030.13.	Scopus, Web of Science
2015	Malmqvist, J., Rådberg, K.K. & Lundqvist, U.	Comparative Analysis of Challenge-based Learning Experiences	Conference paper in 11th International CDIO Conference, Chengdu University of Information Technology. China, p. 13.	Pearl from reference list
2018	Cruger, K.M.	Applying challenge-based learning in the (feminist)	Journal Article in Communication Teacher, 32(2) pp.	Scopus

Year	Author(s)	Title of Publication	Publication Source	How Discovered
		communication classroom: Positioning students as knowledgeable change agents	87-101.	
2018	Ramirez-Mendoza, R.A., Cruz-Matus, L.A., Vazquez-Lepe, E., Rios, H., Cabeza-Azpiazu, L., Siller, H., Ahuett-Garza, H. & Orta-Castanon, P.	Towards a disruptive active learning engineering education	Conference paper in IEEE Global Engineering Education Conference (EDUCON), pp. 1251–1258.	Scopus, Web of Science
2019	Membrillo-Hernánde, J., Ramírez-Cadena, M., Martínez-Acosta, M., Cruz-Gómez, E., Muňoz-Díaz, E., & Elizalde, H.	Challenge based learning: the importance of world-leading companies as training partners	Journal Article in International Journal on Interactive Design and Manufacturing (IJIDeM), 13(3), pp. 1103–1113.	Scopus
2019	Högfeldt, A.K., Rosén, A., Mwase, C., Lantz, A., Gumaelius, L., Shayo, E., Lujara, S., & Mvungi, N.	Mutual Capacity Building through North-South Collaboration Using Challenge-Driven Education	Journal Article in Sustainability, 11(24), p. 7236.	Scopus, Web of Science
2019	Félix-Herrán, L.C., Rendon-Nava, A.E. & Nieto Jalil, J.M.	Challenge-based learning: an I-semester for experiential learning in Mechatronics Engineering	Journal Article in International Journal on Interactive Design and Manufacturing (IJIDeM), 13(4), pp.1367–1383.	Scopus
2020	Koeper, I., Shapter, J., North, V., & Houston, D.	Turning chemistry education on its head: Design,	Journal Article in Journal of University	Education Research Complete,

Year	Author(s)	Title of Publication	Publication Source	How Discovered
		experience and evaluation of a learning-centred 'Modern Chemistry' subject	Teaching & Learning Practice, 17(3)	Australian Education Index, Web of Science, Scopus
2020	Rådberg, K.K., Lundqvist, U., Malmqvist & Svensson, O.H.	From CDIO to challenge-based learning experiences – expanding student learning as well as societal impact?	Journal Article in European Journal of Engineering Education, 45:1, 22-37.	Education Research Complete, Scopus, Web of Science
2020	Vilalta-Perdomo, E.L., Michel-Villarreal, R., Lakshmi, G. and Ge, C.	Challenge-based learning: A multidisciplinary teaching and learning approach in the digital era–UoL4. 0 challenge: A CBL implementation	Book chapter in Engineering education trends in the digital era (pp. 150-176). IGI Global.	Scopus
2021	Shakila, N.U., Nizamis, K., Poortman, C. & van der Veen, J.T.	Interdisciplinary Challenge-Based Learning: Science to Society	Conference paper in SEFI 2021 49th annual conference proceedings (p. 1491).	Scopus
2021	Van den Beemt, A., Van den Watering, G. & Bots, M.	Variety in Challenge-Based Learning in Higher Education	Conference paper in SEFI 2021 49th Annual conference: proceedings. Berlin: SEFI. pp.598-609.	Scopus
2021	Membrillo-Hernández, J., de Jesús Ramírez-	Implementation of the challenge-based learning	International Journal on Interactive Design	Scopus, Web of Science

Year	Author(s)	Title of Publication	Publication Source	How Discovered
	Cadena, M., Ramírez-Medrano, A., García-Castelan, R.M.G., & García-García, R.	approach in Academic Engineering Programs	and Manufacturing, 15, pp. 287–298.	
2021	Gunnarsson, S., & Swartz, M.	Applying the CDIO framework when developing the ECIU University	Conference paper in 17th International CDIO Conference, hosted online by Chulalongkorn University & Rajamangala University of Technology Thanyaburi, Bangkok, Thailand, June 21-23, 2021. (pp. 106-115).	Professional Network
2022	Christersson, C. E., Melin, M., Widén, P., Ekelund, N., Christensen, J., Lundegren, N., & Staaf, P.	Challenge-Based Learning in Higher Education: A Malmö University Position Paper	Journal Article in International Journal of Innovative Teaching and Learning in Higher Education (IJITLHE), 3(1), 1-14.	Professional network
2022	Vilalta-Perdomo, E., Michel-Villarreal, R., & Thierry-Aguilera, R.	Integrating Industry 4.0 in Higher Education Using Challenge-Based Learning: An Intervention in Operations Management	Journal Article in Education Sciences. 12(10):663.	Education Research Complete, Scopus, Web of Science
2022	Rosén, A., Peters, A.K., Daniels, M., Danielsson, M., Hemphälä, J., Håkansson, M.,	Transformation-Driving Education: Perspectives Emerging in a Dialogue between	Conference paper in 2022 IEEE Frontiers in Education Conference (FIE)	Scopus, Web of Science

Year	Author(s)	Title of Publication	Publication Source	How Discovered
	Sandström, G.O.	Teachers with Experiences from Challenge-Driven Education	pp. 1–9.	
2022	Doulougeri, K., van den Beemt, A., Vermunt, J.D., Bots, M., & Bombaerts, G.	Challenge-Based Learning in Engineering Education: Toward Mapping the Landscape and Guiding Educational Practice	Book chapter in E. Vilalta-Perdomo et al. (eds) The Emerald Handbook of Challenge Based Learning. Emerald Publishing Limited, pp. 35–68.	Professional Network
2022	De Stefani, P. and Han, L.	An Inter-University CBL Course and Its Reception by the Student Body: Reflections and Lessons Learned (in Times of COVID-19)	Journal Article in Frontiers in Education, 7.	Scopus, Web of Science
2022	Lara-Prieto, V. & Flores-Garza, G.E.	iWeek experience: the innovation challenges of digital transformation in industry	Journal Article in International Journal on Interactive Design and Manufacturing (IJIDeM), 16(1), pp. 81–98.	Scopus, Web of Science
2022	Gallagher, S.E. and Savage, T.	Challenge Based Learning: Recommendations for the Future of Higher Education	Book chapter in E. Vilalta-Perdomo et al. (eds) The Emerald Handbook of Challenge Based Learning. Emerald Publishing Limited, pp. 391–411.	Professional Network

Year	Author(s)	Title of Publication	Publication Source	How Discovered
2022	Chapel, L. and DePryck, K.	Building a multi-tier Maturity Model for introducing Challenge Based Learning. Opportunities for teachers' professional development	Conference paper in SITE 2022--Society for Information Technology & Teacher Education International Conference.	Found via Innovating Pedagogy 2023 which included link to research gate. Link was sent via Professional Network.
2022	Reymen, I., Bruns, M., Lazendic-Galloway, J., Helker, K., Cardona, V.C., & Vermunt, J.D.	Creating a Learning Ecosystem for Developing, Sustaining, and Disseminating CBL the Case of TU/e Innovation Space	Book chapter in E. Vilalta-Perdomo et al. (eds) The Emerald Handbook of Challenge Based Learning. Emerald Publishing Limited, pp. 13–33.	Professional Network
2023	van den Beemt, A., van de Watering, G. & Bots, M.	Conceptualising variety in challenge-based learning in higher education: the CBL-compass	Journal Article in European Journal of Engineering Education, pp. 1–18.	Academic Search Complete, Scopus and Web of Science
2023	van den Beemt, A., Vázquez-Villegas, P., Gómez Puente, S., O'Riordan, F., Gormley, C., Chiang, F.K., Leng, C., Caratozzolo, P., Zavala, G., & Membrillo-Hernández, J.	Taking the Challenge: An Exploratory Study of the Challenge-Based Learning Context in Higher Education Institutions across Three Different Continents	Journal Article in Education Sciences, 13(3), 234.	Scopus, Web of Science
2023	Lara-Prieto , V., Ruiz-Cantisani , M. I., Arrambide-Leal , E. J.,	Challenge-Based Learning Strategies Using	Journal Article in International Journal of	Scopus, Web of Science

Year	Author(s)	Title of Publication	Publication Source	How Discovered
	Cruz-Hinojosa , J. de la, Mojica , M., Rivas-Pimentel , J. R., & Membrillo-Hernández, J.	Technological Innovations in Industrial, Mechanical and Mechatronics Engineering Programs	Instruction, 16(1), 261-276.	
2023	Daunorienė, A. & Ellinger, D.	Facilitating and Hindering Aspects of Technology-Enriched Challenge-Based Learning in ECIU University, a European University International Network Initiative	Conference Paper in European Conference on Technology Enhanced Learning	Scopus, Web of Science
2023	Helker, K, Michel, S., & Bots, M.	Congruence And Friction Between Teachers' Intentions And Students' Perceptions Of CBL Courses	Conference paper in European Society for Engineering Education (SEFI), 51st Annual Conference.	Scopus
2023	Imanbayeva, A., De Graaf, R., & Poortman, C.	Challenge-Based Learning In Courses: The Implementation Continuum	Conference paper in European Society for Engineering Education (SEFI), 51st Annual Conference.	Scopus
2024	Nizamis, K.	Challenge-Based Learning In Practice: Redesign And Evaluation Of An Interdisciplinary Minor	Conference Proceedings of the 52nd Annual Conference of SEFI, Lausanne, Switzerland.	Scopus

Year	Author(s)	Title of Publication	Publication Source	How Discovered
2024	Vasquez-Lopez V., Millan-Ramos M. & Maldonado-Carrillo R.	Strategies for effective CBL implementation: from company selection to course evaluation	Journal Article in Frontiers in Education, 9. 1413974.	Scopus
2024	García-García, R.M., Lara, V., Membrillo-Hernádez, J. & Ruiz-Cantisani, M.I.	Developing transversal (soft) competencies in Higher Education Engineering students: the role of the Training Partners in the challenge-based learning model	Conference Paper in 22nd LACCEI International Multi-Conference for Engineering, Education and Technology (LACCEI 2024)	Scopus
2024	Santos-Díaz, A.,Montesinos, L., Barrera-Esparza, M., del Mar Perez-Desentis, M. & Salinas-Navarro, D.E.	Implementing a challenge-based learning experience in a bioinstrumentation blended course	Journal Article in BMC Medical Education, 24.	Scopus, Web of Science

Appendix C: Recruitment Advertisement

The following is the text of the participant recruitment email sent to the 14 ECIU Institutional Coordinators whose names are published on the ECIU website at this address: https://www.eciu.eu/about-eciu#local-coordinators).

Dear [ECIU Institutional Coordinator],

I am contacting you to request your support in relation to a forthcoming doctoral study on CBL. This study will focus on perceptions of Challenge-Based Learning among those leading its implementation in ECIU partner universities. The study has already been approved in principle by Katrin Dirksen (ECIU Secretary General) and DCU Research Ethics Committee (see approval documents attached).

As part of the participant recruitment process, I am contacting all 14 ECIU Institutional Coordinators to request certain information. As one of those coordinators may I please request a response on the following items:

- Confirmation on whether or not your institution is willing to participate in this study along with specific advice on any institutional approval processes that would need to be followed
- Nomination of two leaders of CBL implementation from your institution who would be suitable potential candidates for interview

I hope that you will consider this request positively and I appreciate the time and effort involved. There will be a number of benefits to participation, including:

- ECIU leadership and management should potentially benefit from the findings of this study to inform future investments and maximise impact. The researcher is happy to provide a brief presentation of the findings to ECIU partner universities should they wish to learn more.
- Participants will be part of a learning community collectively involved in rolling out CBL experiences. They will likely have a strong interest in hearing about the factors that influence implementation of CBL so may appreciate having an opportunity to contribute to and learn from the conversation.
- Participants may appreciate the reflective opportunity on CBL implementation that the interview will aspire to create.
- Participants may appreciate the early access to findings that the interviewer will provide to all participants and may want to apply recommendations at the earliest opportunity, where relevant. The identification of recommendations may be of practical benefit to participants in terms of embedding CBL at their own institutions.

As per the research ethics application, every effort will be made to anonymise individuals and institutions and protect the identity of all those involved.

If possible, I would be grateful if you could respond by [one month of email being sent]. Should you have any further questions, please see contact information for me and my supervisors below.

Clare Gormley	DCU Teaching Enhancement Unit	clare.gormley@dcu.ie
Dr Enda Donlon	DCU Institute of Education	enda.donlon@dcu.ie
Prof. Mark Brown	National Institute for Digital Learning	mark.brown@dcu.ie

Thanks in advance for your assistance.

With best wishes,

Clare Gormley

EdD Doctoral Candidate with DCU Institute of Education

Appendix D: Interview Guide

1. How long have you been working with ECIU?
2. How would you describe your role or remit with ECIU?
3. How many years has your own university been implementing Challenge-Based Learning (CBL)?
4. Can you tell me more about what draws you personally to Challenge-Based Learning (CBL) as an educational concept?
5. What would you describe as distinctive about CBL from other educational models or approaches?
6. I'm going to show you a number of definitions of Challenge-Based Learning that appear in the literature. Looking at these four definitions, which of these is closest to your understanding of what CBL is? Take your time reading them – they are in no particular order. Can you explain why you have chosen that definition in particular?
7. If you had to rank the definitions in order of your preference, what would be your second, third and fourth choice?
8. Is there a different definition of CBL that appears elsewhere in the literature you would subscribe to, and if so, what is it, and why do you prefer it?
9. How close is your preferred definition of CBL to the one that is informing the work of the ECIU?
10. Some literature highlights that there is significant variety in the 'flavours' or characteristics of CBL that are implemented in practice. What are your thoughts on the pros and cons of developing local flavours to fit the educational context?
11. I'm going to move on to some of the implementation aspects of CBL. As someone leading a CBL initiative at your institution, can you tell me first about what you perceive as the biggest barriers to successfully implementing CBL in practice?
12. To recap, what would you say is the single biggest barrier?
13. So having explored the barriers, what do you see as possible enablers to successfully implementing CBL in practice?
14. To recap, what would you say is the single biggest enabler?
15. I would particularly like to hear your views on the type and form of professional learning (i.e. CPD) for CBL that you think is going to be most impactful for academic teaching staff?
16. What do you think is the best way to incentivise teaching staff to engage with CBL?
17. If you were asked by the University Rector to develop a major new plan for the effective implementation of CBL across the institution on a larger scale, what specific actions would you recommend? Feel free to be practical, creative and/or provocative!
18. What or who have you found most helpful in your thinking about CBL and the challenges of successfully implementing it in your institution?
19. Is there anything further you would like to add?

Thank you.

Appendix E: Information Sheet/Plain Language Statements

Introduction to the Research Study
Title: Perceptions of Challenge-Based Learning among those leading its implementation in ECIU universities
Principal Investigators (PI): Clare Gormley, DCU Teaching Enhancement Unit (clare.gormley@dcu.ie); Dr Enda Donlon, DCU Institute of Education (enda.donlon@dcu.ie); Prof Mark Brown, National Institute for Digital Learning (mark.brown@dcu.ie)

About this research
This research has come about because there is sometimes an implementation gap between the rhetoric and the reality of putting Challenge-Based Learning (CBL) into practice. While there are many examples of small-scale case studies on CBL experiences, there is limited research on the barriers and enablers influencing implementation. Similarly, while leadership is recognised as important to the success of teaching and learning initiatives in general, little has been written from the perspective of those leading CBL implementations specifically. This study aims to contribute to addressing these gaps in knowledge.

Purpose of the research
The study seeks to find out: What are the perceptions of Challenge-Based Learning among those leading its implementation in ECIU partner universities? This information will potentially inform educators, policymakers and educational leaders at multiple levels.

Participant involvement
You are receiving this email as you will have been nominated by the ECIU Institutional Coordinator of your university as a potential participant in this study and permission for your institution to take part will already have been given. If you agree to participate, you are asked to be interviewed as a leader in implementing CBL. It is entirely your decision as to whether or not you wish to agree to being interviewed. If you do agree, the interview will take place via Zoom (for interviews outside Ireland) or in-person (for interviews in Ireland) and will be recorded. It will be 60 minutes (max.) in duration and an interview guide is attached to provide further information on the type of questions that will be asked. You will be provided with a transcript of the interview afterwards which will give you the opportunity to add, remove, or clarify statements as you wish. There are no consequences for not choosing to respond to this invitation. Participant involvement is voluntary and participants may withdraw from this research study at any point with no consequence whatsoever. If you wish to obtain access to any data that you have provided, you are invited to email the lead researcher (clare.gormley@dcu.ie) and/or supervisors listed above, or the DCU Data Protection Office (data.protection@dcu.ie) to request access. You are also welcome to express any adverse/unexpected outcomes, should they arise at any time.

Data Protection/Privacy
The anonymity of participants will be protected in various ways. Data collected from the interviews will be anonymised at the point of transcription through anonymous identifiers and the lead researcher will do the transcribing. Only DCU ISS approved and protected technologies will be employed for recording and transcription. All recordings and transcripts will be stored securely in DCU Apps Google Drive and will not be accessible to anyone outside the research team.

In the findings and the write up, participants will only ever be referred to by their anonymous identifier. The anonymity of individual participants will be protected in so far as possible but it cannot be guaranteed as participants in such a specific sample are likely to know one another and may potentially recognise each other's viewpoints.

Furthermore, every effort will be made to protect the institutional identities. This will be carefully handled in the writing up to minimise the risk of specific institutions being revealed. However, because the study will be transparent that the sample is being drawn from ECIU members, it will be evident that certain universities and possibly certain individuals are potentially involved.

Data and confidentiality
It is important to note that there are some limitations on the extent to which confidentiality can be assured. Confidentiality of information provided cannot always be guaranteed by researchers and can only be protected within the limitations of the law. For example, it is possible for data to be subject to subpoena, freedom of information claim or mandated reporting by some professions.

Data usage and disposal
To allow time for the research and the creation of publications after completion of the doctoral thesis, data will be stored for a maximum period of four years from the date of receiving ethical approval from DCU. Data destruction will be undertaken by the lead researcher after this storage period. This study will be conducted in compliance with the General Data Protection Regulation (GDPR), and if you have any concerns regarding how your data in this study has been handled, you can contact: DCU Data Protection Officer, Mr. Martin Ward − (data.protection@dcu.ie Tel: 01-7005118/01- 7008257) who will handle any data protection concerns arising from this research. An individual also has the right to report a complaint concerning the use of personal data to the Irish Data Protection Commission: Data Protection Commissioner.

Benefits and risks to taking part
By participating in this study, you will have the opportunity to reflect on and engage in a conversation on important aspects relating to leadership of CBL. You will be contributing to building a better understanding and stronger evidence base around the factors influencing implementation. This information will be of value to ECIU and DCU and as an interviewee, you will receive a summary of findings well before thesis publication.

One possible risk to be aware of is the potential for negative repercussions arising from saying something inaccurate or negative that risks institutional and/or individual reputation. Through the process of member checking, you will be given the opportunity to reflect on what you have said in the interview and amend the transcript, should you wish.

Finding out study results
Findings may be disseminated at national and international conferences and submitted for publication in peer reviewed journals. Your name will not be included in any such outputs. Once data analysis has taken place, a summary of key findings will also be shared back to interviewees to give them early insights and show appreciation for the time they have given.

Finding out more about the study
In case of any questions not answered, please contact the lead researcher listed above.

If participants have concerns about this study and wish to contact an independent person, please contact:

The Secretary, Dublin City University Research Ethics Committee, c/o Research and Innovation Support, Dublin City University, Dublin 9. Tel 01-7008000, e-mail rec@dcu.ie

Appendix F: Informed Consent Form

Research Study Title
Perceptions of Challenge-Based Learning among those leading its implementation in ECIU universities

Researchers: Clare Gormley, DCU Teaching Enhancement Unit clare.gormley@dcu.ie
Dr Enda Donlon, DCU Institute of Education enda.donlon@dcu.ie
Prof. Mark Brown, NIDL mark.brown@dcu.ie

Purpose of the research & data gathering
DCU is the Data Controller in this case. Although your name will be anonymised, it is important to be clear that your data is being collected as your voice will be recorded through the interview. Recording is required so that data can be subsequently analysed through a systematic thematic analysis process. This data will be stored and subsequently destroyed as described in the Plain Language Statement (PLS). Please confirm that you are aware of participation requirements and satisfied to proceed by confirming the following:

Participant – please complete the following (Select Yes or No for each question)

	Yes	***No***
I have read the Plain Language Statement (or had it read to me)		
I understand the information provided		
I understand the information provided in relation to data protection		
I have had an opportunity to ask questions and discuss this study		
I have received satisfactory answers to all my questions		
I am aware that my interview will be audio recorded		
I am aware that I may withdraw from this study at any point		
I confirm that that I understand how the researchers will protect confidentiality of data and of information provided subject to legal limitations		
I confirm that I understand arrangements for storing and disposal of data		

Signature:

I have read and understood the information in this form. My questions and concerns have been answered by the researchers, and I have a copy of this consent form. Therefore, I consent to take part in this research project

Participants Signature: _____

Name in Block Capitals: _____

Witness: _____

Date: _____

Appendix G: Overall Profile of Participants

Note that the roles and broad descriptions are as described at the time of writing and may be subject to change.

Participant ID	Referred to Personal Experience as Teamcher or Teaching with CBL	Role Title
P1	No	ECIU Institutional Coordinator
P2	Yes	Former ECIU role
P3	No	ECIU work package contact point
P4	Yes	ECIU work package contact point
P5	Yes	ECIU work package contact point
P6	Yes	ECIU work package contact point
P7	Yes	ECIU work package contact point
P8	No	Former ECIU role
P9	Yes	ECIU work package contact point
P10	Yes	ECIU educational contact point
P11	Yes	Senior Strategic Learning & Teaching role
P12	No	Senior Strategic Learning & Teaching role
P13	No	ECIU Institutional Coordinator
P14	Yes	ECIU work package lead
P15	Yes	ECIU educational contact point
P16	Yes	ECIU Institutional Coordinator
P17	No	Self describes as ECIU stakeholder
P18	Yes	ECIU work package contact point
P19	Yes	ECIU Teamcher

ECIU Institutional Co-ordinator: Institutional Co-ordinators are responsible for overseeing all ECIU activity within an institution. They would have responsibility for finance, they work with the ECIU board, create reports and monitor staff and student involvement with CBL.

Senior Strategic Learning & Teaching role: These individuals are responsible for and exert significant influence regarding strategic implementation of CBL (and other pedagogies) within the institution.

ECIU Work Package Lead: A work package lead brings everyone on the work package together, tracking progress and ensuring work is aligned with ECIU strategy.

ECIU Work Package Point of Contact or related Professional Development Support Role: A work package point of contact is the local, institutional-level contact point. They contribute to that work package and often support staff within their institution with professional learning opportunities around CBL.

ECIU Educational Point of Contact: These are individuals who are primarily responsible for liaising with and supporting Teamchers within their institution who are preparing an educational offer for ECIU.

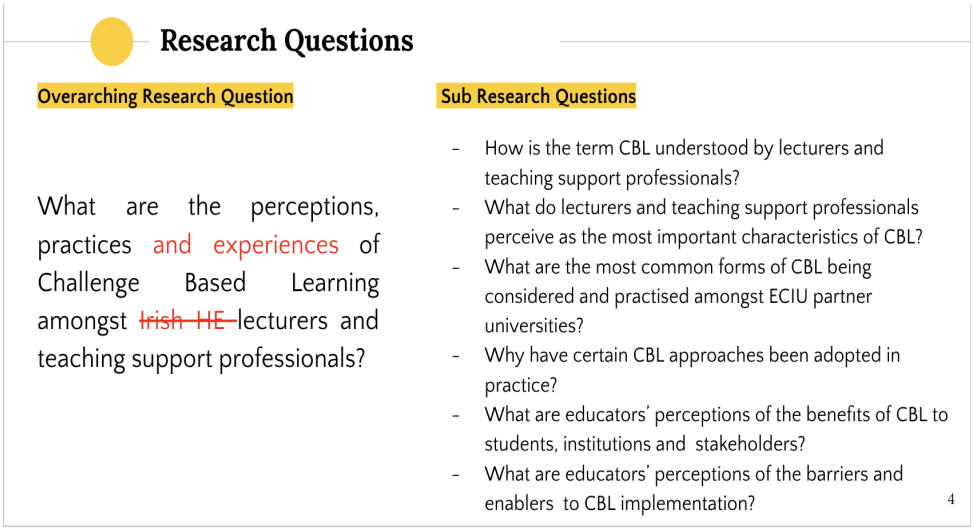
Former ECIU role: These are individuals who are not currently working with the ECIU organisation but have held CBL leadership positions in the past and have worked on aspects of CBL with colleagues from a range of ECIU institutions.

ECIU Teamcher: A Teamcher is an individual who either on their own or as part of a team arranges, leads and supports CBL activities. Teamchers take on and often switch between the roles of being teacher, coach and organizer of CBL activities.

ECIU Stakeholder: These are individuals who may not hold a designated ECIU role but are stakeholders in ECIU decisions as it pertains to their work and the direction of the institution.

Appendix H: EDEN conference contributions

Slide from presentation to EDEN doctoral symposium 2022



Update presented to EDEN doctoral symposium in 2023

Challenging Times Continued: Approaches to Researching Challenge Based Learning

- Clare Gormley (Dublin City University)

Abstract

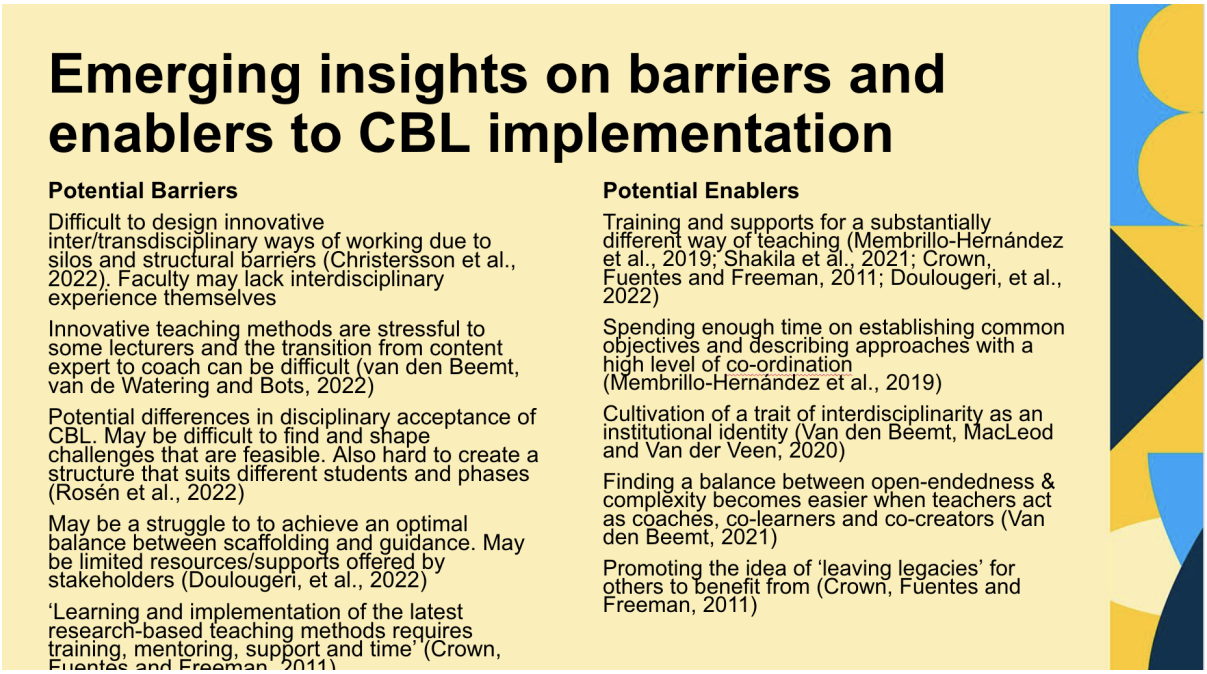
Definitions of Challenge-Based Learning (CBL) have previously been the subject of much debate in the literature (Gallagher & Savage, 2020; Leijon et al., 2021). The EdD research project that is the focus of this presentation will focus on perceptions of CBL among those leading its implementation in higher education.

When this project was presented at last year's EDEN doctoral symposium, the researcher's intention was to explore perceptions and practices of Challenge Based Learning amongst Irish HE lecturers and teaching support professionals. There has since been a change in direction to narrow the focus of the study and act on the themes arising from the literature. Key themes emerging thus far indicate: the persistence of a 'definitional muddying' issue but also increasing recognition of variety in CBL implementations (van den Beemt et al., 2022, p.2); greater recognition of potential barriers to CBL implementation (Rosén et al., 2022); and a potential weakness in the literature on the significance of the leadership component of CBL initiatives.

The literature review approach being taken is a systematized review, an approach informed by systematic approaches but that does not claim systematic review status (Grant & Booth, 2009). This presentation will share reflections and lessons learned from undertaking a literature review in a systematized way. The researcher will share experiences of identifying relevant literature in this field and discuss the challenges of screening and assessing papers for inclusion or exclusion. The development and use of a data extraction form for focused reading and analysis will also be discussed.

The methodology of the study will also be explored. The study will be primarily qualitative in nature and will use interviews as the main data collection method. A purposive sample of interviewees will be drawn from the European Consortium of Innovative Universities (ECIU), a community of 14 universities with a specific remit to enable CBL learning opportunities. ECIU academic facilitators, who are part of this community, will have experience in implementing CBL at institutional and potentially European level so should have both strategic and on-the-ground experience to share. Potential participants could be described as 'mid-level' leaders of CBL implementation, representing a more inclusive and contemporary conceptualisation of leadership in practice. Feedback on all aspects of this study will be welcomed.

Appendix I: Slide highlighting emerging insights from literature



Appendix J: Research on Walls Image

My abstract for this competition described how "My research specifically explores perceptions of CBL among those leading its implementation within the European Consortium of Innovative Universities (ECIU). Like the cat in the image, many in higher education are curious to learn more about how CBL is being perceived and the possible barriers and enablers to its successful implementation in practice." This activity required me to condense my thinking into just one image and then explain it at the event itself.

Appendix K: Letter of REC approval

Ollscoil Chathair Bhaile Átha Cliath
Dublin City University

DCU

Ms Clare Gormley
DCU Teaching Enhancement Unit

15th June 2023

REC Reference: **DCUREC/2023/111**

Proposal Title: **Perceptions of Challenge-Based Learning among those leading its implementation in ECIU partner universities**

Applicant(s): **Ms Clare Gormley, Dr Enda Donlon, Prof Mark Brown**

Dear Colleagues,

Thank you for your application to DCU Research Ethics Committee (REC). Further to notification review, DCU REC is pleased to issue approval for this research proposal.

DCU REC's consideration of all ethics applications is dependent upon the information supplied by the researcher. This information is expected to be truthful and accurate. Researchers are responsible for ensuring that their research is carried out in accordance with the information provided in their ethics application.

Materials used to recruit participants should note that ethical approval for this project has been obtained from the Dublin City University Research Ethics Committee. Should substantial modifications to the research protocol be required at a later stage, a further amendment submission should be made to the REC.

Yours sincerely,

DCU
Research & Innovation

Taighde & Nuálaíocht Tacaíocht
Ollscoil Chathair Bhaile Átha Cliath,
Baile Átha Cliath, Éire

Research & Innovation Support
Dublin City University,
Dublin 9, Ireland

T +353 1 700 8000
F +353 1 700 8002
E research@dcu.ie
www.dcu.ie

Dr. Melrona Kirrane
Chairperson
DCU Research Ethics Committee

Note: Please retain this approval letter for future publication purposes (for research students, this includes incorporating the letter within their thesis appendices).