Futures Consciousness: A futures study in gamified and game-based learning in higher education.

Katerina Economides BA, MA.

PhD

Dublin City University

Supervisor: Professor Charlotte Holland

School of STEM Education, Innovation & Global Studies

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Table of Contents

List of Figures

List of Tables

List of Abbreviations

AI	Artificial Intelligence
AR	Augmented Reality
ARG	Alternate Reality Game
FC	Futures Consciousness
GBL	Game-Based Learning
GL	Gamified Learning
HE	Higher Education
MR	Mixed Reality
TEL	Technology Enabled Learning
VR	Virtual Reality
XR	Extended Reality

Abstract

Title: Futures Consciousness: A futures study in gamified and game-based learning in higher education

Author: Katerina Economides

This research study set-out to explore projections for the futures of gamified and game-based learning in higher education, in order to examine the futures orientation of these visions, and implications thereof, and to uncover the dimensions of futures consciousness that emerged within this futures studies exercise. The participants in this study, experienced academic and industry professionals within and beyond Ireland, used futures studies approaches to hone their visions for the integration of gamified and game-based learning in higher education. Within these processes, the participants engaged in critique of the past and present, and examined possibilities for the future integration of game-based learning and gamified learning in higher education. This qualitative study was framed as a Futures Study, and as such the data collection processes leaned on the approaches and tools employed within futures thinking exercises. In this regard, a hybrid-Delphi survey approach was used to gather the participant insights on the future possibilities for the integration of gamified and game-based learning in higher education. Furthermore, focus-group workshops were used to deepen these visions, and afforded opportunities to discuss implications for present practices in higher education. The findings revealed multiple visions for the futures of gamified and game-based learning in higher education, and evidence of elements of futures consciousness that were mapped within the newly formed Futures Consciousness frame. Overall, the futures orientations within these visions were quite closely related to the present context in terms of what exists in the form of emerging technologies in higher education, with a dearth of speculative imaginings on technologies of the future. The recommendations include to engage in further futures studies research to deepen understandings of the impact of other futures thinking processes on the development of futures consciousness, and to expand the profile of participants to include more diverse stakeholders within and beyond higher education.

Chapter One – Introduction

1.1 Introduction

This research study set-out to explore projections for the futures of gamified and game-based learning in higher education, to examine the futures orientation of these visions, and implications thereof, and to uncover the dimensions of futures consciousness that emerged within this futures studies exercise. Within this chapter, the motivation and rationale for the study is presented, along with an overview of the research approach and outcomes, followed by reflections on the process, and finally, a brief description of the structuring of the thesis.

1.2 The Beginning

The spark for this research study started, quite unexpectedly, while playing a game. At the time, I was completing a teaching degree in Classics, when a friend shared with me a link to an online fictional mystery, called "Pempti Imera". This told the story of the mysterious disappearance of a musician, only hours before they were due to perform in front of thousands of fans at a major music festival. The story unfolded over various websites, where players were asked to solve riddles, puzzles and gather clues to solve the mystery. What "hooked" me into hours of engagement was how realistic the experience felt. All websites, news clips, and other online artifacts I interacted with as part of the experience were designed to look and feel absolutely *real*. I remember being so fascinated by the way the game blended with reality. Later on, I discovered that these types of immersive storytelling experiences belong to a niche genre called "Alternate Reality Game" (ARG). I had enjoyed various games before, but until I played the ARG I had not seriously considered the educational potential of games. Given how engaged and immersed I felt during play, I wondered why this approach is not introduced in teaching and learning. Imagine how powerful it would be if students had the opportunity to learn through immersive game-like stories!

Driven by that idea, I embarked my PhD study exploring the potential of ARG-inspired learning activities, and their effectiveness in inspiring and motivating higher education students towards increased levels of engagement and deeper learning in different

educational contexts. As part of that endeavour, I initially followed a Design-Based Research approach (Wang and Hannafin, 2005) to design and develop a series of ARG-like learning activities, which were implemented in two consecutive academic years as part of the module "Education for Sustainable Development" in Dublin City University. While the design process was enjoyable, I certainly struggled to re-produce the same seamless experience I had excitedly participated in as a player a few years back. Being no game developer nor highly-skilled storyteller, and having found no step-by-step framework or toolkit that I could easily apply as an educator to new learning contexts, I remember feeling unsupported when it came to the design and development of the gaming activities. The technologies available to me were also relatively poor, in comparison to the smooth online experience I was attempting to re-create. I spent valuable time learning how to create websites where I could deploy the story and visual artifacts. Given the university LMS had limited capabilities for gamifying content, I relied heavily on freely available social platforms and tools, such as Facebook, Instagram, and Actionbound[1]. Asking the class to join these social platform groups or download applications on their personal devices made me increasingly uncomfortable, being well-aware that some students may be concerned about their data privacy, despite my taking every effort to make these social groups private and safe spaces.

After the second iteration of the ARG-like activities, it became clear to me why these game-based approaches are not more widespread in higher education settings. I remember thinking "we're just not there yet". *Yet* being a key word here. *Yet* carrying the assumption that perhaps there *is* a possible future down the line, where gamified and game-based approaches are mainstream, streamlined, and non-expert educators can easily customise and apply these experiences with their learner cohorts to achieve desired outcomes. The transition to exploring the topic through a futures-studies lens came naturally after that realisation.

Futures studies (Inayatullah, 2013) provided an ideal framework for me to examine the past and present trends within the digital gamified and game-based learning space in higher education, the barriers that prevent educators from adopting these approaches more widely or more effectively, and to explore the future possibilities for these

[1] A mobile application for playing digitally interactive scavenger hunts.

approaches. What followed was a process of familiarisation with the futures studies approach, a consideration of appropriate futures methods for this type of research, and a deliberation around the inclusion of relevant stakeholders into the exploration of the future within this context.

1.3 Research Rationale

Gamification and game-based learning approaches have a history of being implemented in educational settings, and in fact there appears to be a growing interest in their integration in higher education (Vlachopoulos and Makri, 2017; Subhash and Cudney, 2018). Despite the increased research interest and largely beneficial outcomes recorded from their integration in higher education settings, the approaches continue to be used sporadically. Based on my personal experience integrating game-based activities with higher education learners at the beginning of my research journey, there are still many gaps in terms of available evidence-based examples for digital GL and GBL in higher education, and a scarcity of staff supports, such as training or available technologies, that would enable the design and development of digital gamified or game-based resources without a significant amount of time and effort required from educators.

In addition, to date, there is a large gap in the literature when it comes to exploring the potential of digital GL and GBL for higher education using a futures studies approach. There is also relatively little in the literature to date around exploration of futures for higher education more broadly, and consideration of stakeholders' futures consciousness and orientations during envisioning futures and backcasting actions for shaping preferred futures. The study aims to bridge these gaps, not only by examining the topic for the sake of contributing to the GL and GBL literature, but also to contribute to the knowledge around the futures studies approach, its use in this type educational research in higher education, and the discourse around futures thinking and futures consciousness dimensions and characteristics in futures exercises.

1.4 Research Overview

This research study set out to explore key stakeholders' perspectives on the potential futures of gamified learning (GL) and game-based learning (GBL) in higher education,

and examine these futures visions from a perspective of futures orientation and dimensions of futures consciousness. Participants in the study were academics from a wide-range of disciplinary areas, and industry practitioners within the fields of gamification, GBL, game-design, and technology-enabled learning.

GL refers to using game elements, such as storytelling, interactivity, badges and point-based systems in a learning setting (e.g. in the lecture hall or online courses), with the purpose of enhancing the students' learning experience, typically in terms of student motivation, engagement and participation. Similarly, GBL refers to using games for learning purposes, in formal or informal learning settings, to achieve beneficial outcomes in terms of student motivation, engagement, knowledge or skills development. In essence, GBL uses fully-fledged games with a learning outcome, whereas gamified learning uses *elements* of games. Despite this distinction, both approaches share the concept of using game-inspired experiences for a serious purpose rather than entertainment (Deterding *et al.*, 2011), and are therefore examined together as part of this study.

Futures thinking refers to individuals' overall capacity to think about the future in a systematic and anticipatory way. This ability is also referred to as *future orientation* (Seginer, 2009). *Futures consciousness* is a broader term which not only includes the cognitive development of futures thinking, but encompasses various psychological processes and human experiences, including ones feelings and goals about the future (Lombardo and Cornish, 2010; Ahvenharju, Minkkinen and Lalot, 2018).

The study was guided by two core research questions:

- What futures are envisioned for digital gamified and game-based learning in higher education, and how futures-oriented are these visions?
- What aspects of futures consciousness emerge in expert-led futures thinking exercises, and critique thereof?

To respond to these research questions, this qualitative research study unfolded in three phases:

Phase One: Mapping past and present – Reviewing the history and present state of an issue is an important first step of futures studies (Inayatullah, 2008). As a result, the first phase of research included the mapping of historic and present trends and challenges within GL and GBL integration in higher education. Following a systematic trend review process, phase one explored how digital GL and GBL have been used in higher education to date, and examined outcomes and lessons learned from these interventions. The findings from the trend review were used as a dataset, from which a vignette of the present state of GL and GBL was developed, and a "projected" future scenario was extrapolated. The "projected future", also referred to as "business-as-usual" scenario, is a futures studies term which describes the default future we can expect if no change in events or trends occurs (Voros, 2017). The findings from phase one informed the development of the phase two survey, which is outlined next.

Phase Two: Exploring alternatives, trends and barriers – The second phase of the research engaged stakeholders from academia and industry, in order to explore futures possibilities for GL and GBL in higher education, through a survey tool which enables structured debate between experts on a complex topic, i.e. the Delphi survey tool (Okoli and Pawlowski, 2004). Participants engaged in two-rounds of Delphi survey, with the first round aiming to obtain their critique of the vignette of the present (i.e. the findings from phase one), solicit initial views on the topic including emerging trends and challenges, and encourage visioning of futures possibilities for GL and GBL in higher education 10-15 into the future. The second round presented to participants the findings from round one in the form of statements and summary-future visions. This round aimed to a) assess the likelihood and desirability of each of the futures possibilities materialising for higher education; b) capture participants' critique of these possibilities, allow for additions and clarifications, and gather alternative visions. The Delphi survey dataset was examined through thematic analysis to identify key themes in stakeholder's futures visions, which enabled the development of various scenarios, e.g. possible futures, desirable and undesirable futures.

Phase Three: Transforming the future – The third and final phase of the research re-engaged with a subset of stakeholders from phase two in the form of focus group workshops. These aimed to enable a) further exploration of futures possibilities for

higher education, and specifically the integration of digital GL and GBL in 20 years' time; b) the identification of actions that need to be considered in the present, in terms of policies or practices, in order to shape the most desirable versions of the future for higher education. To facilitate these discussions, the workshop guided participants through two common futures studies exercises: a) a visioning activity (Inayatullah, 2013); and a backcasting activity (Boulding and Boulding, 1995). The focus group workshop datasets were first reviewed through thematic analysis to identify key themes in stakeholder's futures visions and other comments and critical reflections, which enabled the development of a multitude of desirable possibilities, as well as a "plausible" scenario, i.e. a future that *could* happen, based on our current understanding of the world (Voros, 2017). In addition, in this final phase of the research, both the Delphi and workshops datasets were examined for dimensions of futures consciousness, using a futures consciousness frame (Ahvenharju, Minkkinen and Lalot, 2018) as a guide. This layer of analysis responded directly to the second research question, by identifying which dimensions and characteristics of futures consciousness were demonstrated by the participants during their engagement with the futures studies tools, i.e. Delphi and workshops.

The study contributes to the body of knowledge and research in its mapping and critique of futures for higher education, specifically in terms of the integration of GL and GBL in the next 10-20 years, which was shown in the literature review to be an under researched area. The study further makes significant contributions to the domain of futures thinking in its tracing and framing of dimensions of futures consciousness, which is of critical importance to the development of the anticipatory competency.

1.5 Reflections on the Research Journey

Reflecting back on the development and completion of this study, there were certainly unique challenges that accompanied this type of research, given the philosophical nature of futures studies. The future is unknown and unpredictable. How do you study something that does not yet exist? Nevertheless, futures studies can also be very practical in nature, which really appealed to me. As Voros (2007) puts it, "futures research cannot be regarded as simply a pure academic conceptual exercise, disconnected from practical

action in the world" (p. 74). While the goal of futures studies is not to predict or foreclose the future, futures exercises include the assumption that we can be active agents in *shaping* our futures – a concept that I find highly comforting and inspiring.

Moreover, in order to undertake this study effectively, I had to not only familiarise myself with the philosophies underpinning futures studies research, but also become comfortable with using futures tools as a facilitator of futures conversations. In essence, the purpose and contribution of the tools used as part of the study (Delphi survey, focus group workshops) was twofold. These methods not only contributed to the study itself as research tools, but they also contributed to the fostering of futures thinking, as pedagogical tools. Those participating in the study were not only contributing to the research topic, but were also learning to think about the future in a systematic and anticipatory way. These considerations at times caused confusion, but also added to my enjoyment of the research process – I do enjoy a good challenge!

As a personal reflection, completing this PhD while maintaining a full-time job was particularly challenging and delayed my progress at times. Having said that, I am ending this research journey feeling extremely proud of the skills I developed as a researcher, with the help of my supervisor. Compared to the early stages of my research, I can now clearly see the tremendous difference my engagement with this PhD study had on my abilities to critically engage with research, and critically reflect on past, present and future. Looking back at the beginning of my study, I can't help but feel thankful for all I have learned, both from the setbacks and the successes of this journey.

1.6 Overview of Chapters

Chapter two provides an overview of relevant literature. It begins by providing clarity around the terminology of GL and GBL, and presents the theoretical underpinnings of these approaches. The chapter also discusses the futures studies approach, common terms, methods, and concepts, including futures thinking and futures consciousness. The chapter proceeds to present studies which explore the futures of GBL, GL, technology-enabled learning and educational technologies in higher education, using a futures studies

approach. The chapter closes with a presentation of studies which adopt a futures studies approach within higher education research more broadly.

Chapter three outlines the philosophical and methodological underpinnings of the study. It opens with an overview of research philosophical paradigms, before moving on to the framing of this research study and clarifying the interpretivist research philosophy underpinning the study. The research approach and methodology are also discussed, including the specific research strategies, and the chosen data collection tools and analysis methods that were used throughout the three phases of the research. Finally, the ethical considerations and the limitations of the study are discussed.

Chapter four provides a detailed description of the first phase of the research, which included the completion of a systematic trend review as the first dataset. The chapter provides insights into the specific processes involved in mapping the past and present use of GL and GBL in higher education and extrapolating the vignette of the present and the projected future. The findings of the systematic trend review are presented in detail, along with the vignette of the present for GL and GBL in higher education, which informed the next phase of the research.

Chapter five provides a detailed description of the second phase of the research, which included the deployment of two rounds of Delphi survey with stakeholders from academia and industry practitioners. The chapter begins with an overview of survey round one, clarifies its purpose, and then proceeds to present the findings from the thematic analysis of the round one data, and how these informed the second round of the survey. The chapter continues with an overview of survey round two and its purpose, and finally presents the findings from the thematic data analysis of the second round.

Chapter six provides a detailed description of the third and final phase of the research, which included the completion of three focus group workshops with the stakeholders. The chapter first provides an overview of the futures workshops and the activities that took place. It then proceeds to present the findings from the thematic analysis of these, which resulted in a narrative of the futures visions that were articulated for GL and GBL in higher education, and the actions that were identified for shaping preferred futures. Finally, the chapter presents the final layer of analysis that was conducted, i.e. the examination of the Delphi and workshop datasets through a futures consciousness lens,

in an effort to uncover dimensions and characteristics of futures consciousness that manifested in the stakeholder discourse.

Chapter seven concludes the thesis by responding to each of the research questions and discussing outcomes. It first presents the multitude of futures visions that were articulated as part of the three phases of the research and discusses how future-orientated these visions are. The chapter then proceeds to critically discuss the findings from the layer of data analysis that focused on futures consciousness, and presents an adapted frame of futures consciousness, based on the dimensions and characteristics that manifested in the Delphi and focus group workshops datasets. Finally, the chapter articulates the contribution to new knowledge, and highlights the key recommendations from this study.

Chapter Two: Literature Review

2.1 Introduction

This chapter presents the review of the literature that explored futures of game-based and gamified learning in higher education. The chapter begins by providing clarity around the definitions of games and game-based learning, gamification and gamified learning, and proceeds to present the theoretical underpinnings of these approaches. The origins of futures studies, and terms, concepts and methods including futures thinking, futures literacy, and futures consciousness, are also discussed. The studies exploring the possible futures of game-based and gamified learning in higher education, using a futures studies approach are then presented. As the focus of this doctoral study was on *digital* game-based and gamified learning experiences, the literature review also includes studies that explore the futures of technology-enabled learning and educational technologies in higher education. Finally, a broader review of the literature is presented, including studies which used a futures studies approach within higher education research in general.

2.2 Introduction to Game-based and Gamified Learning

Game-based learning and gamification of learning have a long history of being promoted and integrated in education. Bowman as early as 1982 suggested that certain game design elements can enhance learning (Bowman 1982). Gee (2003) is one of the many well-known researchers and educational practitioners that vindicate the integration of games in education, and McGonigal (2011) has been a pro-games spokesperson for over the last decade, proclaiming that games have the capacity to make the world a better place. Specifically, within higher education settings, a systematic literature review on gamified and game-based learning conducted by Subhash and Cudney (2018) has highlighted increased interest and beneficial outcomes from the integration of these approaches, with the use of digital games and game mechanics shown to enhance learning experiences.

However, the terminology used amongst researchers to describe these approaches can vary (Vlachopoulos and Makri, 2017). It is therefore useful to clarify important terms that will be used throughout this chapter and thesis.

2.2.1 Games and Game-Based Learning

Let us start with the broad concept of *game*. According to Cheng et al. (2015) the term "refers to all structured play consisting of rules, goals and challenges that are undertaken for diversion or amusement" (p. 354). A video game is a game in electronic form, which can be played through electronic devices, such as computers, consoles or mobile phones, and may involve the use of extended realities, such as Virtual Reality (VR), Augmented Reality (AR) etc. (Cheng *et al.*, 2015). Video games can also be referred to as *computer games* or *digital games*, whereas electronic games which include use of the web are also referred to as *web-based games* or *online games*. A further subset of games includes *serious games*, a term introduced by Abt (1970) to differentiate between playing games seriously, as opposed to casually. Serious games have a learning purpose, rather than entertainment, as their primary purpose. However, according to Abt, the serious purpose of these games does not mean that they cannot also be entertaining (1970). Serious games include educational software developed for teaching or improving knowledge or skills (e.g. mathematics and language). Serious games have also been created for training and instruction, rehabilitation, as well as to raise awareness for issues or foster empathy.

Although there is varying taxonomy of games in the literature, Gros (2007) categorises games into seven main genres:

- Action games (also referred to as platform games) – According to Gros (2007) these are reaction-based games.
- Adventure games – Where players move through a virtual world solving various tests to progress.
- Fighting games – Where players fight computer-controlled characters or player-controlled characters.
- Role-playing games – Where players assume the role and characteristics of other persons or creatures.

- Simulations – Where players navigate within a simulated place or situation and must achieve specific goals.
- Sports games – Games based on sports.
- Strategy games—Where players must formulate the appropriate strategy to achieve a goal.

Prensky's earlier taxonomy of games includes all seven of the above genres, with the addition of puzzle games (Prensky, 2001). Arguably, one could further expand the taxonomy to also include *Alternate Reality Games*, a unique and highly customizable game genre, which is defined as an interactive narrative "that plays out in real time, using real communications media to make it seem as though the story were really happening" (Phillips, 2012, p. 19), essentially blurring the lines between reality and fiction. These immersive game quests typically unfold around fictional websites containing clues, fictional characters' blog posts or Social Media platforms, YouTube videos, emails, text or audio messages, and in some cases physical objects such as map clippings, business cards, letters etc. Players are involved in a series of challenges, such as puzzle-solving decoding and scavenger hunting) both online and in the real world (Whitton *et al.*, 2014).

In terms of the approach of *game-based learning*, Bober defines game-based learning experiences as activities that have at their core a digital game (as main activity or motivation for related activities), take place in formal or informal learning settings and have a learning outcome (Bober, 2010, p. 7). In some cases a fully-fledged game is created specifically for learning purposes, such as Tower of Babel, an alternate reality game created as part of the European Commission Comenius project, to motivate secondary school students to learn new languages (Connolly, Stansfield and Hainey, 2011). In other cases, a pre-existing game is brought in educational settings to enhance the learning experience. The example of Minecraft comes to mind, an open-world game where players can move freely in a virtual environment and build their own constructions with no particular rules or constrains. The use of Minecraft in primary and secondary level education is greatly popular as the game can be adjusted to suit various learning materials; e.g. Bebbington and Vellino (2015) explore the use of Minecraft in teaching Information Literacy, and Short (2012) explores how Minecraft can be used in classrooms to teach scientific concepts.

2.2.2 Gamification and Gamified Learning

According to Deterding et al. (2011) gamification is "the use of game design elements in non-game contexts" (p. 9). Expanding on this definition, gamified learning is understood as the use of gamification in learning settings. As opposed to game-based learning, the approach of gamified learning does not require the integration of a fully-fledged game with a learning outcome, but the integration of game elements within the learning experience. Such elements can include points, levels, achievement badges, but also storytelling, interactivity and problem solving (Kapp, 2012). These game mechanics can be implemented in the learning process, be it in classroom, fully online or hybrid settings, to support with motivational, behavioural or learning outcomes. In fact, a middle school in New York, founded in 2009, designed their curriculum by fully adopting a gamified approach: *Quest to Learn* is the first school to design this model of gamified learning and students are learning by playing these games on a daily basis. Instead of having mandatory assignments, students have "secret quests" and instead of trying to earn grades, students are doing their best to "Level Up" (McGonigal, 2011), i.e. to progress to higher levels within each game-quest.

Whether using educational games with learning outcomes, or game mechanics meaningfully implemented in teaching, both of these techniques, game-based learning and gamification, are essentially fostering the same values. As Kapp puts it: "Serious games and gamification are both trying to solve a problem, motivate, and promote learning using game-based thinking and techniques" (Kapp, 2012, p. 16). Despite their differences, game-based learning and gamified learning have at their core the game and its potential benefits for the player-learners.

2.2.3 Theories Underpinning Game-Based Learning and Gamified Learning

Research studies in game-based and gamified learning indicate their integration in educational contexts are underpinned by a wide-range of psychological and learning theories and approaches. In fact, a relevant systematic meta-review conducted by Krath, Schürmann and Von Korflesch (2021) uncovered that previous empirical research in the areas of gamification, serious games and game-based learning point to a total of 118

different theories and approaches, which informed the design and evaluation of learning interventions. These theories focus on a) factors that impact motivation and affect, such as self-determination theory (Ryan and Deci, 2017) and self-efficacy theory (Bandura, 1982); b) factors that determine behavioural outcomes, such as the Technology Acceptance Model (Davis, 1989) and reinforcement theory (Moore, 2011); and c) factors and processes of learning, such as constructivist learning theory (Piaget, 1977; Jonassen, 1999) and situated learning theory (Brown, Collins and Duguid, 1989).

The most used theories at the time of the publication of the meta-review (Krath, Schürmann and Von Korflesch, 2021) was found to be by far self-determination theory, used in 82 papers. Self-determination theory focuses on the determinant factors of motivation, such as the basic psychological needs of autonomy, competence and relatedness (Ryan and Deci, 2017). This was followed by flow theory, used in 47 studies. Flow theory proposes that when an individual is in a state of flow "they are completely involved in something to the point of forgetting time, fatigue, and everything else but the activity itself" (Csikszentmihalyi, 2014, p. 230). Finally, experiential learning theory was used in 40 studies. Experiential learning suggests that learners acquire knowledge through an iterative learning cycle of personal experience, reflection, conceptualisation and application of the knowledge in real-world situations (Kolb, 1984).

2.3 Futures Studies

As this study is exploring the futures of gamified and game-based learning through a futures studies lens, it is important to outline the definition and origins of futures studies, and clarify the relevant terminology. Futures studies has been described as the "systematic and explicit thinking about alternative futures" (Bell, 2003, p. 2). Slaughter and Bussey (2006a) describe futures studies as "the forward-looking equivalent to history" and continue that "futures study uses images, values, meanings and a wide range of methods to explore, anticipate and negotiate future possibilities" (p.3). Both definitions emphasise the exploration of alternatives. More recently, Inayatullah defines the field as "the systematic study of possible, probable and preferable futures including the worldviews and myths that underlie each future" (Inayatullah, 2013, p. 37), which

not only highlights the plurality of future possibilities, but emphasises that the questioning of assumptions of each future is a crucial part of the process.

2.3.1 Origins of Futures Studies and Terminology

Despite its existence as a field of inquiry for over 50 years, there is a wide array of terminology used across those who practice futures studies, with terms such as *futurists*, *futurologists* and *foresight practitioners* being used, among other terms, by those who practice futures studies (Sardar, 2010).

Giving a name to the systematic exploration of the future has been a long-standing matter of debate amongst researchers and practitioners in the field. Bell discusses the various terms in his book "Foundations of Futures Studies", in which he chooses to refer to the field as *"futures studies", "futures field"* or *"futures research"* throughout the book (Bell, 2003). Amara uses the term "futures field" in a broader sense, referring to the overall field of studying the future, and uses the term "futures research" more narrowly, to refer to the research arm of the field (Amara, 1974). Sardar also critically examines the various terms and argues that "futures studies" best serves the field (Sardar, 2010).

Thinking about the future can be traced back to human prehistory (Bell, 2003), but if we are to track down the first appearance of terms associated with modern futures studies, the term "*futurology*" was coined in 1966 by Ossip Flechteim, in his book History and Futurology (Flechtheim, 1966) to describe a more systematic approach to the study of the future. In 1972, while discussing the concept of future consciousness, Sande also refers to the field as futurology: "the future itself is important enough to justify a new scientific discipline, futurology" (Sande, 1972, p. 271). The term, however, has not been popular with American futurists, as according to Bell, critics would often use this term by way of attacking the field (Bell, 2003a). Sardar points out further issues with the term, such as the connotations of fortune telling, and its intentional association with sciences (e.g. biology and other "ologies"), implying scientific neutrality (Sardar, 2010).

Futurism has been another term used to refer to the field, but according to Bell it is a term associated with the early 1900s radical art movement in Italy, and is now rarely used to describe modern futures studies (Bell, 2003) given the socio-political connotations that

come with the Italian futurist movement (Sardar, 2010). Despite the lack of popularity of the term, it is widely accepted that the practitioners of futures studies are referred to as *futurists* (Bell, 2003).

According to Inayatullah, previous generations of futurists focused on *forecasting*, which includes the assumption that the future can be known (Inayatullah, 2013). In the US of the 1980s and 1990s, predictions of the future were a leading trend (Sardar, 2010). However, according to Godet and Roubelat, the present would be unliveable if the future was foreseeable: "Certainty is death. Because the future has to be built, it cannot be conceived as a simple continuation of the past" (1996, p. 164). Ultimately, in futures studies, the future is not known and predetermined, hence we refer to studying *futures,* in plural.

The term *foresight* comes with similar problematic assumptions. While some futures studies researchers use the terms foresight and futures studies interchangeably (e.g. Slaughter, 1990), Sardar points out that foresight is commonly associated with business and bureaucrats, who want a product to guide them on certain future potentials, rather than explore alternative possibilities (Sardar, 2010). In contrast, modern futures studies place emphasis on opening up alternatives for the future (Inayatullah, 2013). Foresight, as a term, does not include the plurality associated with futures studies – in fact, in the English language there is no plural for the term foresight, as Sardar points out (2010). Futures studies should also not be used synonymously with *strategic planning, strategic foresight* or *scenario planning*. While these can be *practices* of foresight work, they tend to focus on shorter-term planning, and are associated with the assumption that the future is singular and we can prepare for it (Inayatullah, 2013).

To emphasise the plurality and diversity that is involved in the study of the future, Sardar (2010) argues that the most appropriate term to describe the field is *futures studies*, a term also accepted by Bell (2003) and now widely used by many futurists.

2.3.2 Commonly Used Terms in Futures Studies

Many futurists refer to three main types of futures: possible, probable, and preferable (notably Amara, 1974; Bell, 2003; Inayatullah, 2013). These terms are used throughout

the thesis when discussing the research questions and outcomes of this PhD study. So what do each of these futures mean?

To clarify the various types of futures and their differences, Voros represented them visually in the form of a cone, which resembles a spotlight – bright in the centre and darker in the edges (Voros, 2017). Each future is positioned around the cone in a meaningful order (see figure 2.1). Voros' futures cone not only explains the three main types of futures, but extends the model to include a total of seven types of alternative futures:

- Potential – As the future is open, not fixed, according to Voros (2017) "everything beyond the present moment is a potential future", even the futures we cannot yet imagine (2017). Voros (ibid) invites us to imagine the cone metaphor as a spotlight, with the centre being bright and the edges darker, and notice that the potential futures are positioned outside the cone in the darker areas – as even the futures we cannot yet imagine are potential futures.
- Preposterous – Futures that seem impossible to ever happen.
- Possible – Futures that "might" happen. These are based on future knowledge we do not yet have.
- Plausible – Futures that "could" happen. These are based on knowledge we currently possess, i.e. of how the world works (e.g. physical laws).
- Probable – Futures that are "likely to" happen. These are typically based on current trends.
- Preferable – Also known as preferred futures, i.e. futures that we "want to" or "should" happen. By extension of this, we also have the un-preferred futures, which are undesirable or should *not* happen. Preferable futures include the notion that some future possibilities are more desirable than others. Bell argues that if any future is as good as another, then there would be no reason to be concerned about the future (Bell, 2003).
- Projected – This is also known as the "business as usual" future. It is singular and is a continuation of the past and present. In other words, if every aspect of past and present stays the same, this is the default future we can expect. According to Voros, this could be considered the most probable of the probable futures (2017).

If we consider the spotlight metaphor, we notice how the projected future is positioned in the very centre of the cone, i.e. the brighter position of the spotlight.

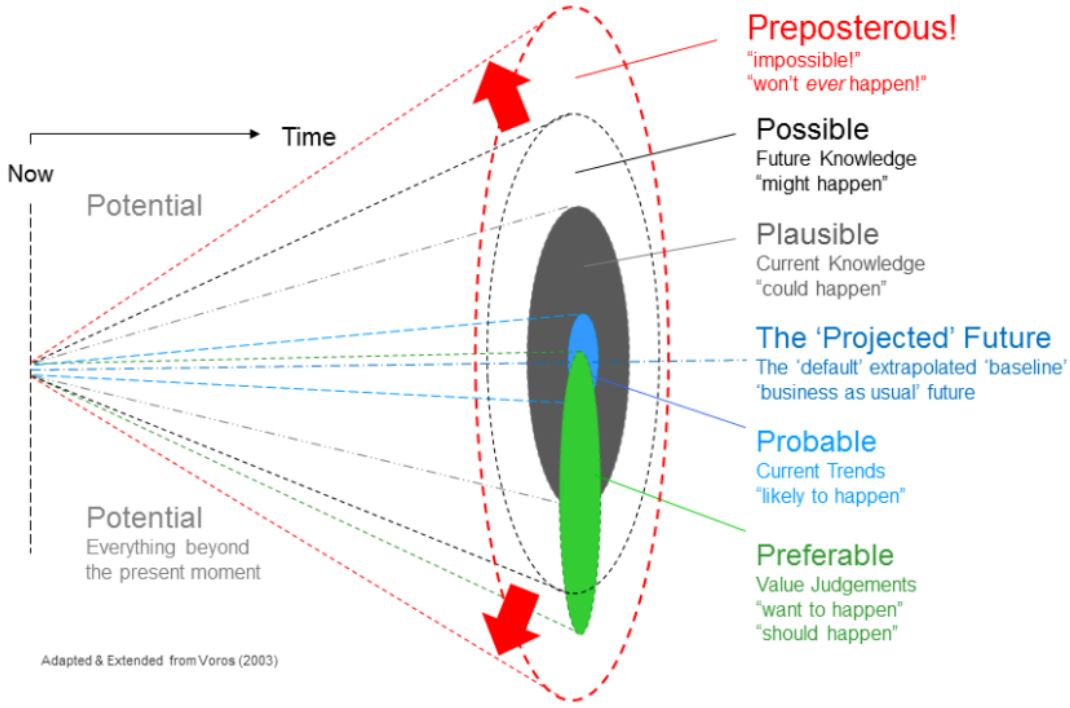


Figure 2.1 Voros' extended futures cone (2017)

In addition to the types of futures, several other terms are commonly used by futures studies researchers and practitioners, including trends, drivers, signals, and horizon planning, and explained as follows.

A *trend* is a "[g]eneral tendency or direction of a movement/change over time" (Bourgeois, 2015, p. 22). These are well-established, long-term patterns of change. Some examples of trends include the aging population and the shift to digital technology (Saritas and Smith, 2011).

Drivers, also referred to as drivers of change are "[f]actors causing change, affecting or shaping the future" (Bourgeois, 2015, p. 8). Some examples of drivers include climate policies and demands for certain products, which has an impact on the marketplace (Saritas and Smith, 2011).

A *signal* is an indication that something might change. Bourgeois calls these weak signals, which are defined as "[a]n early indication of a potentially important new event or emerging phenomenon that could become an emerging pattern, a major driver or the source of a new trend" (Bourgeois, 2015, p. 28).

Horizon planning is necessary for all aspects of futures studies, and Sharpe et al. (2016) points to the three horizons framework as a tool to enable lateral thinking and planning across levels, within a participatory futures studies approach. The first horizon constitutes the present – the current system and practices, otherwise known as the 'business-as-usual'. The third horizon is the envisioned or imagined future. The second horizon is the transitional area or transformation zone between the other two horizons. The three horizons framework can be useful in terms of identifying continuities and discontinuities in moving from the present to the future/s – so it can be used to examine the ideas and practices that will lead to the change or re-orientations for the desired future.

2.3.3 Methods of Futures Studies

Futurists use methods, tools and techniques both quantitative and qualitative, from a variety of disciplines, depending on the type of futures exploration. Bell notes that futurists have their own preferences, and he concludes that "no method has a monopoly on producing good – or bad – work" but it rather depends on the futures researcher, i.e. their "skills, talent, ingenuity, insight, diligence, and even luck" (Bell, 2003, p. 241). Some common methods used in futures studies, as found in the literature, are briefly described below:

- *Environmental scanning* is the active process of monitoring sources and trends in order to gather information for a specific purpose (Slaughter and Bussey, 2006b). According to Slaughter and Bussey (2006b) the person conducting environmental scanning should define their sources and have a scanning filter, i.e. they should know what they are scanning for, why they are scanning for it, what needs to be addressed, and they must also be able to distinguish between significant and insignificant information (ibid. 2006b).
- *Trend analysis* is a process, where the practitioner gathers data and asks questions in order to understand past and existing trends and their causes, and extends into

the future, by questioning whether these trends will persist (Slaughter and Bussey 2006).

- *Delphi survey,* developed in the 1950s by the RAND corporation in the USA (Gordon and Helmer, 1964), is not a futures studies method per se, but a tool to assess the "current status of any specialised area" by gathering expert opinion about likely developments in a certain field (Slaughter and Bussey, 2006, p. 5).
- *Emerging Issues Analysis (EIA),* developed by Molitor (2003), is a tool that generates an S-curve which seeks to identify issues that may appear unlikely to happen, but can be of very high impact. EIA enables us to identify potential problematic areas and seek solutions for them before they arise, but also allows us to seek new possibilities (Inayatullah, 2013).
- *Causal Layered Analysis (CLA)* was developed by Inayatullah (2004) and aims to discover which narrative or metaphor is stopping organisations from successful strategy. CLA can be used for deeper causation, i.e. to understand the deeper reasons behind an issue (Inayatullah, 2010).
- *Scenarios development* is a process to create visions for futures and alternatives to these. Scenarios can be developed through various methods, such as single or double variable, archetypes, organizational, and integrated scenarios, that can be used to open the present, reduce uncertainty or create new possibilities (Inayatullah, 2008).
- *Visioning* is "the process of creating a series of images or visions of the future"(Bourgeois, 2015, p. 23). According to Inayatullah (2013) there are three ways to develop a vision: through scenarios (your preferred future or best case), through creative visualisation (in workshop settings, participants close their eyes and imagine their preferred futures) and through questioning (in workshop setting, two participants interrogate each other about their preferred future). These three visioning methods can be triangulated for a complete vision of the future (Inayatullah 2013).
- *Backcasting* is the method developed by Elise Boulding (Boulding and Boulding, 1995) to describe events, trends or steps that lead us to a desired or preferred end state (Slaughter 1997, Inayatullah 2013). This process starts with describing our

future vision (preferred or other), and then working "backwards" to discover how to get there.

- *Futures wheel* is a visual tool, integrating a structured process that can be used to capture dimensions of futures, and consider implications of these at a number of levels. To create a futures wheel in a workshop setting, participants imagine a future possibility and present it in the middle of the board or paper. They then start noting around it the immediate consequences, eventually moving on to second order and third order possible outcomes (Slaughter and Bussey, 2006b). Inayatullah uses futures wheel in a similar way within a workshop setting as part of his "Six Pillars Approach", as a way to anticipate issues and create new possibilities (Inayatullah, 2008).

The Six Pillars approach (Inayatullah 2008) is an integrated approach to envisioning futures and can be conceptualised as a theory of futures thinking with a suite of methods and tools that can be applied in part or as a whole. The six pillars are: Mapping the present and the future, Anticipating the Future, Timing the Future, Deepening the Future, Creating Alternatives to the Present (Widening), and Transforming the Present and Creating the Future. Sample tools within each layer are listed in Figure 2.2.

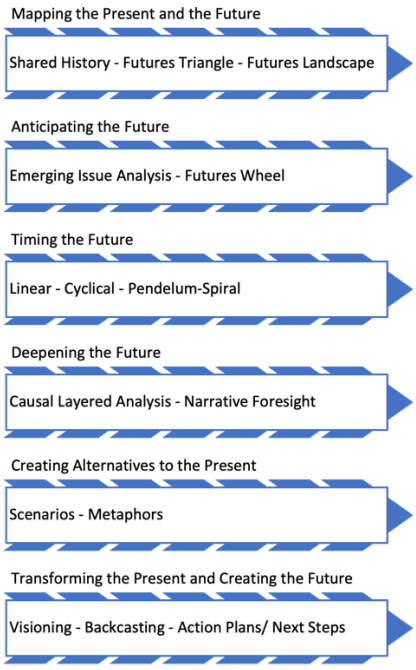


Figure 2.2 – Overview of Six Pillars and Associated Tools, adapted from Inayatullah (2008; 2013)

2.3.4 Futures Thinking, Futures Literacy, Futures Consciousness

In line with the multitude of terms previously used to describe futures studies – what Sardar would call the futures studies "crisis of identity and meaning" (2010, p. 177) – one finds a variety of terms in the literature to describe futures thinking and other similar concepts. According to Ahvenharju, Minkkinen and Lalot (2018) this overlap of concepts which describe similar phenomena is to some extent because these concepts were developed for different purposes, e.g. from foresight work, to exploring individuals' futures thinking.

Throughout the thesis, when the term *futures thinking,* is used to refer to individuals' overall ability to think about and explore future possibilities in detail. Seginer refers to this as *future orientation*, i.e. individuals' "generalized aptitude to think about the future" (Seginer, 2009, p. 5). The capacity to think about the future in a systematic and anticipatory way, has in fact been identified as a key competency for acting in support of sustainable development (UNESCO, 2018). This is referred to as anticipatory competency, i.e. "the ability to understand and evaluate multiple futures – possible, probable and desirable – and to create one's own visions for the future, to apply the precautionary principle, to assess the consequences of actions, and to deal with risks and changes" (UNESCO, 2018, p. 44). Note how the definition of this competency includes not only the ability to evaluate the impact of each future, but to also be an active agent in creating desirable visions.

Futures literacy is another related concept found in the literature. The UNESCO website[2] states that futures literacy "helps people understand why and how we use the future to prepare, plan, and interact with the complexity and novelty of our societies". For Miller (2007), futures literacy is "the capacity to think about the potential of the present to give rise to the future by developing and interpreting stories about possible, probable and desirable futures" (p. 347) – making a clear connection between futures literacy and the exploration of possible, probable and preferable futures.

[2] https://www.unesco.org/en/futures-literacy

Futures consciousness is another closely related term, which refers to the human consciousness of past, present and future; of what is possible, probable and preferable. According to Lombardo and Cornish (2010), futures consciousness is "the human capacity to have thoughts, feelings, and goals about the future. It is the total integrative set of psychological abilities, processes, and experiences that humans use to understand and deal with the future" (pp. 34–35). Whereas with futures literacy the emphasis is very much on the cognitive development of futures thinking, futures consciousness includes psychological processes beyond cognition (Ahvenharju, Minkkinen and Lalot, 2018), thus futures consciousness is a broader concept.

In an effort to provide a conceptual model of Futures Consciousness that can support empirical research, Ahvenharju, Minkkinen and Lalot (2018) analysed the definitions and descriptions of future consciousness across the literature, as well as related concepts in various fields of research (e.g. psychology and philosophy). Through their review and analysis, they were able to present a model of Futures Consciousness, which includes five dimensions:

- Time perspective: This first dimension refers to the awareness of the passing of time, including past, present, and future. It includes the way one perceives time. e.g., whether the future is perceived to be distant or close to the here and now. It also refers to how far one can look into the future, and capacity to engage in long-term thinking.
- Agency beliefs: This dimension refers to one's sense of ability to shape the future; It is based on the view that the future is not predetermined, and that people have active agency (either individually or as a collective) to influence future events. This dimension includes the level of optimism and enthusiasm with which one views future possibilities, and the level of motivation to influence the future.
- Openness to alternatives: This refers to the ability to view future possibilities and potential changes with openness, creativity, and curiosity. It includes the attributes of courage and risk-taking when it comes to innovating and changing the future, as well as critical thinking and questioning assumptions, which can lead to opening multiple, diverse, future possibilities.
- Systems perception: The fourth dimension refers to the ability to think about the future systemically and holistically, i.e., to recognise the interconnectedness of

factors and phenomena, acknowledge the long-term consequences of decisions on each part of a system, and as a result the complexity of decision-making.

- Concern for others: The final dimension refers to the capacity to strive for better futures not only for oneself, but for everyone. It includes making decisions about the future based on one's values, and envisioning preferable futures, which ensure the welfare of humanity.

2.4 Futures of Game-Based, Gamified, and Technology-Enabled Learning in Higher Education

Given the growing research interest in game-based and gamified learning approaches in higher education (Vlachopoulos and Makri, 2017; Subhash and Cudney, 2018), this literature review aimed to capture studies conducted to date, which explored the probable, possible or preferable futures of these approaches in higher education, using a futures studies approach. As the focus of this PhD study is on *digital* game-based or gamified interventions, i.e. those which make use of technology in some way, the literature review focused on studies that explored the futures of technology-enabled learning and educational technologies in higher education. Two databases were selected for this review:

- Education Research Complete (EBSCO): EBSCO was utilised on the basis that the database covers research in all areas of education. In addition, *On the Horizon* is indexed in this database – a peer-reviewed academic journal, which serves as a strategic planning resource for education policy makers, practitioners and researchers in post-secondary and life-long learning settings.
- Science Direct: This was targeted on the basis that one of the oldest[3] futures studies Journals, *Futures*, is available in this database, and includes research on futures studies approaches. Furthermore, the *Futures'* editorial board includes many of the most respected futures researchers and practitioners in the field.

[3] Founded in 1968, according to the World Futures Studies Federation: https://wfsf.org/futures-publications-journals/

Further to the databases search, deep searches were conducted directly within several Futures Studies academic journals. The rationale behind this was to ensure the search would be thorough, and to increase the likelihood of yielding relevant results, as the futures studies approach appears to be a relatively new methodology in educational research and may not have been fully incorporated in the database logic yet.

To conduct this search, the main futures studies journals available in the university library were identified, using the following keywords: "futures studies", "futures", "foresight" and "futurist". The World Futures Studies Federation[4] website was also consulted, as it provides an extensive list of peer-reviewed academic journals in the field of futures studies. Excluding those who appeared to focus on strategic forecasting within corporate and management contexts, the following journals were selected: *Futures, Journal of Futures Studies, World Futures, Foresight, European Journal of Futures Research,* and *Policy Futures in Education.* In addition to the database and journal searches, a general web-search was conducted, to capture any further studies that may have not been published in academic journals (e.g. conducted by futures organisations). The web-search revealed two reports on the future of higher education, with emphasis on the impact of technology, which have been included in this review.

2.4.1 Search Terms and Selection Criteria

As each database and academic journal had different search capabilities, various combinations of the search terms were used to ensure optimal results for each platform. No time/date limit was added in the search, in order to gauge relevant research from any point in time. The Boolean search operators (AND, OR) and phrase searches were used where the search function allowed for this option. While the search string was not identical each time, the overall search criteria included:

Search One - To identify papers exploring the futures of gamified and/or game-based learning in higher education:

- serious game or gamification or gamified or game-based or game

[4] https://wfsf.org/resources/futures-publications-journals

- AND futures studies or futures research or education futures or scenario building or visioning or backcasting[5]
- AND higher education or college or university or post secondary or postsecondary

Search Two - To identify papers exploring the futures of technology and/or technology-enabled learning in higher education:

- digital learning or technology or technology enabled learning or virtual reality or extended realities or mixed reality or augmented reality
- AND futures studies or futures research or education futures or scenario building or visioning or backcasting
- AND higher education or college or university or post secondary or postsecondary

The searches within the two databases and six academic journals returned a total of 358 results. These were further refined by excluding formats beyond research articles and book chapters (i.e. excluding conference abstracts, book reviews, editorials, discussions), limiting the results to English language only (where that option was available) and reviewing each title for relevancy to the topic in question, i.e. detecting whether: a) the paper studies the future; and b) the topic focuses on futures of gamified learning or game-based learning or technology enabled learning in higher education. Where the above were not clear from the title review only, the abstract was also reviewed.

After the above refinement stage, a total of 15 papers were selected for full review, to further determine whether they were relevant for inclusion in this literature review. Following the paper review, any papers that were not following a futures studies approach or method, were looking at education futures at levels other than higher education (e.g. secondary level, K-12) or were not including empirical data, were excluded. Following this last refinement stage, a total of 5 papers were selected for inclusion in this review: specifically, 3 academic journal articles and 2 web-based reports. Figure 2.3 shows a visual representation of the selection process.

[5] The search terms scenario building, visioning and backcasting were included as these are some commonly used futures studies methods.

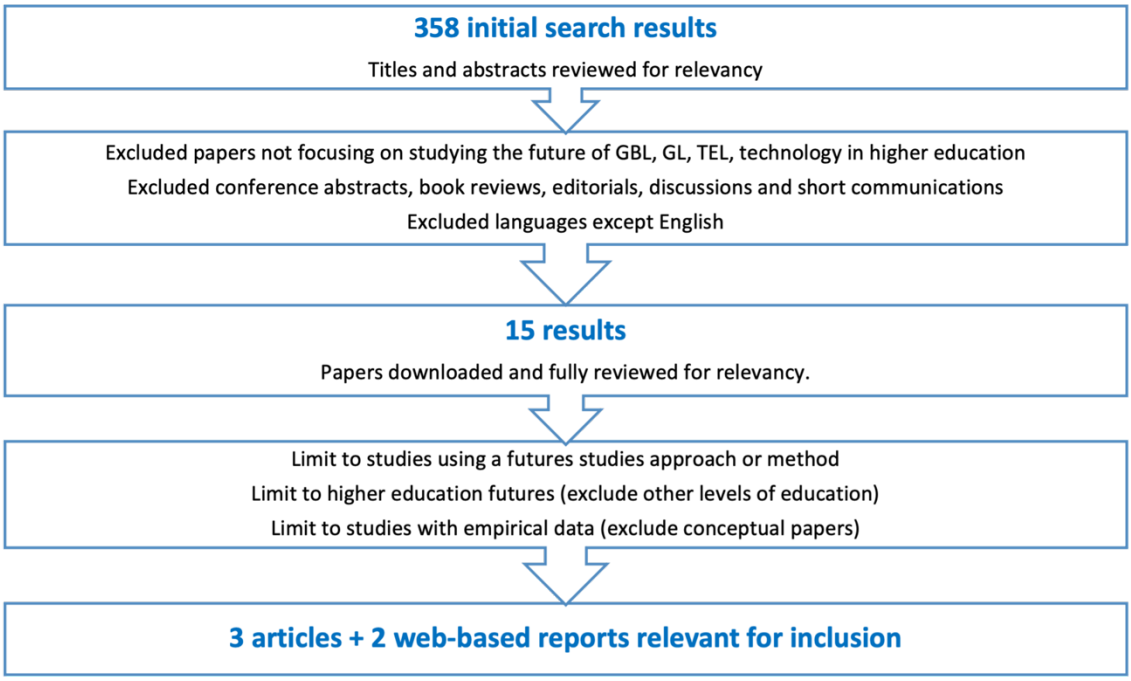


Figure 2.3 – In numbers: Selection process of studies for inclusion in the literature review

2.4.2 Overview of Studies

The following section presents a summary of each of the five papers, along with key outcomes and observations. These are presented in chronological order in terms of publication date, starting with the most recent publications.

Paper 1: Deloitte (2021) The Future of Higher Education

The first paper is a report published by Deloitte in 2021, on the future of higher education (Deloitte, 2021). The paper uses inputs from a trend analysis of the higher education landscape, past Deloitte studies and articles in this field (with an emphasis on the pandemic) and inputs from a webinar conducted in November 2020 around the future of higher education in Portugal, where challenges and opportunities were discussed, particularly in the context of COVID-19. The paper does not go into further detail around the methodological processes followed in order to compile the report. The paper focuses on summarising recommendations for higher education, categorised under three main

subjects: a) Student Experience; b) Technological and Physical Infrastructures; and c) New Markets and Business Models.

In terms of student experience, the report provides strategies for higher education institutes, which will enable them to prioritise student experience and success. Briefly, these strategies include: a) providing opportunities to students for dialogue around issues that administrators should address, and a platform for exchanging innovative ideas around student success; b) training academic staff on how to connect students to available resources, ultimately promoting a student-centric culture; and c) leveraging local resources, ranging from small tasks, such as checking the local commuting bus timetable when scheduling classes, to leveraging student success metrics dashboards in order to improve the student experience when it comes to registration, change of modules, credits management etc.

In terms of technological developments and drivers of innovation in educational technology, the paper discusses the following emerging technologies: Artificial Intelligence (AI), Digital Reality (Virtual and Augmented Reality combined with the Internet of Things[6]), Blockchain, Learning analytics and Application Programmer Interfaces (API). The paper highlights the opportunities of these technologies for higher education, i.e. a) the potential of AI for improved quality of research, improved learning analytics and personalised learning experiences; b) the potential of Digital Reality for enhancing remote learning, improving classroom interactions with smart technologies. Combined with AI, digital reality can be used to immerse users in a digital world that looks real; c) the potential of using smart devices for campus interaction, providing personalised and location-based information; d) the potential of blockchain technology, which can allow for secure storage and authentication of information, specifically when it comes to accrediting educational achievement, keeping student records private, and allowing for secure payments/compensation for work completed; e) the potential of institutions using learning analytics to personalise and tailor the learning experience to meet students' needs, predict student outcomes and tailor marketing for increased student

[6] "IoT involves a network of connected devices that brings users, devices, and data together" (Deloitte, 2021, p. 8).

recruitment and retention; and f) the potential of using Application Programmer Interfaces (APIs) to enable sharing of data between apps, platforms and systems – a process referred to as API Economy. In terms of benefits to higher education, according to the paper, API Economy can support efficient scaling of data across the university through a centralised portal, it can provide new revenue streams (e.g. by monetising core assets through APIs), and enhance partnerships between education and industry (Deloitte, 2021).

Finally, the paper discusses new markets and business models emerging after the global COVID-19 pandemic. Specifically, they discuss emerging trends in higher education, including substantial IT investments to support changes in instruction, significant on-campus expenses to ensure social distancing, and potential consolidation of higher education institutions and programs, to tackle the likely enrolment decline due to the pandemic.

Paper 2: Barzman, M. et al. (2021) Exploring Digital Transformation in Higher Education and Research via Scenarios

The second paper, published in the *Journal of Futures Studies*, explores digital transformation in higher education. The focus of the paper is on higher education and research institutions that specialise in the fields of food, agriculture and the environment. Given the fast-paced rhythm by which technology impacts practice, the authors generated four scenarios presenting possible future changes by 2040, in an effort to enable institutions to anticipate risks and opportunities around the digital transformation of higher education. Each scenario identifies areas where stakeholders and decision-makers can take action.

In terms of methodological approach, a multi-disciplinary working group and project group worked for a period of 18 months between January 2018 and June 2019 on this futures exercise. First, the working group and project team compiled a list of issues related to the digital transformation in higher education and research institutions, e.g. issues related to the practice of research, the practice of teaching etc. This was followed by a retrospective analysis, where shared knowledge of past and present trends related to the aforementioned issues was gathered through a process of literature-based analysis,

supplemented by three guest lectures within the relevant domains. Following this phase, the team produced 94 hypotheses for the future (2040 horizon), which were then refined and combined into four plausible scenarios using morphological analysis, a method which allows for exploration of complex systems. The four scenarios are summarised below:

Scenario 1: "HER in the shadow of digital giants"

For-profit digital giants (i.e. large digital firms) are now key players in research and teaching. Many researchers and higher education educators join the private sector since 2030. Digital giants manage matchmaking platforms, which centralise calls for proposals and, using AI, they match researcher groups with available funding. AI is now the new standard in knowledge production, knowledge validation and researcher evaluation. Higher education is split into two tiers, which reinforces social inequalities: a) the private sector, which focuses on specialised, innovative topics; and b) the public sector, which focuses on more general topics or topics less in demand. The role of teachers changes - they now coach and guide students through the online learning resources they need to access. Their evaluation is based on their digital reputation, via online rating scores. There is now a leading learning management system, which all teachers use for all aspects of teaching. Students are certified via badges.

This scenario carries risks for non-profit and public institutions. Public research and education resources might become overshadowed by digital giants. The increased automation of research could lead to a research agenda that is market-driven, rather than in the common interest, and it also raises ethical concerns around the use of learning and personal data. In terms of opportunities, education and research could benefit from the established networks, and academics in the public sector may be protected from economic ups and downs.

Scenario 2: "HER and digital tech for the planet"

The environmental emergency takes priority status since 2021. The European Union is a main actor in tackling this global challenge, and develops its own digital resources, search engines etc. EU and member states invest substantially in public higher education and research to address the global challenge. Global inter-operable databases and systems allow for interdisciplinary research. Scientists and non-scientists maintain trust between

them, thanks to educational efforts which promote a critical use of digital resources. In higher education, curricula is internationalised. Teaching takes place mostly in English or is translated live by AI, and the courses relate to global challenges. Students are mobile, and can select modules from a European digital catalogue. Their diplomas are recognised throughout the EU.

In terms of their capacity to address environmental challenges, higher education and research institutes are equipped to respond to some extent, but a radical systemic transformation would be required to ensure these complex issues can be addressed efficiently at a global level.

Scenario 3: "Digital territoire[7]-based HER ecosystems"

In this scenario we see the existence of local higher education and research hubs which focus on their own themes. These operate in cooperation with surrounding communities, forming research and innovation ecosystems. Artificial Intelligence supports researchers in processing data. Local infrastructure (digital platforms, open laboratories) lead to strong cooperative relationships between science and society, with citizen groups now influencing research and education agendas. Through self-regulation and policies, citizens have mastered using digital technology in a sensible way. Local fieldwork becomes more important than teaching. Teachers are now employed by local government and focus on helping students take advantage of the variety of online tools and content available to them. Modules which do not require fieldwork (e.g. mathematics) are provided on digital platforms only. These are run by designers who co-create digital tools with students.

In terms of risks arising from this scenario, a failure of civil society and for-profit organisations to effectively collaborate could create dissatisfaction between stakeholders and academia. The scenario holds opportunities for educators and researchers to take advantage of new uses of digital technology. Local hubs provide an opportunity to bring research and education locally, supporting participatory science.

[7] Territoire is defined as "a geographical area that includes the human communities providing its economic, ecological and cultural reality" (Barzman *et al.*, 2021, p. 76).

Scenario 4: "HER faces digital frugality"

The EU now regulates digital use, following a global movement supporting a balance between digital use and protection of the environment, social and behavioural health. A data-byte tax is introduced in 2035, where citizens and organisations are charged if they exceed their allocated data limit. In terms of research and higher education, the priority is now to support the development of frugal digital practices. Data science reduces the use of digital resources and the emphasis is on laboratory and field experimentation. Higher education is decentralised and distributed geographically. Learners acquire knowledge with fieldwork or in the laboratory, and by interacting with others in hybrid learning communities, where they co-construct tools and content with their teachers, both online and face-to-face. Teachers act as facilitators and collectors of know-how.

Digital frugality will affect scientific fields that are reliant on using large-scale data, computer simulations and artificial intelligence. However, this might open up new areas of innovation, and lead to increased collaboration between institutions and between individuals.

Paper 3: Calabor et al. (2019) The future of "serious games" in accounting education: A Delphi study

The study, published in 2019, examines educators' perceptions on the use of accounting serious games in the classroom, focusing on perceived usefulness and barriers. The study used an MIT-developed business game called "Platform Wars Simulation", where players play the role of video game producers that make business decisions and compete against competitors. Through a Delphi survey, the study captured the perceptions of 12 Accounting lecturers, in terms of perceived barriers to the adoption of accounting serious games, and perceived benefits.

The main findings from the Delphi showed that the accounting lecturers perceived the following factors as barriers to the adoption of serious games in accounting education: a) academics' lack of information on appropriate games; b) lack of resources for purchasing games; and c) academics' lack of knowledge on serious games. In terms of perceived benefits of serious games, the Delphi participants stated that serious games: a) give an image of modernity to the university; b) they benefit the faculty by increasing student motivation and engagement, allowing for practical application of concepts, and helping

to make teaching easier and more dynamic; and c) they benefit students by making the learning experiential and enjoyable, and by relating concepts with real world.

Paper 4: The Economist (2008) The future of higher education: How technology will shape learning

The fourth paper is a report published by the Economist Intelligence Unit in 2008, focusing on how technology will shape learning in higher education. In terms of methodological approach, the paper is based on input from two initiatives: a global survey with 289 executives (from higher education and corporate settings); and 12 interviews with university Chief Information Officers and leaders in private sector. The report acknowledges that while universities are already embracing technology in many ways, e.g. by integrating sophisticated learning management systems and distance learning, technology still remains an expensive and disruptive innovation. The main findings from the survey and interviews presented in the report include:

- Technological innovation will not only continue to significantly influence higher education over the next five years, in terms of teaching methodologies, but it will become a differentiating factor in terms of attracting students.
- Online learning will continue to be key in advancing academia's mission and reaching learners who would otherwise not have access to advanced education.
- Partnerships between corporate world and academia will increase, as a way for higher education institutions to locate funding and control costs.
- While technology is seen by stakeholders as having a positive impact in higher education to a large extent, there are a number of challenges which may prevent it's beneficial adoption, i.e. faculty resistance to new technologies, and an increase in student plagiarism, due to easy access to mobile technologies.
- Responding to globalisation, the majority of higher education institutions will have a presence in foreign locations. In addition, universities will leverage advanced technologies to reach larger numbers of students via global, distance education.

Paper 5: Roberts and Sapio (1998) Structural analysis using signed evaluations

The paper, published in 1998 in the academic journal *Futures,* focuses on the potential of new information storage and communication technologies for open and distance learning in higher education globally. In terms of methodological approach, the authors use the Signed–Weighted Impact Structural Evaluation (S-WISE) method to a variety of variables (e.g. technological, environmental etc.) which have the potential to influence the uptake of distance learning. S-WISE is a version of the WISE method, which provides information "about the capability of the different factors to influence the development of the system and to be influenced by it" (Roberts and Sapio, 1998, p. 324).

The main aim of the paper is to demonstrate the strength of the WISE and S-WISE methods in showing the potential influence or dependence of various factors. Nevertheless, the paper presents a number of factors that could impact the adoption of distance learning in higher education. Reviewing these factors through today's lens is interesting, given the paper was published over 25 years ago. According to the main findings, the paper concludes that for most students traditional higher education (i.e. face-to-face) will continue to be the preferred mode of study in the future. The S-WISE analysis also highlighted the factors that can hinder the adoption of distance learning, namely: students' concerns over social isolation, the possibility of increased issues with software upgrades, the possibility of increased censorship and copyright regulations around the materials used in education, and finally the access to traditional higher education, i.e. the more accessible entry to conventional education is, the less students will need to seek distance learning opportunities. However, according to the findings, there are also a number of factors which can strengthen the appeal of the distance learning approach. These include: the development of and investment in new communication technologies, the improved quality of content used in distance learning, students' desire for more flexibility, and the better familiarisation with the new technologies and what can be achieved with/through them.

2.4.3 Observations

The five reviewed studies utilise various methods to study the future. Prominent methods appear to be the literature-based trend analysis, to determine past and present trends (Barzman *et al.*, 2021; Deloitte, 2021) and participatory approaches, where stakeholders

are heavily involved in the process of exploring the future. In these cases, stakeholders have been involved through discussions of challenges and opportunities of future possibilities (Barzman *et al.*, 2021; Deloitte, 2021), scenario development (Barzman *et al.*, 2021), surveys and interviews (The Economist, 2008) and a Delphi survey (Calabor, Mora and Moya, 2019). The only outlier appears to be Roberts and Sapio (1998), who use a structural analysis method to evaluate the influence of a wide-range of factors.

It is also evident in the reviewed studies that their exploration of the future results largely in developing *plausible* or *probable* futures possibilities. In Roberts and Sapio (1998b), the S-WISE analysis shows which factors may influence more strongly the uptake of distance learning in the future – an approach which contributes to the development of *probable* futures. The Economist report (2008) makes short-term projections on the future (i.e. 5-year horizon) based on stakeholder's current dispositions and survey responses about present trends – again, an approach which generates probable future eventualities. While the futures horizon is not specified in the Deloitte report (2021), the factors discussed are largely current, established trends, and the emphasis of the paper is on increasing higher education preparedness by outlining plausible opportunities. On the other hand, Barzman *et al.* (2021) offer a more comprehensive array of alternative futures, by developing a total of four scenarios on a longer-term horizon (i.e. 20 years). All scenarios presented are plausible, and while none is treated as preferred or un-preferred, each scenario has both desirable and undesirable aspects, so emphasis is given on discussing the risks and opportunities of each.

As an overall observation, it is obvious that there is a dearth of scholarly studies (evidenced by the gap in the literature) in terms of researching the possible, probable and preferable futures of game-based learning and gamified learning within a higher education context. While researchers have indeed studied the futures of higher education more broadly, with technological advancements forming an aspect of these broader futures[8], only one study has been found to study the future of serious games within accounting education and only a handful of studies (as presented above) focused on the futures of educational technology in higher education.

[8] These will be discussed in the next section.

Given the rapid developments in Artificial Intelligence observed currently (i.e. at the time of writing this thesis) it is possible that some futures studies are currently being conducted or have been conducted in the very recent past, with an aim to explore the future of AI and/or other topical educational technologies and their potential in higher education teaching and learning, but have not yet been funnelled through academic journal channels.

2.5 Futures Studies in Broader Higher Education Research

As futures studies is a relatively new approach to education research, this literature review was expanded to review and include studies conducted with a focus on higher education more broadly, using a futures studies approach. This layer of the literature review helped determine which methodologies or approaches may be most suitable for futures research within a higher education context, and therefore influenced the methodological approach followed in this PhD.

In a similar manner as the literature review outlined in section 2.4, two databases were selected for this review: a) Education Research Complete (ESBCO); and b) Science Direct. In addition, individual searches were conducted in the following futures journals: *World Futures, Futures, Journal of Futures Studies, Foresight, Policy Futures in Education, European Journal of Futures Research.*

2.5.1 Search Terms and Selection Criteria

Given each platform had different search capabilities, a variety of combinations and search terms were used in each case, to ensure optimal results. In some cases, terms were excluded from the search, if not recognised by a given platform - e.g. the term "foresight" was not recognised in the EBSCO database thesaurus, so was not included in the search. While the search string was not identical in every search for the reasons described above, sample search strings that were used are provided below to illustrate the search process:

- "futures education" (search field: abstract) AND "higher education" OR college OR university OR post secondary OR postsecondary (search field: all text)

- "futures research" (search field: abstract) AND "higher education" OR college OR university OR post secondary OR postsecondary (search field: all text)
- "futures studies" (search field: abstract) AND "higher education" OR college OR university OR post secondary OR postsecondary (search field: all text)
- "futures studies" (search field: subject) AND "higher education" OR college OR university OR post secondary OR postsecondary (search field: subject)

The database and journals search yielded a total of 687 initial results. These were filtered to limit results to: a) journal articles, book chapters and case reports; b) results in the English language; and c) results where the full paper was accessible. Titles, abstracts and keywords were reviewed to determine if these results were relevant for inclusion in this review.

Following this refinement stage, a list of 43 articles was identified. These were downloaded and further reviewed to determine whether they met the following inclusion criteria:

- Studies which focus on interventions, workshops or events that took place within a higher education setting, using a futures studies approach.
- Studies relating to the future of higher education or the future of an element, subject or field within higher education.

The bibliography provided within each paper was also reviewed, as a final avenue for identifying relevant studies. Finally, the following were considered irrelevant for the purposes of this literature review and were excluded from further review at this stage:

- Articles with no empirical data, e.g. conceptual papers where futurists discuss ideas about the futures of higher education without articulating a specific methodology.
- Articles that simply discuss different futures studies programmes offered in universities around the world.
- Articles describing the development of futures studies as an applied discipline and as part of a higher education curriculum.

Following this final refinement stage, a list of 32 relevant studies was compiled. Figure 2.4 shows a visual representation of the review and refinement process.

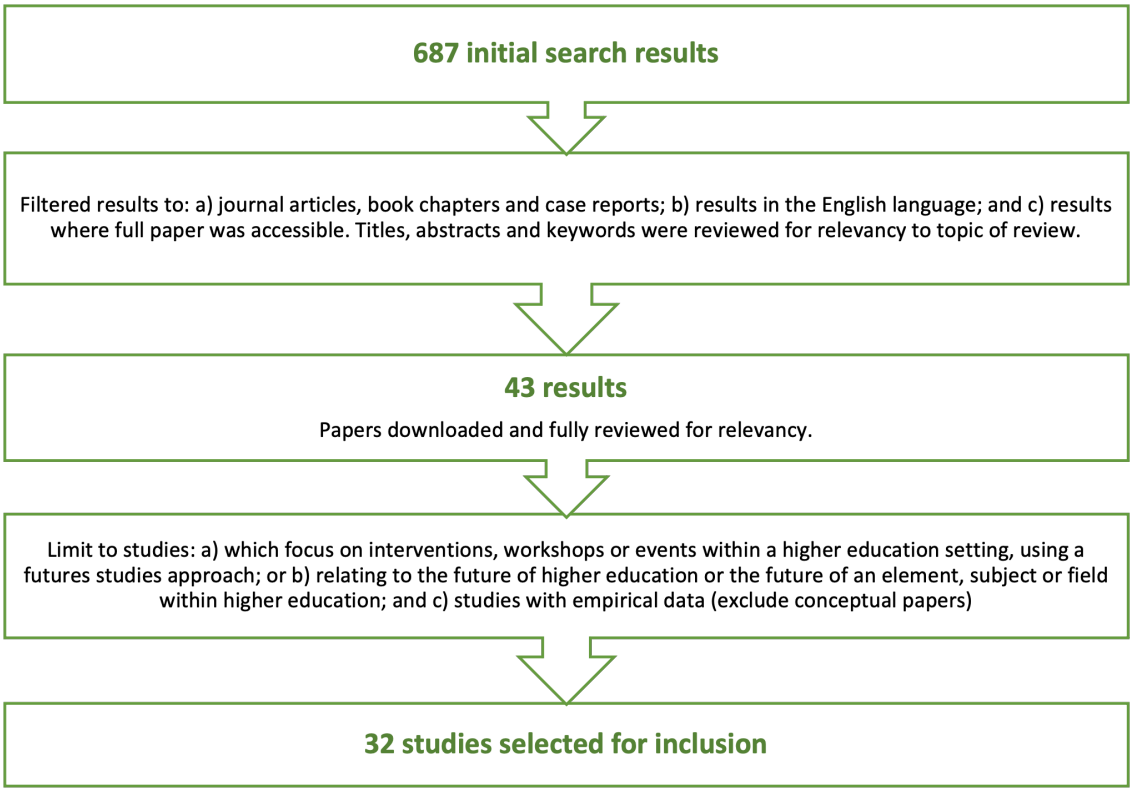


Figure 2.4 – In numbers: Selection process of studies for inclusion in the literature review

2.5.2 Overview of Reviewed Studies

The identified studies explored the broad theme of futures for higher education. Appendix C presents a summary of the 32 studies, categorised by the main method used. In the majority of studies, researchers combined a variety of methods to achieve the purposes of their studies.

It is evident in the literature that a variety of methods and methodological combinations are used in the identified papers, including: Delphi Approach, Trend Analysis, Scenario Development and Casual Layered Analysis. Researchers and foresight practitioners used these methods in a variety of ways, to best suit the aims of their study. While some researchers and foresight practitioners were evidently influenced by Inayatullah's Six Pillars Approach and Causal Layered Analysis (Conway, 2012; Baradaran Ghahfarokhi,

Mohaghar and Saghafi, 2018), others develop custom methodologies to address the specific aims of their study (Hines, 2017b; Géring *et al.*, 2018). In some cases, researchers articulated their visions of the future in the form of conceptual papers, without utilizing or clearly articulating a specific methodology (Abeles, 2006; Melville-Ross, 2010).

The majority of studies examined medium-term futures, i.e. a time horizon of 10-15 years, with the exception of Munck and McConnell (2009), which is concerned with a 5-year strategic plan for an Irish university. The following section excludes short-term horizon studies from the discussion, as these fall within the life-span of the present rather than what is understood as "futures" in authentic futures exercises. Two of the articles explored longer-term horizons, looking at futures 20-25 years ahead (Hicks, 1996, 1998).

Scenario-building appears to be an integral part of almost every futures methodology used in the identified studies. Some chose to build scenarios guided by the Six Pillars Approach (Inayatullah, 2008), and others used scenarios as part of conceptual papers, to foster thought-provoking conversations about the future. Trend analysis was utilised in the majority of cases followed by articulating scenarios of the future based on findings from the analysis.

For the majority of studies, there appears to be a deep-dive into the history of, current state of and/or drivers related to an issue, prior to developing futures scenarios. For some researchers, this stage of "mapping the past" was named as the framing phase (Géring *et al.*, 2018), for others it comprised the literature review (Blass, Jasman and Shelley, 2010; Blass and Hayward, 2014; Faasse, Meulen and Heerekop, 2014) or a "diagnosis of the times" (Hammershøj, 2018).

2.5.3 Review of Futures Studies Approaches and Tools

The Delphi approach, Trend Analysis, Scenarios Development and Casual Layered Analysis featured in the reviewed futures studies in higher education and are discussed as follows.

Delphi Approach:

Six of the identified papers included in this literature review have used the Delphi method as part of a future-orientated study. All papers, with the exception of De Wit & Hunter (De Wit and Hunter, 2015) provide a detailed account of how the Delphi approach was used in their respective studies. All identified papers appear to be using the Delphi approach to capture expert opinion on a number of statements over at least two rounds of questionnaire. The experts in the identified studies are mainly local and/or international higher education professionals, working across a range of roles within the sector.

As part of the studies, during the first round, experts are asked to rate the probability and desirability of a number of statements for the future (Huisman, de Boer and Bótas, 2012; Schüll, 2019) or are asked open ended questions (Hayes, 2007; Rieckmann, 2012). As part of the second round of the Delphi approach, the experts usually receive a summary of previous expert responses in order to reflect and reach consensus. The only "unexpected" use of Delphi in the identified studies were Noh et al., who use a version of the approach named "Fuzzy Delphi Method", which appears to be preferred by the authors as a more cost-effective and less time-consuming version of Delphi (Noh et al., 2013).

The majority of the identified studies have delivered the Delphi questionnaire online (Hayes, 2007; Huisman, de Boer and Bótas, 2012; Rieckmann, 2012; Schüll, 2019) or via email (Hayes, 2007). The delivery method appears to be an advantage for some, as it allows the researcher(s) to reach experts globally (Hayes, 2007). In all identified cases the Delphi method has been successful in capturing expert views, with half of the identified studies using the findings from the Delphi questionnaire as the basis for articulating scenarios for the future (Huisman, de Boer and Bótas, 2012; Schüll, 2019).

Trend Analysis:

Four of the identified papers use Trend Analysis as the main method to study the future, or as a stepping-stone to enable scenario development for the future. It is not uncommon to see trend analysis used as part of a foresight endeavour, as it appears to be "one of the most powerful tools for exploring future developments" (Beynaghi *et al.*, 2014, p. 51).

The identified papers examine trends and drivers in a number of ways. In Vincent-Lancrin (2006) the trend analysis is based on quantitative data gathered from selected databases. The identified trends include, among others, the number of higher education researchers, funding sources for higher education research and development. In other cases, the trend analysis becomes possible through a combination of literature review and document analysis, followed by expert panel discussion to discuss possible interactive effects of the identified trends (Beynaghi et al., 2014). In Hashimshony & Haina (2006) the authors review and discuss socio-economic, technological and cultural factors, prior to illustrating a number of scenarios on the design of future universities. Boer et al. (2002) follow a very structured approach to trend analysis, which includes defining the research questions and stakeholders, before scanning a large volume of recently published books, articles and other relevant applications. The research team also complete extensive searches within several databases, using a variety of keywords related to the research questions (Boer et al., 2002).

Scenario Development:

Scenarios appear to be the most frequently used futures method amongst the identified studies. That would be in line with the overall futures studies literature, where scenarios are deemed as very useful for futures discourse. Indicatively, Vincent-Lancrin (2006), commenting on the advantages of using scenarios, states that "[t]he use of scenarios enables complex trends to be combined, tensions between people's actions to be highlighted, emerging trends to be brought into the picture, and what trend reversal or radical innovation might entail" (p. 193). Similarly, the OECD publication praises scenarios as "a useful way of drawing upon imagination in a structured and serious way to think creatively on matters we often take for granted and to look at issues in a holistic way rather than in isolation" (OECD, 2008), ultimately helping us answer important questions about the future: i.e. where we are going, where we want to go and how we can get there.

In the identified studies, the authors use scenarios mainly to offer alternative futures (Blass, Jasman and Shelley, 2010), to support stakeholders in their strategic thinking (Snyder, 2006; Azman, Sirat and Karim, 2010) and to emphasise the need to action (Hammershøj, 2018).

The authors build a number of scenarios based on trends identified via cross-disciplinary literature reviews (Blass, Jasman and Shelley, 2010; Blass and Hayward, 2014), trend analyses (Vincent-Lancrin, 2006) and interviews with stakeholders (Faasse, Meulen and Heerekop, 2014). On some occasions, the scenarios are developed as a collaborative process, as part of participatory workshops or events, where stakeholders explore future developments in the context of higher education (SARUA, 2012).

It is worth noting that Beynaghi et al. propose their own model for developing trend-based scenarios (2016). The model follows a two-phased approach, which spans from trend analysis to scenario building, and enables researchers to identify futures (probable, possible and desirable) from the convergence of trends (Beynaghi et al., 2016). As part of this process, following the first phase, where the research team identified key trends and uncertainties for the future, the research team organised an expert panel discussion, through which three scenarios were created.

Causal Layered Analysis:

Two studies used Causal Layered Analysis (CLA) as their main futures method. From the two, Conway's approach places emphasis on CLA, exploring each phase of CLA with a large number of participants within a workshop setting (Conway, 2012). Following a preliminary analysis of the collected data, Conway follows up with an online post-intervention survey, to test some emerging themes (Conway, 2012). On the other hand, Baradaran Ghahfarokhi, Mohaghar and Saghafi use CLA as part of semi-structured qualitative interviews with a wide range of stakeholders, who are asked to respond to each level of CLA (Baradaran Ghahfarokhi, Mohaghar and Saghafi, 2018).

2.6 Conclusion

This chapter provided context and clarity on the terminology used throughout the thesis, relating to game-based learning, gamified learning, as well as futures studies, futures thinking, futures literacy and futures consciousness.

The literature review set-out to identify studies that examined the futures of gamified learning and game-based learning in higher education. However, the review highlighted a serious gap in the literature in the context of futures studies/ research, with only a

handful of studies identified in the broader educational technology and technology-enabled learning futures for higher education, and one study found in the thematic area of game-based and gamified learning futures in higher education. From the small sample of studies identified in technology futures for higher education, the review provided useful insights into vignettes for the futures of higher education, and on the types of approaches being employed in futures studies, which informed the framing of the methodology for this research study as detailed in chapter three. Furthermore, the Futures Consciousness dimensions model informed a layer of analysis of the Delphi survey and futures workshops datasets, discussed in more detail in chapters six and seven.

It is important to note here that part of futures exercises involves tracing the history of the issue – known as "mapping the past" – which in the context of this thesis involves reviewing the trends in terms of the integration of games-based and gamified learning in higher education from the past to the present. The mapping process is in essence a review of the literature on the integration of game-based and gamified learning in higher education. The outcome of this mapping process is presented in chapter four rather than as part of this literature review, as it forms part of the overall "Futures" research methodology.

Chapter 3: Philosophical and Methodological Framework

3.1 Introduction

This chapter sets out the worldview and philosophical assumptions underpinning the research approach, research methods, and tools employed in this study of futures thinking in the context of game-based and gamified learning in higher education. This research set out to explore expert insights on the futures of game-based and gamified learning in higher education, with a specific focus on articulating and contextualising visions for the future and engaging in critique thereof. In terms of the latter, the study examined characteristics of futures consciousness in the analysis of the "futures-orientation" nature of the emergent visions. This qualitative research study utilised historic and present trend mapping, the hybrid-Delphi survey approach, and futures workshops to reveal expert-led visions of game-based and gamified learning in higher education and engage in back casting thereof. The rationale for using the qualitative approach, and the accompanying data collection and analysis processes are discussed herein.

3.2 Overview of Research Philosophical Paradigms

Guba and Lincoln (1994) define a paradigm as "basic belief systems based on ontological, epistemological, and methodological assumptions" (p. 107). Before the research paradigms are introduced, it is important to provide an explanation of ontology, epistemology and methodological assumptions. *Ontology* is concerned with the nature of being, so it asks: What exists (in the human world-view)? Is there a single knowable reality or do multiple realities exist? In research paradigmatic contexts, ontology refers to a system of beliefs about what is considered the nature of "reality" and relates to the values a researcher holds about what can be known and what is understood to be factual (Bryman, 2008). *Epistemology* is the study of knowledge and processes of coming to know or knowing, and examines the possibilities and limits of human knowledge, thus it asks: How can we (come to) know what exists? How do we generate knowledge? *Methodological assumptions* are the considerations that informed the framing of research

approaches and processes in the study, with a focus on data collation and analysis, and on what is valued therein. Guba and Lincoln (1994) ask: "How can the knower go about obtaining the desired knowledge and understandings?" (p. 108). Aside from the ontological, epistemological and methodological considerations, there is a need to further articulate the *axiological* bases for the study, in this regard, Guba and Lincoln (2005) ask: "What is the nature of ethics? ", in essence of what was valued in this research study?

In relation to philosophical underpinnings of research, there are five main classes of paradigms: Positivism, Post-positivism, Constructivism, Critical Theory, and, the Participatory paradigm (Guba and Lincoln, 1994, 2005). In other framings of research paradigms, Constructivism and Critical Theory have been categorised under Transformative Paradigms, and Pragmatism has been added as an overarching paradigm that includes the Participatory dimension. Voros (2007) argues that it is useful to reconsider research philosophical paradigms typology under three categories– "1) positivistic (positivism and post-positivism); 2) interpretivistic (criticalism and constructivism); and 3) action/ participatory" (p. 76), and that has informed the framing of the following discussion of philosophical underpinnings of research.

The Positivist research philosophical paradigm operates on the basis of a social reality that is perceived to be knowable, thus a reality that is perceived to be independently observable, and analysable by researchers to generate law-like generalisations (Saunders, Lewis and Thornhill, 2009, p. 128). Positivist approaches involve the generation of hypothesis at the outset of the research study that are subsequently proved or disproved. Post-positivism rejects the notion that there is a single, knowable external social reality and that researchers can independently observe and analyse this. Post-positivism recognises the influence of researchers' values, beliefs, and identity on what is observed and valued, and seeks to identify and minimise effects of this researcher bias in its overall pursuit of objectivity.

Interpretivism from an ontological perspective is underpinned by the relativist premise that knowledge can only be generated through socially constructed meanings (Ritchie and Lewis, 2003). Therefore, the interpretivist paradigm recognises that objectivity is not possible in the study of social realities, and there is not a single, knowable shared reality. In this regard, interpretivism accepts that the construction of knowledge differs, as does the construction of corresponding meanings attributed to activities, actions, interactions

(Given, 2008). Critical realism distinguishes between what is real and what is observable and recognises that hidden or unobservable forces impact and shape our understanding of the world. Therefore, there is a focus within research underpinned by critical realism on the examination of the underlying causes and mechanisms that shape events in the social world. Constructivism ontologically recognises the existence of multiple realities, which are constructed and come to be known (perceptions or cognitions of these realities from an epistemological perspective) and are actively (re-)shaped by the individual through interaction with the environment, social or otherwise. In terms of the latter, constructivism "holds that the findings are co-created by the inquirer and the object of inquiry through the very act of inquiry itself" (Voros 2007, p.78).

The Participatory paradigm relates to the phenomenological ontological position of *being in the world* and ultimately developing practical knowledge (know-how), which according to Voros (2007) may be preceded by the development of experiential, presentational and propositional knowledge. Within participatory contexts, the emphasis is on "research with" rather than "research on" participants, and in this regard, it supports "self-reflexive actor-agent engaging with others in multiple forms of knowing, knowledge-creation, and reality-creation", enabling "equal-power status (i.e. 'political participation')" (Voros 2007, p80).

3.3 Framing of this Research Study

Futures studies are by nature esoteric, in that futures do not exist, and imaginings of futures may never be realised. Futures research therefore is challenging in that the researcher is studying something that does not exist, compared to research conducted on what is happening in the present or what has happened in the past. Futures research is by nature not empirical, literally (Voros, 2007). As James Dator puts it, "'the future' cannot be 'studied' because 'the future' does not exist. Futures studies does not -or should not- pretend to study the future. It studies ideas about the future (what I usually call 'images of the future')" (Dator, 2005; quoted in Voros, 2007, p. 72).

Voros (2007) argues "a useful concise working conception of futures research might simply be that it is inquiry into (among other things, but most especially) 'images of the future' and the wide variety of inputs into, outputs from, and consequences which flow

from these images of the future, in human activity and decision-making" (p. 73). This research set out to explore stakeholders' insights on the futures of gamified and game-based learning in higher education, with a specific focus on articulating and contextualising visions for the future and engaging in critique thereof. The overarching research questions were:

1. What futures are envisioned for gamified and game-based learning in higher education, and how futures-oriented are these visions?
2. What aspects of futures consciousness emerge in expert-led futures thinking exercises, and critique thereof?

The participants were experienced academics, technology experts and industry practitioners in the fields of gamified and/or game-based learning, game-design, technology-enabled learning within and beyond Ireland.

The "Research Onion" framework (as illustrated in Figure 3.1) has been adapted from Saunders et al. (2016, p.124) to present the research philosophy underpinning this study and explain the assumptions underpinning decisions on the research process across six dimensions, namely, philosophy, approach to theory development, methodology, strategies, time-horizons and data collection and analysis.

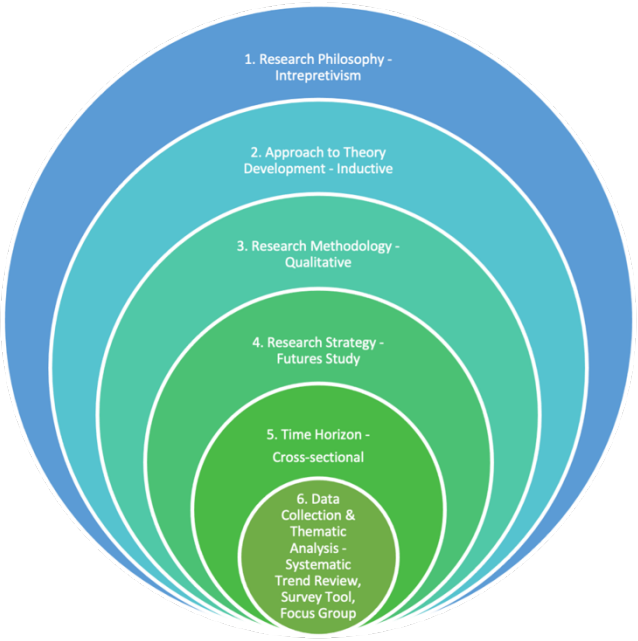


Figure 3.1 – Overview of Research, adapted from "The Research Onion" by Saunders, Lewis and Thornhill (2016, p.124).

3.3.1 Research Philosophy

In this context of this study, the outer-most layer of the Research Onion presents Interpretivism as the research philosophy underpinning this research study. Creswell suggests that " [w]hether we are aware of it or not, we always bring certain beliefs and philosophical assumptions to our research" (Creswell 2013, p.15). Within academic research, these assumptions include ontological, epistemological, methodological and axiological beliefs, i.e. assumptions about the nature of reality, the relationship between the knower to the known and the roles of values in research (Lincoln & Guba 1985). These assumptions constitute our worldview or paradigm, i.e. "a basic set of beliefs that guides action" (Guba 1990, p.17). If I were to place myself on the Rossman and Rallis (2012) subjective-objective continuum of the nature of reality, I would find my beliefs towards the subjective end. For Lincoln and Guba (1985) I would hold naturalist ontological and epistemological axioms, believing in "multiple constructed realities" and seeing the knower and known as inseparable, interacting to influence each other (Lincoln and Guba 1985 p. 37). Holding subjective assumptions, the goal of my study "is to describe and interpret how people make sense of and act in their worlds" (Rossman and Rallis 2012 p. 39). As a researcher, I adopted Rossman and Rallis' view of the inquirers being not mere instruments of the study, but *co-constructors of knowledge*, as they "construct understandings of their topics through the questions they ask, the contexts they study, and their personal biographies" (Rossman and Rallis 2012, p.33). Interpretivism is often linked to Constructivism, as they both share related concerns and a "common intellectual heritage" (Schwandt 1998 p. 222). Other authors, such as Baert et al. (2011), describe the interpretivist notion of *Verstehen* (understanding through interpretation) under the term "Hermeneutic Constructionism", which is considered by the authors as a category of social constructionism (Baert et al. 2011). Ultimately, I am in favour of the idea that philosophies such as Interpretivism and Constructivism provide only a general direction for the reader, and their meaning depends on the intentions or purpose of their users (Schwandt 1998).

I explored the possibility of not "fitting" into one paradigm-box and allowed myself to be inspired by various ideas. As Seale (2007) argues: "good quality research does not depend on the adoption of a particular philosophical or theoretical position, or on the

commitment to particular political goals. Consideration of all of these things is relevant for research practice, but it is a mistake to allow any one of them to over-determine practice" (Seale 2007 p.387). Within this frame of mind, I found myself flirting with ideas associated with Pragmatism. While I cannot fully commit to the pragmatists' assumptions "that truth is found in 'what works'" (Given 2008 p.672), the idea of seeking for truth/s or reality *that solves a problem* (Powell 2001) resonated with me. At the same time, I remain conscious that human action is unpredictable (Rossman and Rallis 2012), and I am humbly recognising the exploratory nature of my study.

In this context, Interpretivism was chosen as the underpinning philosophical paradigm, in doing so, acknowledging the intricate nature of human beings, who are the creators of their world (Rossman and Rallis 2012). Interpretivist approaches allow for multiple perspectives and interpretivists are interested in the subjective experience.

3.3.2 Research Approach

Futures can't be known, thus, the study did not set out to prove or disprove a pre-determined hypothesis on futures for game-based or gamified learning in higher education, it was therefore not deductive in nature, as described in Saunders et al. (2016). Instead, Inductive reasoning was foregrounded as this exploratory study focused on mapping visions for the futures of game-based and gamified learning and tracing dimensions of futures consciousness that emerged in the process, processes that mainly necessitated open-ended rather than convergent reasoning from the expert group of participants and researcher.

3.3.3 Research Methodology

The futures studies research was qualitative in nature, channelled through a Futures Study approach, as specified in the third and fourth layers of the Research Onion. Denzin and Lincoln (2005) write that qualitative researcher "study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (p.4). Their definition brings to mind Schwandt's (1998) introduction on Constructivist and Interpretivist approaches to human inquiry, where he writes that by

interpreting, the inquirer constructs a reading of meanings, i.e. a "construction of the constructions of the actors one studies" (Schwandt 1998 p. 222). This idea of the final research report constituting an interpretation of a series of individual interpretations serves as an axiological guide during this research study: First, as a reminder to respect all perspectives. Second, as a reminder to provide a balanced representation of these differing perspectives during the research report (Mertens 2010).

Qualitative research felt like a natural fit to my interpretivist worldview and the exploratory nature of this study. However, there were also a few practical reasons for choosing a qualitative design over other approaches. While reading Creswell's (2007) guidelines on when to use qualitative research, it became clear to me that a qualitative approach was appropriate for this study for the following reasons:

- It allows the researcher to explore an issue and gain a detailed understanding of it.
- It allows the researcher to hear the voices of my study's participants.
- It gives the researcher the opportunity to collaborate with the participants during the design process and data analysis.
- It gives the researcher the freedom to write in a literary and flexible style.
- It allows the researcher to recognise the uniqueness of their study's participants, by not reducing their stories to statistical conclusions.

A list of the "attractive" qualities of qualitative research is not utilised here to eliminate the limitations often linked to the approach. Qualitative research has often been criticised as subjective or unscientific, and the results of qualitative studies have been questioned as non-generalisable, non-credible and non- verifiable (for an overview of "Resistances to Qualitative Studies" see Denzin and Lincoln 2005, p. 8). Therefore, a careful consideration of the limitations of qualitative research becomes necessary. This thesis adopts Seale's (2007) definitions of *quality* as "transparency of the whole research process" (p.377) and *credibility* as "the validation of findings and results" (p.377) of qualitative research. To enhance these qualities, a number of research techniques and guidelines found in the literature have been employed:

- Provide clear description of framework – Rossman and Rallis (2012) emphasize the importance of being clear about how you will interpret your data: "Rather than pretending to be objective, state and make clear who you are and what perspective drives the study" (p. 34). As part of this thesis, a detailed description of the data analysis process is provided.
- Collect multiple forms of data – Following Creswell's (2007) guidelines for rigorous research, as part of this study data have been collected in more than one form.
- Address your bias – To ensure transparency and credibility, I actively engaged in critical reflection throughout the study on my biases, beliefs, perspectives, assumptions and experiences that may affect my views (Rossman and Rallis 2012; Creswell 2007).
- Keep a researcher's diary – Rossman and Rallis (2012) urge the researcher to keep a log of the research process: "Documenting your intellectual and methodological journey is crucial for establishing the soundness of the study" (p. 51). Accordingly, I kept a reflective diary throughout the different phases of research design, data collection and data analysis, while also recording key moments of "research breakthroughs", personal development and inevitable frustrations.
- Provide thick descriptions – I have collected detailed descriptions of the data collection and analysis processes. As per Creswell and Miller (2000) "[t]he purpose of a thick description is that it creates verisimilitude, statements that produce for the readers the feeling that they have experienced, or could experience, the events being described in a study" (pp. 128-129), thus establishing credibility.

3.3.4 Research Strategies

The overarching frame of this research is Futures Study. As such the data collection processes leaned on the approaches and tools employed within futures thinking exercises. Futurists use methods, tools and techniques from a variety of disciplines to the extent that they are relevant to the futures investigation they are conducting (Bell 2009). Bell highlights the methodological diversity in futures studies, with some methods being more

quantitative, such as technical or mathematical methods, and others being more qualitative, such as participant observations and reflections (Bell 2009 p 241). Bell notes that futurists have their own preferences, and he concludes that "no method has a monopoly on producing good – or bad – work" (Bell 2009 p241). Good or bad futures work depends on the futures researcher: Their "skills, talent, ingenuity, insight, diligence, and even luck" (Bell 2009 p241).

Future studies strategies can be classified in a variety of ways. Gordon (1992) classifies futures methods into quantitative and qualitative, and exploratory and normative. The former pair is distinguished by whether the methods make use of numerical measurements and statistical analysis or whether they allow space for subjectivity, speculation and intuition. The latter pair distinguishes between forecasts of plausible futures (exploratory) or desirable futures (normative), although as Bell (2009) comments, this distinction can be misleading, since every forecast can be evaluated for its desirability, regardless of which method used to produce it.

Slaughter (1997), on the other hand, classifies methods into four levels:

- Input methods: Used to gather material and information from various sources.
- Analytic methods: Used to analyse information and factors gathered.
- Paradigmatic methods: Which allow for critical discourse and deeper dive into phenomena.
- Iterative and exploratory methods: Used to define or explore "future states, future options or future strategies" (Slaughter 1997 p7).

Horton (1999) follows a different approach, but not too dissimilar from Slaughter's. Horton's organisational foresight process follows three phases, which are outlined below. The process could also serve as a way to classify foresight methods, as Horton lists a number of methods that can be deployed in each phase. Using Horton’s work (1999), I have put together a brief description of each phase below:

- Phase One - Inputs: During this phase, the futurist collects, collates and summarizes information, similarly to the “Inputs” phase described by Slaughter (1997).
- Phase Two - Foresight: During this phase, the futurist translates and interprets the foresight knowledge produced in phase one, in order to gain an understanding of

what implications this new knowledge may have for the future of the organisation in question.

- Phase Three - Outputs and action: During this phase, the futurist assimilates and evaluates this new understanding, to be able to commit to actions.

While engaging with Slaughter's and Horton's approaches has been useful to get a well-rounded view of futures studies frameworks, in terms of methods classification, I tend to favour Voros' classification as described in his generic process framework for foresight work (2003). Voros' framework combines Slaughter's four-level classification described above (Slaughter 1997), Mintzberg's work on strategic thinking, strategy development and strategic planning (Mintzberg 1994) and Horton's foresight process phases (Horton 1999). Voros' framework is designed to be scalable, i.e. it can be applied on an individual level, organisational level, even up to societal level. The process includes four key elements, which are outlined below. Voros (2003) accompanies each process phase with a guiding comment or question (in italics) to enhance understanding of what each phase includes:

Inputs: *Look and see what's happening*. During this phase, the practitioner is gathering information via a variety of methods, which we will identify as "input methods" in the next section of this paper.

Foresight work: The second phase of this process is comprised by three stages:

- Analysis: *What seems to be happening?* During the analysis stage, the practitioner attempts to put in order the data collected. The variety of methods that can be used during this stage will be identified as "analytical methods" in the next section of this paper.
- Interpretation: *What's really happening?* During this stage, the practitioner looks for "deeper structure and insights" (Voros 2003 p15). The variety of methods that can be used for interpretation will be listed as "interpretative methods" in the next section.
- Prospection: *What might happen?* During this stage, forward views are created and alternative futures are explored. Conway (2006) stresses the importance of this stage. Traditional organisational strategy process uses methods for input, analysis and interpretation, but the stage of prospection is either dismissed or it is not done in depth, according to Conway (2006). "It is adding the prospection stage

and maintaining it over time that will develop and embed a foresight capability in organisations", Conway adds (2006 p4). The various methods that can be used during the prospection stage will be identified as "prospective methods" in the next section.

Outputs: *What might we need to do?* According to Voros (2003), the outputs can be tangible, such as a number of options emerging from the foresight work, or intangible, such as changes in thinking. The variety of methods that are deployed to communicate the outputs are not specific to foresight, e.g. reports, multimedia, workshops etc. (Voros 2003).

Strategy: *What will we do? How will we do it?* The final stage of this process involves decision makers considering the output, which can now influence strategy development and strategic planning. Voros (2003) highlights the need at this stage to close the loop (Voros 2003 p16) by feeding the results of this process back into the inputs of the framework, as a way of re-assessing and making corrections along the way.

3.3.5 Time Horizons

The study was cross-sectional in nature, focusing on mapping the history of the issue and the collation of insights from experts on the futures for game-based and gamified learning in higher education, and analysis thereof, across a specified time-frame.

3.3.6 Data Collection and Analysis Methods

Finally, as shown in the innermost layer, the data collection tools and analysis included a historic mapping exercise, and a thematic analysis of outcomes from the two-round Delphi survey approach and focus-groups (in the form of workshops) with relevant stakeholders, i.e. academics and industry practitioners in the fields of GL, GBL, game design and technology-enabled learning.

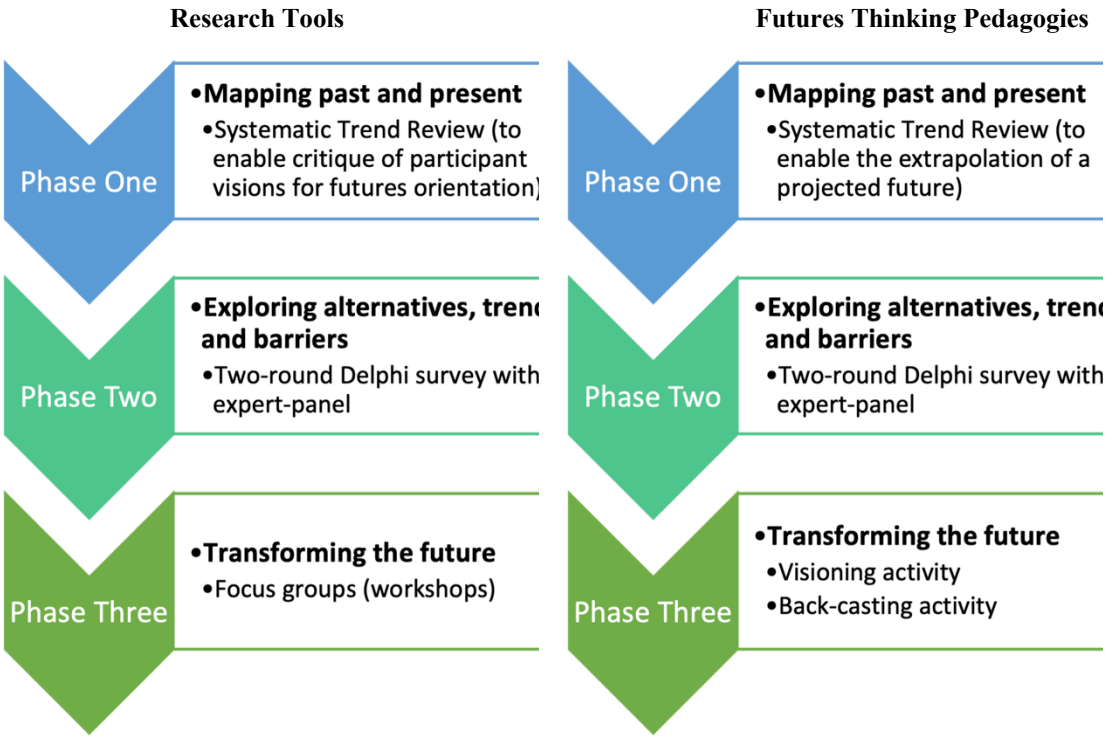


Figure 3.2 – The three phases of research showing the research tools and futures thinking pedagogies used in each phase

3.3.6.1 Phase One: Mapping Past and Present – Systematic Trend Review

The first phase was inspired by Inayatullah's first two questions for questioning the future (2013, p.60), namely 1) what is the history of the issue?; and 2) if current trends continue, what will the future look like? This phase involved the mapping of the historic context of the integration of GL and GBL in higher education, with the aim of capturing past and present trends and extrapolating the "projected future", also referred to as "business-as-usual" future, i.e. the future we can expect if no change occurs (Inayatullah, 2013; Voros, 2017). This type of trend analysis is a common futures studies method, which supports futurists understand existing trends based on historical and current data, and then extrapolate trends into the future (Slaughter and Bussey, 2006).

While there are many ways of collecting that data, e.g. through quantitative methods (Vincent-Lancrin, 2006), given the qualitative methodology chosen for this study, a decision was made to follow a literature-based trend review, similar to other relevant

studies (Barzman *et al.*, 2021; Deloitte, 2021). To ensure the review was conducted in a rigorous and systematic manner, the process of a systematic review was followed (Newman and Gough, 2020). Systematic reviews involve the collation of data from relevant individual studies, in an effort to answer the research question. In the context of this study, past practices with respect to the integration of digital GL and GBL experiences in higher education settings were explored through a deep review and analysis of the literature and pertinent studies. Specifically, the Systematic Trend Review aimed to answer the following questions: a) how have digital GL and GBL been used in higher education? and b) what are the outcomes or lessons learned from these interventions? The step-by-step process followed as part of the review is further detailed at the outset of Chapter Four.

As an outcome of phase one, a vignette of the present state of GL and GBL in higher education was articulated, based on the trends identified through the systematic review of historical and contemporary data. The vignette of the present, which also serves as the projected future if nothing changes, was further developed into an eight-minute animated video, to facilitate further exploration of futures possibilities for GL and GBL in phase two of the study. In the context of this study, the trend review served a twofold purpose: a) it served as a futures thinking pedagogy, as it allowed the researcher to position the vignette of the present and projected future for participants and support their envisioning; and b) it served as a research tool, as the knowledge of past and present enabled the researcher to compare, examine and critique participants' futures visions for future orientation.

3.3.6.2 Phase Two: Exploring alternatives, trends and barriers - Delphi Survey

Phase two of the research study included the implementation of a two-round survey with an expert panel of relevant stakeholders, i.e. academics and industry practitioners in the field. The purpose of this phase was for stakeholders to critique the present state of GL and GBL in higher education (i.e. the aforementioned vignette of the present), and further consider current and emerging trends that can alter the direction of these approaches, reflect on barriers to change, and explore possibilities for higher education 10-15 years into the future.

To facilitate this phase, the Delphi survey was used, a tool first developed in the 1950s by the RAND corporation, as a technique to obtain consensus on a complex topic from a group of experts (Gordon and Helmer, 1964). The Delphi is not exclusively a futures studies method, but rather a tool that aims to gather expert views about the current status and likely developments in a specialised area (Slaughter and Bussey, 2006). The Delphi can be defined as "a scientific method to organize and manage structured group communication processes with the aim of generating insights on either current or prospective challenges; especially in situations with limited availability of information" (Beiderbeck *et al.*, 2021, p. 2).

The Delphi survey is an iterative process. The group views are typically summarised and fed back to participants across multiple rounds (Beiderbeck *et al.*, 2021). While traditionally used to obtain consensus from an expert-panel, the Delphi survey tool has also been used for development of futures scenarios (e.g. Kendall *et al.*, 1992; Renzi and Freitas, 2015), therefore difference of opinions amongst the experts can be beneficial, especially in futures-oriented studies (Beiderbeck *et al.* (2021).

Delphi has typically been used in the past for quantitative assessments, e.g. probability. In fact, one of the inventors of the tool, Olaf Helmer, indicates his subscription to the (post)positivistic paradigm, by stating that "most of futures research may be regarded as a subfield of operations research" (Helmer, 1983, p. 83). As Voros (2007) points out, operations research "is an archetypal rational-quantitative discipline" (p. 81). For the purposes of this study, the Delphi tool is deployed to collect qualitative data, and is therefore framed as hybrid-Delphi survey.

In relation to traditional surveys, the Delphi survey has some important differences and strengths. Okoli and Pawlowski provide a comprehensive comparison of the two tools (2004). Briefly, Delphi studies are designed to have multiple iterations (at least two rounds), and therefore result in richer data than traditional surveys. Delphi participants can be asked to participate in follow-ups, e.g. interviews, which can result in gathering further qualitative data. Moreover, traditional surveys typically include the random selection of a sample that is representative of the audience of interest, and typically require a large sample to allow for generalisation of results. In contrast, Delphi questions investigate a complex topic, which requires a sample that has a deep understanding on the relevant topic in order to respond accurately, and therefore a smaller sample is

sufficient. Typically, a Delphi panel of 10-18 experts is sufficient (Okoli and Pawlowski, 2004) whereas others suggest the inclusion of 15-35 experts (Glenn and Gordon, 2009). In terms of anonymity, traditional survey participants are typically anonymous to each other, and often to the researcher as well. In Delphi surveys, respondents are not anonymous to the researcher, to allow for follow-ups, i.e. to obtain clarifications or gather further qualitative data (Okoli and Pawlowski, 2004). In the case of Delphi, the anonymity between participants is beneficial, as it allows for an impersonal, controlled debate between experts, whereas knowing the identity of potentially well-known specialists can interfere with expressing and elaborating of opinions (Renzi and Freitas, 2015).

In terms of participant selection criteria and recruitment process, due to the multi-disciplinary nature of the study topic, a variety of voices both within academia and industry was deemed important. The literature suggests that heterogeneity amongst the expert panel is beneficial, as it can mitigate cognitive biases (Bonaccorsi, Apreda and Fantoni, 2020; Beiderbeck *et al.*, 2021). For example, the inclusion of solely industry experts from within the fields of technology, GL and GBL could potentially result in futures visions that are heavily biased in favour of digital games and gamification, neglecting to consider the realities and challenges in academia. As a result, the Delphi survey included participants with experience in higher education, in their capacity as educators and researchers in various disciplinary areas (e.g. Education, Science, Computer Science), as well as industry practitioners within the fields of gamification, game-based learning, game-design, and technology-enabled learning.

To identify expert participants within the aforementioned fields, an online search was conducted amongst global university staff inventories, as well as relevant academic and industry journals and other publications, and global conferences of GL and GBL. To ensure both rounds included at a minimum 15 participants, convenience sampling was also used, i.e. contacts within academia and industry, who were invited to participate or nominate other experts. Once a list of potential participants was compiled based on the above criteria, all participants were invited to the Delphi survey via email, and were provided with the necessary information on the background and aims of the study. Online informed consent was obtained prior to participants engaging with the survey. The

following section describes the deployment of the two Delphi rounds and provides more details around participation.

Round One: The first round of Delphi was open between March and June 2022 and was deployed via the Qualtrics platform. The purpose of the first round was to solicit initial expert views on the topic by critiquing the vignette of the present, considering current trends that can alter the direction of GL and GBL in higher education, and imagining futures possibilities for higher education and the integration of GL and GBL in 10-15 years. To enable the collection of rich data, open-ended questions were used in this round of Delphi. The specific questions and structure of round one is further detailed in chapter five.

In terms of participation, the first round of Delphi obtained a total of 25 responses. The majority of participants (22) were academics, from the fields of Education, Educational Technology, Computer Science, and Digital Learning. The remaining 3 participants were industry practitioners, with areas of expertise in educational technology, GBL, GL, game design, gamification, technology enabled learning, curriculum development. Figure 3.3 presents further demographic information that was collected in round one, i.e. participants' country of work and years of experience in their respective fields of work.

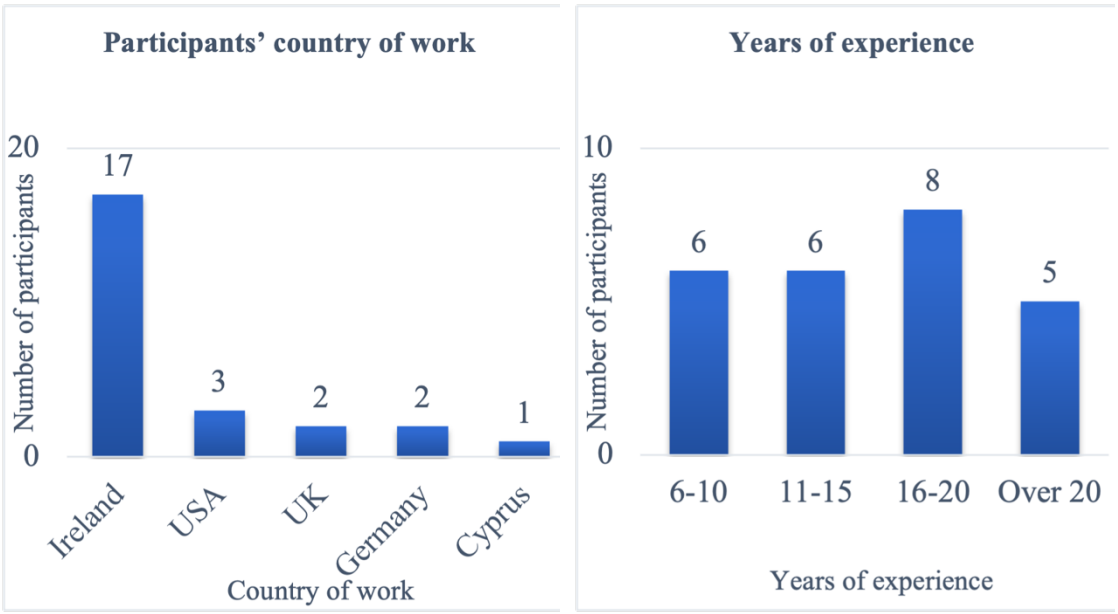


Figure 3.3 – Delphi Round One: Demographic Information

Round Two: The second round of the survey included a total of five questions, which summarised findings from the first round. This included a list of current trends, factors that support the adoption of GL/GBL, and barriers to change was compiled, along with a wide-range of futures possibilities for higher education 10-15 into the future. Participants were asked to assess these statements for their likelihood, desirability or importance for shaping the future, by rating on a 5-point scale, and/or adding open-ended comments to further elaborate.

The second round captured a total of 27 responses. Out of the 27 respondents, 12 had also completed the first round of the survey. The remaining 15 were new participants from the relevant academic or industry fields of Education, GL/GBL, technology-enabled learning, game design etc. The new participants met the same expert selection criteria as the first round, and were invited to ensure the expert panel included at least 15 responses. Specifically, this round included 18 participants representing Academia, working in the disciplinary areas of Education, Computer Science, Educational Technology (e.g. TEL, VR), Game development, Science education. The remaining 9 participants were industry practitioners with expertise in educational technology, gamification, game design, and learning and development. See figure 3.4 for further demographic information.

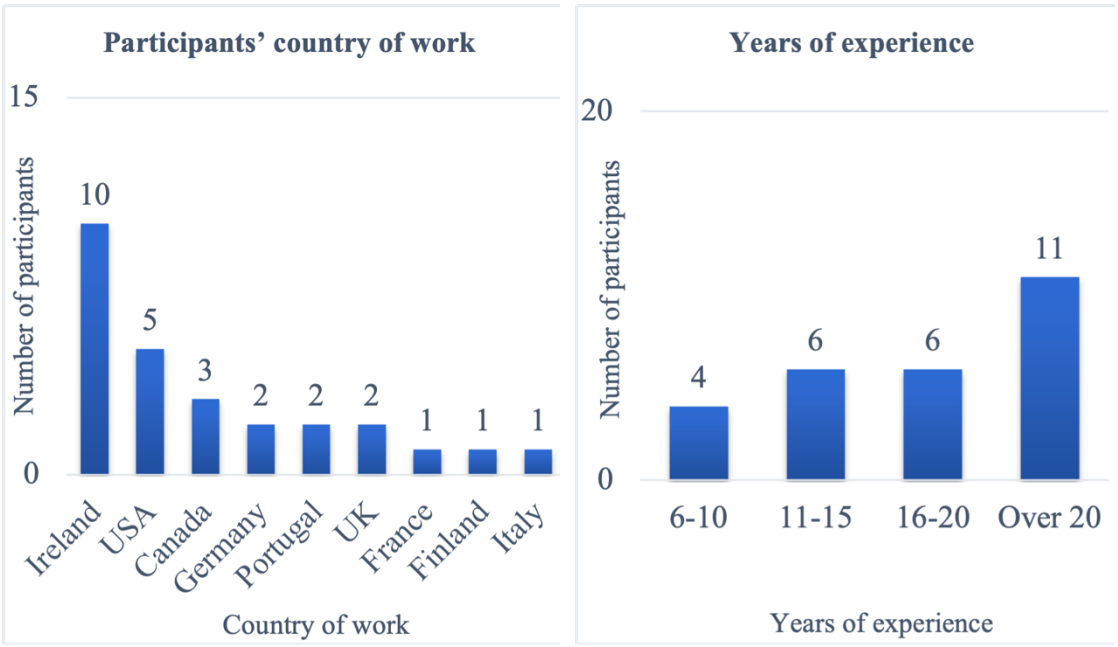


Figure 3.4 – Delphi Round Two - Demographic Information

In terms of the data analysis process of the Delphi survey data, the analysis was informed by the Braun and Clarke's (2006) thematic analysis guide. Braun and Clarke (ibid) define thematic analysis as "a method for identifying, analysing and reporting patterns (themes) within data" (p. 79). In terms of what constitutes a theme, Braun and Clarke (ibid) clarify that a theme "captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set" (p. 82).

The initial layer of thematic analysis, which supported the response to the first research question, followed the step-by-step guide outlined by Braun and Clarke (2006):

- Familiarisation with the data, i.e., transcription of the data and multiple rounds of reading the data, making a note of any initial ideas
- Generation of initial codes, i.e., coding interesting features across the dataset
- Search for themes, i.e., collation of codes into potential themes
- Review of themes, i.e., checking whether the proposed themes work, first in relation to the relevant extracts, and secondly in relation to the entire dataset
- Definition and naming of themes, i.e., refining each theme
- Production of the report, including highlight appropriate extracts as examples

More recently, Braun and Clarke (2019) emphasised that their thematic analysis framework is a reflexive process, and that themes do not simply emerge from the data, but are *conceptualised* based on the data. It is therefore important to denote where the thematic analysis of this study deviated from this reflexive model. Given the nature of questions posed in the first round of Delphi[9], in addition to examining the responses through the lens of reflexive thematic analysis, it was deemed useful to also categorise responses into relevant topic summaries, e.g. "Current technology innovations". This type of categorisation provided a good structure for the development of narratives around trends, barriers and futures visions.

[9] E.g., "Are there any current innovations in technology that you think could significantly alter the direction of gamified learning and/or game-based learning integration in higher education? Please explain.

The second round of the Delphi survey included the collection of numerical data, in addition to open-ended questions. The purpose of participants' numerical ratings was to assess the likelihood, desirability and importance of qualitative statements, and enable the development of futures visions in narrative form (probable, desirable etc.). Despite the presence of numerical assessments, these were reviewed qualitatively, informed by the overarching qualitative methodology of this study. Open-ended responses were thematically analysed using the Braun and Clarke (2006) thematic analysis framework described above. Table 3.1 provides an example of the coding process.

Extract	**Initial Code**	**Refined Code**	**Theme**
I would be very confident that in a 4 year course, students would use some form of MR/AR experience in at least one module during their course. Even now this is true for a lot of subjects within my institution.	Participant identifying MR/AR as technologies that will feature in the future	Existing technology features in future vision	Future vision rooted in technology of the present
This seems overly optimistic [i.e. widespread adoption of GL/GBL in Higher Education]. I suspect some of this will happen in some places some of the time.	Participant expressing view that adoption of GL/GBL will be sporadic	Adoption of GL/GBL will be sporadic	Adoption of GL/GBL will not be widespread

Table 3.1 – Example of Delphi survey coding process

In terms of how the findings from the Delphi informed the next phase of research, the findings served as a good basis for the focus group/workshops with the participants. During the workshop activities, various connections were made with the survey data to enrich and guide the conversation. For example, to support and guide the backcasting activity, the summary of barriers identified via the Delphi survey were presented to the workshop participants for further discussion, and to consider actions in the present that might address these.

3.3.6.3 Phase Three: Transforming the future – Focus group workshops and analysis of Futures Consciousness

Following the two-round Delphi survey, participants were asked to participate in a focus group workshop, to further explore the topic by envisioning potential futures and identifying actions needed to be taken by policy-makers and/or academics today, in order to avoid pitfalls and start shaping the desired futures for GL and GBL in higher education. In terms of futures tools/pedagogies, participants were asked to complete a visioning activity (Inayatullah, 2013) and a backcasting activity (Boulding and Boulding, 1995). The participants were further asked to share their perspectives of engaging with this type of future-oriented research. Combining the two-round Delphi with focus group/futures workshops was deliberate, in an effort to increase the rigour of the research, by exploring the topic in a systematic and structured manner. In fact, Zimmermann et al. (2012) also combine Delphi with backcasting, to improve the trustworthiness of the latter. The specific futures activities followed as part of the focus group workshops are further detailed in chapter six.

In terms of research tools, focus groups are one of the most common qualitative data collection tools, along with interviews. For the purposes of this study, focus groups were chosen as an appropriate method to collect data from participants in this third phase of the research. Diversity of voices is important in futures studies. In fact, many futurists explore futures with multiple relevant stakeholders in workshop settings (Inayatullah and Milojevic, 2016; Ithnin, Mohd Nor and Yusoff, 2017; Géring *et al.*, 2018). Ultimately the focus group tool allows for a heterogeneity of views to be heard, perspectives to shift and opinions to be challenged as part of the group dynamics – something that would not be possible with individual interviews.

According to focus group researcher Morgan (2001), there are two main types of focus groups: a) the structured one, typically used in market research; and b) a less structured one, typically used in social sciences. As part of the latter, the researcher facilitates the conversation, but participants are encouraged to talk to each other, rather than answer directly to the facilitator (Liamputtong, 2011). As part of this study, a less structured focus group approach was adopted, with a series of semi-structured questions serving to provide a loose structure around the conversation. These are presented in further detail in chapter six.

In terms of the focus group composition, it is recommended that the researcher gives prior consideration to how the group mix might impact the discussion (Gill *et al.*, 2008). In the case of this study, as the participants were academics and industry practitioners with busy schedules, the allocation of participants to groups was based on their availability. Where participants were flexible, they were moved to other groups to ensure each focus group/workshop would include four participants at a minimum. A total of 16 participants engaged in three focus group/workshops, with 12 out the 16 having also completed at least one round of Delphi survey. In terms of breakdown per focus group/workshop, the first group consisted of 5 participants, the second group consisted of 7 participants, and the third group consisted of 4 participants

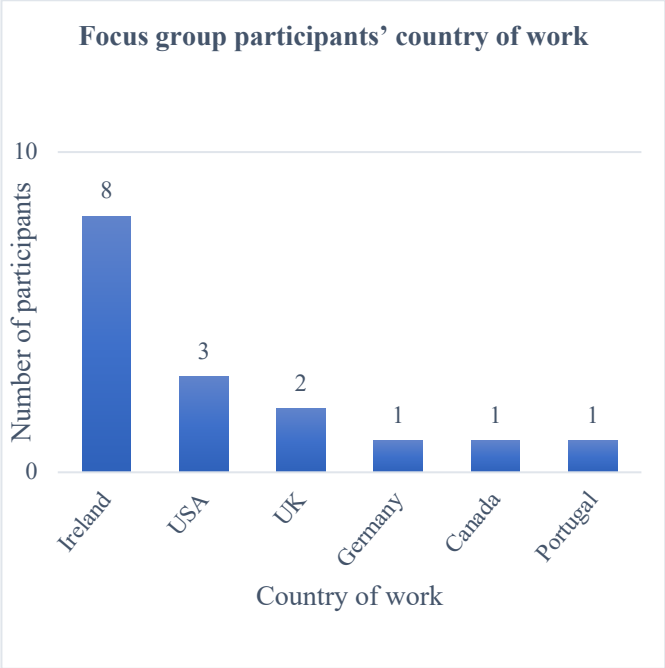


Figure 3.5 – Focus Group Workshops - Demographic Information (country of work)

The data analysis of the focus group/workshop data took inspiration from Braun and Clarke's (2006) thematic analysis guide, in the same manner as the initial layer of the Delphi data analysis discussed earlier. In terms of responding to the second research question, a second layer of data analysis was adopted, which was informed by the conceptual model of Futures Consciousness Dimensions (Ahvenharju, Minkkinen and Lalot, 2018). To support this layer of analysis, the existing model and the accompanied futures concepts were first studied carefully, which resulted in the development of a

coding frame (see Appendix F for a summary of the dimensions, theories/concepts on which the dimensions were based, and the proposed code that the researcher developed as a coding frame). The Delphi survey and focus group/workshops datasets were examined through the futures dimensions coding frame, to determine which dimensions and characteristics of futures consciousness became evident in the data. In addition to applying the coding frame, the data were also reviewed reflexively, allowing for new coding opportunities and conceptualisation of new dimensions. The specific dimensions and characteristics of futures consciousness that manifested both in the Delphi and focus groups/workshops are presented in further detail in chapter six, and critically discussed in chapter seven.

Extract	**Initial Code**	**FC Characteristic**	**FC Dimension**
"GBL is a complex and ill-defined phenomenon that needs specific skillsets, confidence building and resilience for academics to learn how to design, sequence and orchestrate GBL and gamified learning"	Participant critically commenting on barriers to change [i.e. lack of educator training and supports]	Critically considering barriers to change for the future	Critique of the present
"There will be fewer bricks and mortar institutions, and learners will be able to access learning without geographical limitations"	Participant articulating a possible/preferable future	Envisioning Futures	Disposition Toward Futures Possibilities
there's a number of potential futures […] Of course there's a multitude of them that are desirable, but there's also some that aren't. […] the conversation of the future has to be couched in the importance of what's right and what good for society within that.	Participant highlighting that the future should be beneficial to society, community, human beings	Indicating that the future should be for the well-being of others	Concern beyond the self

Table 3.2 – Example of Delphi and focus group/workshop data analysis for futures consciousness (FC)

3.4 Ethical Considerations

This research originally received ethical approval by the DCU Research Ethics Committee in March 2020. As stated in the application for ethical approval, the study was not likely to result in exposure to personal or cultural issues that would cause harm to individuals. The participants were all adults, working in the field of higher education and/or GL/GBL industry or technology sector. All participants were presented with the information necessary to make an informed decision to consent to participation in the research and their participation was voluntary. Through the informed consent process, participants were made fully aware of the project's objectives and were given the right to withdraw their participation and information at any stage of the research without penalty.

Given the COVID pandemic context, in November 2020 the researcher requested that the initial ethical approval be extended to cover gaining online consent for the study and for additional online data collection in the form of online focus-group workshops, and online interviews using ZOOM meetings. The Plain Language Statement and the Informed Consent form were amended to reflect the addition of the new online data collection via ZOOM (for focus group workshop). The Informed Consent form was also amended to include a reference to the Data Protection Office. A Protocol for gaining consent online and a protocol for using ZOOM to collect online data was compiled and provided to the DCU Research Ethics Committee for consideration (see Appendix B). The research received further ethical approval to the addendum by the DCU Research Ethics Committee in November 2020 (see approval in Appendix A).

In addition, a Personal Data Security Schedule (PDSS) was compiled to list the categories of personal data held or processed by the research team, to set out the security measures, practices and controls to be applied for each category of personal data listed, and to guide researchers as to their responsibilities when handling, processing or interacting with the personal data listed in any way. In the case of participants who completed survey(s) and focus group workshops, anonymity was preserved through use of pseudo-names and removal of any likely unique identifiers in the transcription from audio or observation data sets. In the case of the Delphi survey responses, the participant details were not anonymous to the researcher, as the Delphi process enables follow-up with participants for clarification purposes, where required. Participants were asked for their name and

contact email on the survey, which was visible to the research team only and not shared with third parties. The participants' identity and responses were not identifiable to other participants. Participants were made aware of this in the plain language statement. As soon as the full-dataset was collected, the participants' details were anonymised through the use of pseudo-names, and these pseudonyms were used in reporting of research findings. The contact details and associated pseudonyms are maintained separately in a password protected encrypted excel file and only accessible by the main researcher and their PhD supervisor. In any account of the study (e.g. thesis, conference papers, Journal articles), participant anonymity will be assured. Pseudonyms were used when taking notes on observation and whilst transcribing the focus groups/workshops.

Furthermore, the video files for the focus groups/workshops were deleted once the transcription process was completed. Participants were made aware of this in the plain language statement. All data held on the DCU managed Google Drive will be securely disposed of two years post-completion of the project by deletion of the electronic folder containing the data files, and any copy or trace thereof of related files on the computer, by experienced members of the Information Support Services unit within DCU.

3.5 Limitations of the Study

This study has a number of limitations that the researcher needs to acknowledge. The fact that the researcher was involved in all processes of design, implementation and assessment of the futures intervention, raises questions regarding researcher bias that potentially impacts on the credibility of futures studies. Such concerns have been expressed by Barab and Squire (2004), who stress that a sense of responsibility is necessary to assure of the validity of the researcher's assumptions; a responsibility "to draw on methodological practices consistent with other qualitative methods [...] to convince others of the trustworthiness and credibility of claims being advanced" (p.10). More recently, however, Anderson and Shattuck (2012) argue that the researcher's involvement may actually contribute to credibility and it comes down to the researcher's "wisdom" in maintaining the balance between bias and objectivity. To address validity concerns and limit researcher bias, the researcher provided a clear description of the framework, and detailed description of the data collection and data analysis process

followed, and collected multiple rounds and forms of data, such as two-round open-ended survey data and numerical survey data, focus group data, and personal reflections.

Other limitations relate to the selection and involvement of stakeholder voices in the exploration of the topic. As diversity in stakeholder voices is recommended in futures studies, in order to collect multiple perspectives, the study involved experienced academics from various disciplinary areas, and industry practitioners in various relevant fields of work, such as GL, GBL, game-design and technology-enabled learning. However, two voices that were not included in the study were higher education policy/management level decision-makers and student voices. In regard to the former, it was deemed that it would be particularly challenging to guarantee the commitment of policy-makers/ management level decision-makers to multiple rounds of data collection. In terms of the latter, the main reason for not directly engaging students in this study was the study's focus on expert practitioner level views of futures for gamified and game-based learning in higher education, rather than user (i.e. student) level views. Furthermore, it was deemed that an exploration of the future of GL/GBL with higher education student voices would likely not sufficiently contribute to the conversation around emerging technological trends (compared to the contribution of the more knowledgeable expert-panel in that regard) nor the identification of actions that are needed in the present to ensure beneficial integration of GL and GBL in higher education. However, the student voice was not completely absent in the overall analytic frame of the study in that the systematic trend review, which was completed in phase one, did include several studies that had garnered the perspectives of students who had engaged in studies of gamified and game-based activities in higher education. Nevertheless, future research in this field could consider expanding the profile of participants to include policy makers, management level decision makers, and student voices for a more complete discourse on this topic.

Finally, while the combination of systematic trend review, two-round hybrid Delphi survey, and focus groups/workshops worked well in capturing a multitude of futures visions (which contributed to the exploration of the topic, but also enabled the examination of the visions for futures thinking and futures consciousness), other futures pedagogies could have been considered to enable participants' futures thinking in focus

group settings, e.g. the futures wheel (Glenn and Glenn, 2009) or the Causal Layered Analysis (Inayatullah, 2004). Where it would be possible to engage with stakeholders for longer durations of time (e.g. longer than a two-hour workshop), one could also consider applying Inayatullah's comprehensive six pillar approach with the stakeholders, to allow for deeper exploration of possible futures and particularly the assumptions and worldviews that underpin them.

3.6 Conclusion

This chapter presented the philosophical and methodological underpinnings of the research, and outlined the research methods and tools employed in this study in order to respond to the research questions. The study adopted an interpretivist philosophy and an inductive approach throughout, with an overarching qualitative methodology. In terms of research strategies, the study was framed as a Futures Study, and as a result the data collection processes leaned on the approaches and tools employed within futures thinking exercises. Specifically, a hybrid-Delphi survey approach was used to gather participant views on futures possibilities for the integration of GL and GBL in higher education. In addition, focus group workshops were used to further explore and deepen these visions, as well as discuss implications for present practices in higher education. The Delphi survey and focus group workshop datasets were analysed using thematic analysis, as well as through a futures consciousness coding frame (developed by the researcher based on the existing futures consciousness model, see Ahvenharju, Minkkinen and Lalot, 2018). The analysis resulted in multiple visions for the futures of GL and GBL in higher education, as well as evidence of new elements of futures consciousness. The findings from the latter analysis are presented in further detail in chapter six and critically discussed in chapter seven.

Chapter 4 – Systematic Trend Review

4.1 Introduction

This chapter provides insights into the processes involved in examining the past use of game-based and gamified learning in higher education, with a view to considering the implications of these within higher education futures. An overview of the methodology used to analyse the past and to create projections of the probable future (if current trends in game-based and gamified learning continue) is presented. The findings of the systematic trend review are presented, along with the vignette of the present for game-based and gamified learning in higher education, which are then critiqued by academics and industry/technology experts as part of the Delphi survey.

4.2 Terminology

Gamification is understood as "the use of game design elements in non-game contexts" (Deterding et al., 2011 p9). Such elements include points, levels, achievement badges, rewards, but also storytelling, interactivity and problem solving (Kapp, 2012).

Game-Based Learning is understood as experiences based on activities that have at their core a *digital* game (either as the main activity or motivation for related activities), and that is implemented within higher education contexts, with a learning focus and outcome (Bober, 2010).

4.3 Systematic Trend Review

Systematic reviews aim to answer a research question by gathering evidence from the literature in a systematic manner that aims to minimise reviewer bias. Systematic reviews are often conducted within health care and biomedical fields, with the Cochrane Database of Systematic Reviews[10] being the leading global database for such research. According to the Cochrane online handbook, systematic reviews "seek to collate evidence that fits

[10] https://www.cochranelibrary.com/cdsr/about-cdsr

pre-specified eligibility criteria in order to answer a specific research question" (Higgins *et al.*, 2021 Chapter I[11]). In line with the Cochrane definition and guidelines, it is imperative to define in advance of the review the research questions and the methods to be followed, in the form of a protocol. As systematic reviews within the health care and medical fields aim to accurately represent the current knowledge about a topic to support health decision makers, Cochrane reviews should be conducted by a team that possesses domain and methodological expertise (Lasserson, Thomas and Higgins, 2021).

Beyond medical research, the process of systematic reviews can be applied to other fields, including education research, where there appears to be a variety of review approaches, compared to medical and health care reviews. Newman and Gough (2020) identified various types of systematic reviews in educational research, and these vary depending on the research questions they seek to investigate. The authors discuss some examples of varying review structures, including "review of reviews", which synthesise findings from previous reviews, "rapid evidence assessments", which follow methods in a minimal way in an effort to conduct the review more quickly, and "living reviews", which are continuously updated with new relevant studies.

Overall, within the context of education research, a systematic review is a "a review of existing research using explicit, accountable rigorous research methods" (Gough, Oliver and Thomas, 2017, p. 4). To ensure the research question is investigated in a rigorous and systematic manner, this Systematic Review followed the process steps and guidelines outlined in Newman and Gough (2020). These include:

- *Developing the research question and conceptual framework* – The process starts with defining the research question, which drives key decisions, such as what studies will be included, where the reviewer will search for these studies etc. According to Newman and Gough (2020), the research question encompasses a number of assumptions, including epistemological and theoretical frameworks. These form the conceptual framework, i.e. a working hypothesis, which drives decisions on most appropriate approach and methods to conduct the systematic review.

[11] Quote retrieved from https://training.cochrane.org/handbook/current/chapter-i

- *Constructing the selection criteria* – At this stage, the reviewer defines a set of rules about which studies will be considered in the review. These include inclusion and exclusion criteria, which are driven by the research question and conceptual framework.
- *Developing the search strategy* – The strategy includes a detailed plan on which sources will be searched and how they will be searched. The strategy should clearly define which bibliographical databases and which search criteria will be used.
- *Selecting studies based on selection criteria* – At this stage, the reviewer applies the selection criteria to the studies identified in the search. According to Newman and Gough (2020), this can take place in two stages: a) a title and abstract review first, to exclude irrelevant studies; and b) obtaining a full copy of the relevant papers for screening.
- *Coding studies* – Following the review of relevant articles, the reviewer systematically records information from each study that addresses the research question. This includes details on the research conducted, the methodology followed and the findings of the research.
- *Assessing the quality of studies* – At this stage, the reviewer makes judgments about the quality of the individual papers reviewed. The way in which research quality is assessed can vary greatly, according to Newman and Gough (2020). Broadly, during this stage the reviewer can consider three elements in the context of the review question: the relevance of the study to the review question, the appropriateness of the study design, and the quality of the execution of the study's methods (Gough, 2007).
- *Synthesizing the findings of studies to answer the research question* – This stage includes collating the findings from the individual studies to address the research question. According to Newman and Gough (2020) the specific synthesis techniques can vary, but would typically involve some analytic methods, such as identifying patterns in the data and integrating the individual findings to answer the review question.
- *Reporting findings* – The final stage of the systematic review process includes a detailed report on findings.

For the purposes of this chapter, the afore-mentioned eight steps outlined by Newman and Gough (2020) are discussed in four parts, starting with the Conceptual phase, the Sourcing phase, the Reviewing phase, and the Synthesizing phase. Figure 4.1 illustrates how each of the phases followed as part of this Systematic Review correspond to Newman and Gough's process steps.

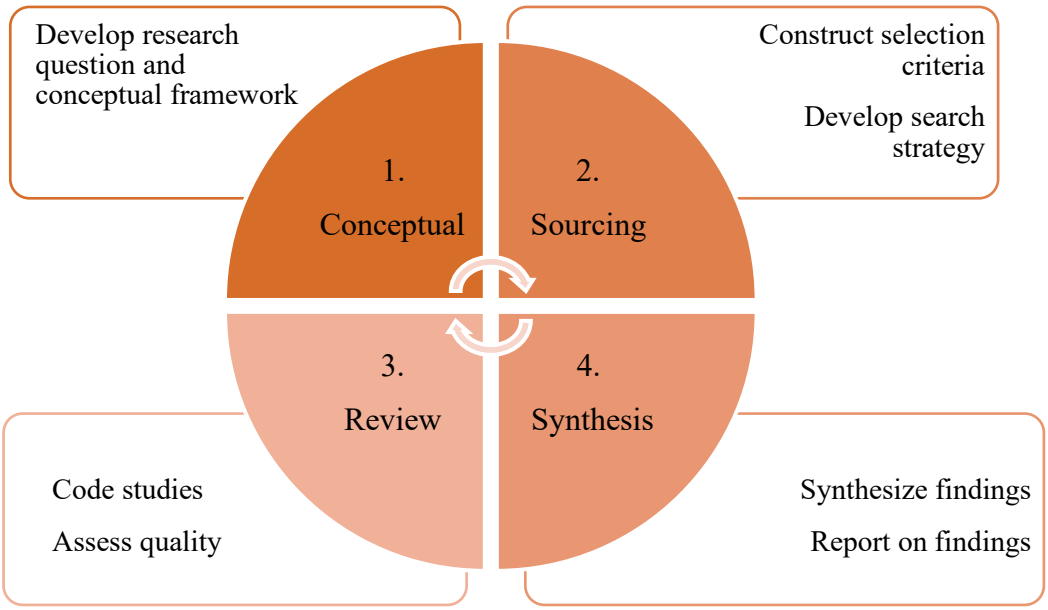


Figure 4.1 – A representation of how each phase of this Systematic Review corresponds to Newman and Gough's (2020) systematic review process steps.

Conceptual Phase

The purpose of this Systematic Review was to gain a better understanding of digital game-based and gamified learning approaches in higher education, in order to project probable future trajectories. This endeavour needed to provide understanding of past interventions in the field of game-based and gamified learning. Specifically, the Systematic Review aimed to answer the following questions:

i. How have digital game-based and gamified learning been used in higher education?
ii. What are the outcomes or lessons learned from these interventions?

The above questions drove key decisions on how to frame and conduct the Systematic Review, i.e. where to search, where to focus and what to exclude. The focus of the analysis was on capturing digital game-based and gamified learning interventions or approaches which:

- used game-based or gamified digital/technological elements. The focus of the review needed to be on interventions that adopted a gamified or game-based pedagogical approach, which was deployed on or made use of technology. With this in mind, a wide-range of education and multidisciplinary research databases were selected, in order to respond to the interdisciplinary thematic areas of gamification and game-based learning.
- were deployed within higher education contexts. The review needed to focus on interventions or pedagogical approaches used within a higher education context. Other levels of education were excluded. The database search terms aimed to ensure that search results would be relevant to higher education/tertiary level.
- were published within a specific timeframe, 2010 to 2019. The assumption was that it is unlikely that computer games or other types of digital gamified and game-based learning would have been widely used in higher education prior to the 2000's. A recent systematic literature review conducted by Subhash and Cudney (2018) on gamified and game-based learning in higher education identified relevant studies published no earlier than 2012, despite not restricting their search to a specific starting timeframe. This confirmed our assumption, and further narrowed the timeframe from 2000 to 2010, and as such the database search results were filtered to exclude results that fell outside of the timeframe. 2010-2019.

Sourcing Phase

A number of databases available via the EBSCOHOST platform were selected for their relevance to the subject, as they cover a wide range of educational research: Education Research Complete, Academic Search Complete, British Education Index, Education Full Text (H.W. Wilson), ERIC (Education Resource Information Center) and Social Sciences Full Text (H.W. Wilson). In addition, SCOPUS and Web Science were chosen for their extensive library of multi-disciplinary research. The selection of these databases aligned with recent systematic reviews in the field of gamified and game-based learning (Bakan and Bakan, 2018; Subhash and Cudney, 2018; Zhonggen, 2019).

To ensure consistency, the same search terms and criteria were used to search in each database. The Boolean search logic was used, with the inclusion of "**and**" when each result should contain all of the terms, and the inclusion of "**or**" when each result should contain at least one of the terms. A number of combinations were tested[12] prior to choosing to search selected terms in the "Title", "Abstract**"** and **"**All text/All fields**"** search fields. Specifically, the following criteria had to be met in the search results:

- "serious games"[13] or gamification or gamified or "game-based" or game – to appear in the "Title" field. These terms were deemed essential for the review. Therefore, to limit the inclusion of irrelevant articles, a decision was made to search these terms in the title search field.

  AND
- "higher education" or college or university or "post secondary" or postsecondary or tertiary or undergraduate - to appear in the "abstract" field. It was essential for the review to limit the results to studies focusing at tertiary level, therefore these terms were used in the abstract field. While the inclusion of the term "postsecondary" could potentially return search results which include studies

[12] Other search combinations returned high volume of results. As the sole reviewer of these papers, it was expected that following this approach would be impractical. Indicatively, searching in the EBSCOHOST platform with all relevant terms in the "All text" field yielded 321,535 results in the English language. A title-screening of a small subset of the results indicated that a lot of the results were irrelevant to the review question.

[13] Phrases in quotation marks signify a phrase search.

within a vocational/non university-level context, it was included to ensure comprehensive results.

AND

- technology or computer or tablet or "mobile phone" or smartphone or internet - to appear in "all text" or "all fields". This was to prevent search results that do not make use of any technology elements.

The results were further filtered by language and document type. More specifically, the results were limited to English language, and filtered to include only Journal articles. Books, theses, and book chapters were excluded, as they can be difficult to access in full text and may not follow the same meticulous peer-review process as Journal papers. Finally, conference materials were excluded. While conference papers would no doubt be interesting to review, they typically tend to be a stepping-stone to academic Journals, therefore it was considered that limiting the review to Journal publications would not compromise the quality of the Systematic Review.

After applying the filtering criteria, the search results were exported from each database and imported into a reference manager application (Zotero) where duplicates were removed. Following an initial screening of titles, irrelevant articles, such as ones focusing on college sports games and drinking games, were excluded, reducing the number of abstracts to be reviewed to 3018.

Due to the large number of search results to be reviewed, a decision was made to use a citation screening software to facilitate the abstract review and paper selection process. The chosen software, Abstrackr (Wallace *et al.*, 2012) , is a free, open source, tool developed by Brown University, which facilitates the process by automatically highlighting important terms and allowing the addition of tags and notes, which can be exported at the end of the review in an organised manner. Abstrackr also uses an algorithm that can predict the relevance of citations, allowing for semi-automated screening. While this feature appears to have high accuracy and could potentially result in faster title and abstract screening (Rathbone, Hoffmann and Glasziou, 2015), it was decided to not rely on the automated predictions. Being the sole reviewer during this Systematic Review, a manual review of titles and abstracts was preferred to achieve increased accuracy and rigour.

All 3018 abstracts were uploaded for further review on Abstrackr and were reviewed for relevance. During this screening stage, initial notes were taken to capture the following information:

- Pedagogy or Approach: E.g. Game-based learning or Gamification
- Type of Intervention: E.g. Online simulation game, computer software etc.
- Population: Number of higher education students participating in the study
- Disciplinary Area: The topic in which the intervention is deployed

Papers were selected for further review if they were empirical studies that used game-based learning or gamification as a pedagogical approach at tertiary level. A further requirement for selection was the use of technology as part of these gamified interventions – such as online/web-based games, computer games, mobile applications, augmented or virtual reality technologies, and other digital elements.

Furthermore, a decision was made to focus only on the most current research at the time, i.e. studies published between 2018-2019, and to narrow results to studies conducted within the EU landscape[14] (figure 4.2 shows the exclusion process in numbers), which resulted in 41 studies. These additional exclusion criteria were introduced to ensure the number of selected studies would be feasible for a sole researcher to review in a rigorous and systematic manner, and to ensure the selection would be in line with the focus and purpose of the Systematic Review. During the abstract screening phase, a repetition of trends was observed in terms of how gamification and game-based learning were applied in higher education. This indication of redundancy/saturation signalled that restricting the review to a subset of results would not compromise the quality of the Systematic Review. The intention of this Systematic Review was not to provide an exhaustive list of relevant studies, but rather to set the context for the next phases of the research, providing a solid stepping-stone for futures discourse with academic and industry experts in the fields of gamified and game-based learning. To reinforce and cross-validate findings from the 41 studies, I was informed by two recent systematic reviews, which cover global studies published between 2010 - 2017 (Vlachopoulos and Makri, 2017; Subhash and Cudney, 2018).

[14] This included the UK at the time of research.

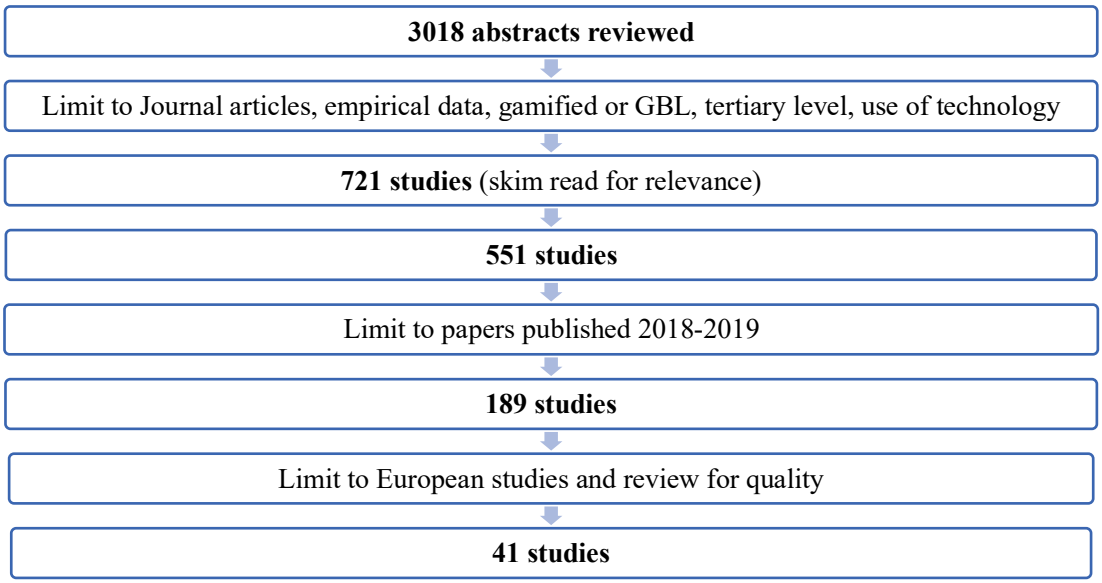


Figure 4.2 – In numbers: Selection process of studies for inclusion in Systematic Review.

Review Phase

Following the sourcing stage, the final list of 41 relevant studies were reviewed and relevant information was captured systematically, in line with the Newman and Gough (2020) guidelines, to address the research question. Specifically, extensive notes were taken to capture each study's methodology and study design, theoretical framework, data collection process and tools used, description of gamified or game-based intervention, main findings, as well as challenges and design recommendations from the authors. From the sourcing phase throughout to the final selection and review of relevant studies papers, progress and observations were discussed with an independent researcher on a weekly basis, as additional control of rigour and opportunity for exchange of insights.

The selected studies were also reviewed for quality, which focused on capturing theoretical underpinnings and methodological process of each study, and considering the relevance of the individual studies to the systematic review question. In addition, the ranking of the Journals in question was searched on the SCImago Journal Rank website[15]. It is important to note that this quality screening did not serve as exclusion criteria. It is my epistemological belief that all worldviews and methodologies, if used rigorously,

[15] https://www.scimagojr.com/

have the potential to produce high-quality results, as such at this stage the focus was on ensuring the papers discussed empirical data, provided clarity around the study type, the research questions, the sample, and the methods used for data collection and analysis. While the Journal Quartile ranking was not used to discriminate against studies, it must be noted that out of the 41 studies, 26 were published in Quartile 1 Journals and 9 were published in Quartile 2 Journals, which would suggest a rigorous peer review process. From the remaining 6 papers, 2 were published in Quartile 3 Journals, and 4 were published in Journals not listed on the SCImago Rankings website.

Synthesis Phase

The Systematic Review synthesized information relating to the use and the outcomes of digital gamified and game-based learning interventions in higher education. In addition to studies presenting empirical data from implementation of such learning interventions, the Systematic Review included papers investigating educator and student attitudes on game-based and gamified learning. These added to my understanding of work conducted in this field, and provided insight into educators' and students' perceptions of gamified and game-based learning approaches for teaching and learning in higher education - which in turn aimed to support the discussion on potential future directions.

During the synthesis phase, all information captured systematically during the coding of the 41 studies was reviewed and analysed for common themes and patterns. This information included each study's methodology and design, theoretical underpinnings, data collection process and tools used, understanding of gamified or game-based learning, main findings, challenges and design recommendations. In addition to the review of the 41 papers, this Systematic Review was informed by two recent systematic reviews on gamified and game-based learning in higher education (Vlachopoulos and Makri, 2017; Subhash and Cudney, 2018), which were used to reinforce and cross-validate findings from the 41 studies.

The two systematic reviews covered global publications from 2010-2017 and sourced studies from various multi-disciplinary databases[16] – thus expanding the scope and

[16] Databases used in Vlachopoulos and Makri (2017) include: Google Scholar, Web of Science, ERIC, PsycInfo, PsycArticles Fulltext Search, InterDok, ProQuest, Scopus, BEI, and

enriching the findings of this Systematic Review. Both papers reported on studies that are diverse in terms of research questions, methodological approaches, disciplinary areas and game genres. It is apparent from the two reviews that there is growing research interest in the topics of gamification and game-based learning in higher education in the last decade, particularly in Europe and the USA. The main findings from these systematic reviews are presented below, and connection to both have been made throughout this chapter, where appropriate. Following the presentation of findings from Subhash and Cudney (2018) and Vlachopoulos and Makri (2017) the chapter continues with reporting of findings from the systematic review of the 41 identified studies.

4.3.1 Main findings from Subhash and Cudney (2018)

Subhash and Cudney (2018) conducted a systematic review on gamified learning in higher education, which focused on the use of gamification, game-based interventions, and design and evaluation frameworks for gamified systems. While the review included both digital and non-digital interventions, the findings were deemed useful for consideration as part of this Systematic Review, as they focus on the same pedagogical approaches and target audience as this Systematic Review. Subhash and Cudney (2018) considered peer-reviewed journal articles published in English. The review included 41 papers published after 2012 until Sept 2017. Interestingly, the review was not confined to a specific starting time frame, but the first relevant paper was published in 2012, with authors observing a rapid increase in research interest in these topics thereafter.

Subhash and Cudney (2018) found that gamification and GBL are integrated in a variety of subject areas, ranging from science subjects to language learning and communication, with the majority of studies (14 out of 41) being conducted within the topic of computing, followed by Business (5) and Science (4). Spain appears to be leading the research with 14 published studies within 2012-2017, followed by the USA with 7 studies, and Germany with 5 studies.

SearchPlus. Databases used in Subhash and Cudney (2018) include: Academic Search Complete, ACM Digital Library, Education Full Text, ASEM Digital Collection, IEEE Xplore, PsychINFO, and Scopus.

The main findings from the reviewed studies are widely positive, therefore Subhash and Cudney (2018) do not discuss specific challenges with these pedagogical approaches. According to the authors, the findings from their review are encouraging, as several benefits of gamification and GBL have been identified. Based on their findings, gamification and game-based learning offer very similar benefits, most significantly increased student engagement, attitude and performance. The main findings of Subhash and Cudney (2018) on the use of gamification and game-based learning in higher education are presented below respectively.

Subhash and Cudney (2018) findings on gamification:

The reviewed studies on gamification focused on the use of game elements and game mechanics in higher education. The studies differed in their research focus, with some investigating the impact of gamification when integrated in the classroom or in Learning Management Systems, and others gauging faculty attitudes towards gamification practices. The gamification experiences discussed in Subhash and Cudney (2018) included the use of various game mechanics, with points, badges and leaderboards being the most commonly used elements. Some examples cited in Subhash and Cudney (2018) include the studies conducted by Bernik *et al.* (2017) and Hew *et al.* (2016), who integrated points, badges and leaderboards as part of a computer-graphics course and a graduate course on designing questionnaires, respectively. Other mechanics used in the studies reviewed by Subhash and Cudney (2018) included levels, quests, graphics, feedback, narration, and discussion boards.

Gamification was found to improve student engagement, motivation and attitudes. Notably, in Hew *et al.* (2016), as cited in Subhash and Cudney (2018), the game elements incorporated in a graduate course motivated students not only to produce higher quality assignments, but also to choose more difficult tasks as part of the course. In another study cited in the systematic review, Çakıroğlu *et al.* (2017) showed that the use of points, quests and leaderboards had a positive impact on student engagement. In terms of performance, the results were inconclusive, as the reviewed studies varied greatly in terms of approach, context and application of the gamification. Overall, while some studies showed that gamification contributed in improving student performance, others observed an increase in perceived learning and enjoyment instead, but no significant

impact on performance. By way of example, in the case of Dias (2017), as cited in the systematic review, the management students who participated in the gamified version of an operations research course demonstrated higher mean scores, attendance, participation and pass percentage compared to students who participated in the non-gamified version. On the other hand, Stansbury and Earnest (2017) observed a significant improvement in perceived learning within the gamified group, compared to the control group of their study, but they did not find a statistically significant improvement in the students' performance.

In terms of faculty dispositions, Fisher *et al.* (2013) as cited in Subhash and Cudney (2018), observed a notable correlation between faculty experience with gamification and their positive attitude toward the approach. Overall, the study found that faculty was familiar with gamification and agreed that it can be a useful teaching approach for recruiting students to business programs, increasing motivation and learning. In contrast, in Wiggins (2016) as cited in Subhash and Cudney (2018), faculty were unfamiliar with gamification as a concept, but they largely recognised gamification strategies, with Wiggins arguing that these instructional strategies are not novel, but rather they are traditional strategies repackaged.

Subhash and Cudney (2018) findings on game-based learning:

The reviewed studies on game-based learning included learning interventions in the form of serious games, gamified mobile and computer applications and 3D simulations. Graphical elements, such as avatars and illustrations, and levels, in the form of challenges, missions and quests, were the most commonly used elements in these interventions. The studies reviewed by Subhash and Cudney (2018) reported various benefits of game-based learning, with improved student engagement, attitudes and performance being the most significant contributions of the approach in higher education. Other benefits reported include increased motivation, enjoyment and perceived learning. Indicatively, in Knautz *et al.* (2014) as cited in the systematic review, the interactive game implemented in an information literacy course contributed in raising the average student GPA, as well as reducing failure rate. Similarly, in Berns *et al.* (2016) the German-language students using the game-based application showed significant improvement in terms of learning outcomes. Daubenfeld and Zenker (2015), as cited in Subhash and

Cudney's review (2018), observed that students who used the digital game-based learning environment as part of a physical chemistry course spent more self-study time in comparison to the traditional lectures.

As the main findings from the reviewed studies are largely positive, Subhash and Cudney (2018) do not synthesize or comment on challenges faced with using the game-based learning approach. However, some notable challenges are mentioned in one of the reviewed studies. Specifically, Guenaga et al. (2013), who used serious games to develop employment competencies, found that a key challenge with developing the game was ensuring compatibility across a variety of platforms within the university community. Another challenge reported was ensuring an attractive gameplay, which would also meet pedagogical needs, of the project, given existing economical and time constraints.

4.3.2 Main findings from Vlachopoulos and Makri (2017)

Vlachopoulos and Makri (2017) conducted a systematic review on the use of games and simulations in higher education, including a review of previous meta-analyses. The authors included 123 empirical studies in the systematic review, published between 2010-2016. The majority (33%) of studies were published in Europe, followed by Asia (22%), the USA (18%), and Australia (1%). An additional 24% of studies did not specifically mention the location. According to the authors, the majority of publications come from the USA, the UK, and the Netherlands.

The purpose of the systematic review was to develop a framework for educators who want to implement games and simulations in higher education. It is important to note that the review focuses on the positive impact of these experiences on learning outcomes (cognitive, behavioural, and affective), and as such it does not discuss specific challenges to implementing these approaches. The authors do acknowledge, however, one significant challenge; the high cost of games and simulations development, which according to the authors needs to be addressed at government level, and with the collaboration of scholars, designers and educators.

The systematic review revealed a continuous increase in research interest in the last decade, with an increase of publications from 2012 onwards. The reviewed studies implemented games and simulations in a wide range of subject areas, with Business

Management and Marketing being the most common area (21 studies), followed by Biology and Health Sciences (16), and Computer Sciences (11). In terms of game genres, the reviewed literature included a diverse representation of simulations and games (online, computer-based, role-playing, serious games) with virtual/online games and simulations being the most prominent genre (88% of the reviewed literature).

In terms of learning outcomes, the systematic review found that games and simulations contributed to *cognitive learning outcomes*, such as knowledge acquisition and understanding across a wide range of subjects. Serious gaming, for example has been proved effective in medical education for training on clinical decision-making and patient interaction (Vlachopoulos and Makri 2017 cite de Wit-Zuurendonk and Oei, 2011). According to the findings of the systematic review, when used in support of more conventional methods, such as traditional lectures, games can aid students' understanding of theoretical concepts. Simulations, in particular, provide students with opportunities to observe the outcomes of their decision-making, and support them in developing their critical and higher-order thinking. By way of example, Vlachopoulos and Makri (2017) cite Poikela *et al.* (2015) who found that the use of a computer based simulation of a nursing procedure supported more meaningful learning outcomes than the traditional lecture, due to the metacognitive and reflective nature of the simulation activities.

The review found that the use of games and simulations also supports *behavioural outcomes*, such as social, emotional and collaborative skills. Students playing digital games and simulations often need to interact not only with the game itself, but also with other players and with the instructor. Overall, the review found that games and simulations promote effective collaboration with peers, adapting to new tasks, being organised and resolving conflict. The authors highlight three studies where teamwork was found to hinder learning outcomes. As cited by the authors, in Bolliger *et al.* (2015) students felt that games can reduce opportunities for interaction with peers and with the instructor. Merchant *et al.* (2014) found in their meta-analysis that student performance was better enhanced when playing individually, compared to playing collaborative. Finally, Dankbaar (2016) found that the use of a simulation game was distracting and hindered learning for novice students.

Vlachopoulos and Makris' (2017) systematic review has also found that games and simulations have *affective outcomes*, such as increased motivation, engagement, attitude and student satisfaction. According to their findings, it is evident that students develop a positive attitude toward the use of games and simulations as part of the learning process, and show enhanced engagement and motivation levels.

The systematic review highlighted the role of the instructor in the effectiveness of game or simulation integration in higher education. According to the authors, "the integration of games depends on instructors' contribution and the way they design and incorporate games in their teaching. This means that instructors should be equipped with knowledge and experience, and be aware of providing guidance to students as regards the proper way of playing games" (2017 p8). The instructor plays a key role in engaging students with the learning content, providing continuous support, guiding the game-based learning, ultimately contributing to student satisfaction and learning outcomes. Another interesting finding relating to the instructor was that the use of simulations in the learning process can have benefits not only for students, but also for instructors. Citing Auman's study (2011), Vlachopoulos and Makri (2017) highlight that student's enhanced engagement through simulations can in turn increase the instructor's own engagement and excitement with the topic, and reinvigorate their enthusiasm about the learning process and their teaching approach.

4.3.3 Reporting on Findings of the Systematic Trend Review

The following sections provide a summary of key findings from the 41 reviewed studies in this research study, with Appendices D and E presenting in table format the main findings from each study. The sections below include an overview of outcomes from the learning experiences, discussion on specific aspects of the experience that were successful or unsuccessful, and discussion on challenges and considerations when utilising the gamification or game-based learning approaches. Findings are presented in two separate categories, based on the type of intervention used in the study:

- *Game-Based Learning:* Studies that use a fully-fledged game as part of the learning experience, or investigate students' and/or educators' perceptions on this pedagogical approach. This category includes 24 studies.

- *Gamification:* Studies that use game design elements as part of the learning experience. This category includes 17 studies.

4.3.3.1 Game-Based Learning (GBL): Main Findings

Context and Theoretical Framework

The majority of GBL studies reviewed (17 out of 24 in total) followed a quantitative approach, deploying a variety of methods and designs, such as control groups, pre-tests and post-tests, and questionnaires to answer their research questions (Buil, Catalán and Martínez, 2018, 2019; Hernández-Lara, Serradell-Lopez and Fitó-Bertran, 2018; Martínez-Cerdá, Torrent-Sellens and González-González, 2018; Martí-Parreño, Galbis-Córdova and Miquel-Romero, 2018; Middeke *et al.*, 2018; Perini *et al.*, 2018; van Goor, Luursema and IJgosse, 2018; Chon *et al.*, 2019; Corda *et al.*, 2019; Matute-Vallejo and Melero-Polo, 2019; Mullor *et al.*, 2019; Palomo-Duarte *et al.*, 2019; Siala, Kutsch and Jagger, 2019; Silva, Rodrigues and Leal, 2019; Sánchez-Mena, Martí-Parreño and Miquel-Romero, 2019). Two studies followed mixed methods (Ameerbakhsh et al., 2019; Buzady and Almeida, 2019), one study followed a qualitative and quantitative approach without specifically referring to it as mixed methods (Calabor, Mora and Moya, 2019), and three followed a qualitative approach (Barr, 2018; Beatriz Hernandez-Lara and Serradell-Lopez, 2018; Taillandier and Adam, 2018).

The studies were informed by a wide range of theoretical frameworks during the GBL intervention design phase or the data analysis. Four (out of 24 studies) examined the effectiveness of GBL interventions through a Flow Theory (Csikszentmihalyi, 2008) lens (Buil, Catalán and Martínez, 2018; Buzady and Almeida, 2019; Matute-Vallejo and Melero-Polo, 2019; Silva, Rodrigues and Leal, 2019). From the rest of the reviewed studies, those who discuss their theoretical underpinnings vary greatly in frameworks and methods used:

- Buil, Catalán and Martínez's study (2019) was grounded in Self-Determination theory (as articulated by Ryan and Deci, 2000), exploring aspects that enhance intrinsic motivation.

- Siala, Kutsch and Jagger's study (2019) combined Self-Determination theory with Adoption theory, to investigate the role of culture in students' adoption of a business game.
- Beatriz Hernandez-Lara and Serradell-Lopez (2018) were informed by social constructivism (Kent, Laslo and Rafaeli, 2016) to conduct a content analysis of students' online discussions while playing a business simulation game.
- Perini *et al.* (2018) were guided by Anderson's (2005) types of knowledge to design their GBL experience and learning outcomes.
- Hernández-Lara, Serradell-Lopez and Fitó-Bertran (2018) reviewed a GBL experience using Hofstede's cross-cultural dimensions (2001), to capture differences in students' views on business games depending on their cultural contexts.
- Palomo-Duarte *et al.* (2019) were guided by the principles of the Cooperative Learning approach followed in Berns *et al.* (2013) to design a virtual world video game which can support foreign language learning.
- Corda *et al.* (2019) design their educational video game guided by a set of criteria proposed in Gibson and Bell (2013).
- Taillandier and Adam (2018) design their educational game's engagement mechanisms by combining and adapting criteria proposed in the work of Brandtzaeg, Folstad and Heim (2006) and Garris, Ahlers and Driskell (2002).
- Ameerbakhsh *et al.* (2019) are using the Learning Effectiveness Survey (LES), which was based on an instrument developed by Moody and Sindre (2003). LES was used to capture students' views after playing a computer-based simulation game to support the teaching of marine ecology.
- Siala, Kutsch and Jagger (2019), Sánchez-Mena *et al.* (2019a) Matute-Vallejo and Melero-Polo (2019) and Sánchez-Mena *et al.* (2019b) use the Technology Acceptance Model (Davis, 1989, 1993) for their respective questionnaires, seeking to gauge students' and/or educators' acceptance of business games.
- Mullor *et al.* (2019) used the Spanish version of the Stigma Attribution Questionnaire (Corrigan, Watson and Warpinski, 2004; Muñoz *et al.*, 2015) as part of their study, which compared a serious game with traditional methods in terms of effectively reducing stigma toward mental health illness.

- Calabor *et al.* (2019) use the Delphi methodology (Dalkey and Helmer, 1963; Turoff and Linstone, 1975) to explore the future of serious games in accounting education.
- Finally, Whitton and Langan (2019) use thematic network analysis (Attride-Stirling, 2001) to analyse students' perceptions on the element of fun in higher education.

In terms of research sample, all participants in the reviewed GBL studies were university students, with the exception of three studies that focused on capturing educators' perspectives. Specifically, Sánchez-Mena, Martí-Parreño and Aldás-Manzano (2019) and Sánchez-Mena, Martí-Parreño and Aldás-Manzano and Miquel-Romero (2019) investigate instructor's intentions to use educational videos in higher education, and Calabor *et al.* (2019) use a Delphi questionnaire with accounting lecturers to explore the future of serious games in accounting education.

The median number of study participants was 120, with lower number being 12, highest 930, and one study being unclear in terms of total participant number (Buzady and Almeida, 2019).

Defining Game-Based Learning

According to Vlachopoulos and Makri's (2017) systematic review, there appears to be a variety of terminology among scholars and educators, particularly when it comes to the different types of games and simulations used. This Systematic Review has focused on a subset of the published literature, where it appears authors have a similar understanding of game-based learning (GBL) – although they do not necessarily refer to the approach in this term. Out of the 24 studies, nine make reference to the term GBL (Buil, Catalán and Martínez, 2018; Perini *et al.*, 2018; Matute-Vallejo and Melero-Polo, 2019; Palomo-Duarte *et al.*, 2019; Siala, Kutsch and Jagger, 2019; Silva, Rodrigues and Leal, 2019; Sánchez-Mena, Martí-Parreño and Aldás-Manzano, 2019; Sánchez-Mena, Martí-Parreño and Aldás-Manzano and Miquel-Romero, 2019; Whitton and Langan, 2019) and only four define the approach. Specifically, for Whitton and Langan (2019) game-based learning is the use of games in the classroom. For Silva *et al.* (2019), the GBL approach uses games designed for a specific purpose within an educational context, and allows

students to learn in a non-traditional way. Siala, Kutsch and Jagger (2019) understand GBL as an approach that aims to enhance the learning experience and to increase student engagement by including an element of entertainment to the learning activities. Perini *et al.* (2018) have a similar understanding of the term and highlight that the element of fun in GBL is not used for entertainment, but to support student engagement. This study appears to be the only one from the reviewed GBL papers that specifically use the term Digital Game-Based Learning (DGBL), to distinguish between digital and non-digital game-based learning experiences.

Two of the reviewed studies appear to be connecting their learning interventions with gamification, rather than GBL. Buzady and Almeida (2019), who used an online serious game to support development of entrepreneurship competencies, do not make reference to the term GBL, but rather understand serious games as a derivative of gamification and Technology Enabled Learning. Similarly, Corda *et al.* (2019), who used a computer game to teach Computer Science, do not refer to their experience as GBL – instead, their definition of an educational game suggests a closer connection to the gamification approach. The authors define educational games as instructional strategies, which include various game elements (goals, rules etc.) and are "designed for teaching specific competencies or concepts, mixing the entertainment with the pedagogical purpose" (2019 p13732). This indicates that scholars and educators may not always have a shared understanding of terminology, however all of the GBL experiences included in this Systematic Review fall somewhere within the spectrum of gamified experiences[17].

In regard to types of GBL experiences, 10 out of 24 studies refer to their interventions as serious games (Middeke *et al.*, 2018; Perini *et al.*, 2018; Taillandier and Adam, 2018; van Goor, Luursema and IJgosse, 2018; Ameerbakhsh *et al.*, 2019; Buzady and Almeida, 2019; Calabor, Mora and Moya, 2019; Chon *et al.*, 2019; Mullor *et al.*, 2019; Siala, Kutsch and Jagger, 2019) and for four studies the preferred term appears to be business game or business simulation game (Beatriz Hernandez-Lara and Serradell-Lopez, 2018;

[17] The idea of the spectrum is derived from Cheong, Cheong and Filippou (2013), who view gamification as a continuum, with serious games on one end, and activities with added game elements on the other end of the continuum.

Buil, Catalán and Martínez, 2018, 2019; Hernández-Lara, Serradell-Lopez and Fitó-Bertran, 2018).

Serious games can be understood as endeavours which are intended for purposes beyond mere entertainment, e.g. for teaching or training, and aim to enhance the learning experience and support student engagement and skills development (Middeke *et al.*, 2018; Taillandier and Adam, 2018; van Goor, Luursema and IJgosse, 2018; Ameerbakhsh *et al.*, 2019; Mullor *et al.*, 2019; Siala, Kutsch and Jagger, 2019). Serious games include simulation games (Calabor, Mora and Moya, 2019).

Finally, *business simulation games* can be understood as digital or e-learning methods, which can support management training by simulating real business situations, and allowing students to apply management concepts in a risk-free environment (Beatriz Hernandez-Lara and Serradell-Lopez, 2018; Buil, Catalán and Martínez, 2018, 2019).

Why Game-Based Learning?

Educators and researchers are deploying GBL to enhance the learning experience and/or address a variety of issues. Specifically, the reviewed studies used games for the following reasons:

- As a motivational hook to enhance learning, as game-based learning is perceived as a fun, engaging and motivating way to learn (Palomo-Duarte *et al.*, 2019) (Corda *et al.*, 2019) (Beatriz Hernandez-Lara and Serradell-Lopez, 2018) (Perini *et al.*, 2018; van Goor, Luursema and IJgosse, 2018; Mullor *et al.*, 2019).
- To address student retention issues in higher education, through their motivational effects (Silva, Rodrigues and Leal, 2019) (Corda *et al.*, 2019).
- To allow learners to practice real world situations in a risk-free, safe environment, without real-world consequences, or where a real-word experience would be impractical or unethical (Buil, Catalán and Martínez, 2019) (Siala, Kutsch and Jagger, 2019) (Chon *et al.*, 2019) (Beatriz Hernandez-Lara and Serradell-Lopez, 2018; Taillandier and Adam, 2018; Ameerbakhsh *et al.*, 2019).
- To fulfil the need for more active, experiential and practical learning approaches, bridging theory and practice, particularly in the teaching and learning of complex or theoretical concepts (Buzady and Almeida, 2019; Siala, Kutsch and Jagger,

2019; Buil, Catalán and Martínez, 2018; Taillandier and Adam, 2018; Hernández-Lara, Serradell-Lopez and Fitó-Bertran, 2018; Perini *et al.*, 2018).

Games Used & Gameplay

GBL appears to be deployed in a wide range of disciplinary areas as illustrated in Figure 4.3. From the 24 reviewed GBL studies, the majority were conducted within Business, Management, and Marketing, followed by studies within the Medical field. Specifically, out of the 24 studies, eight focused on Business-related topics, such as Management, Entrepreneurship & Marketing (Beatriz Hernandez-Lara and Serradell-Lopez, 2018; Buil, Catalán and Martínez, 2018, 2019; Hernández-Lara, Serradell-Lopez and Fitó-Bertran, 2018; Buzady and Almeida, 2019; Matute-Vallejo and Melero-Polo, 2019; Siala, Kutsch and Jagger, 2019; Silva, Rodrigues and Leal, 2019), four studies were within the medical field, including psychology (Middeke *et al.*, 2018; van Goor, Luursema and IJgosse, 2018; Chon *et al.*, 2019; Mullor *et al.*, 2019), two on Accounting (Calabor, Mora and Moya, 2019; Silva, Rodrigues and Leal, 2019)[18], and one study was published per each of the following topics: Engineering (Taillandier and Adam, 2018), Computer Science (Corda *et al.*, 2019), Marine Ecology (Ameerbakhsh *et al.*, 2019), Foreign Language Learning (Palomo-Duarte *et al.*, 2019), graduate skills, such as communication (Barr, 2018), Sustainable Manufacturing (Perini *et al.*, 2018), and collaborative skills (Martínez-Cerdá, Torrent-Sellens and González-González, 2018). Finally, four of the studies did not focus on a specific disciplinary area, as they were a broader exploration of student and educator attitudes towards game-based learning (Martí-Parreño, Galbis-Córdova and Miquel-Romero, 2018; Sánchez-Mena, Martí-Parreño and Aldás-Manzano, 2019; Sánchez-Mena, Martí-Parreño and Miquel-Romero, 2019; Whitton and Langan, 2019).

[18] Note: Silva *et al.* (2019) is listed twice, as the paper used both a Marketing game and an Accounting game.

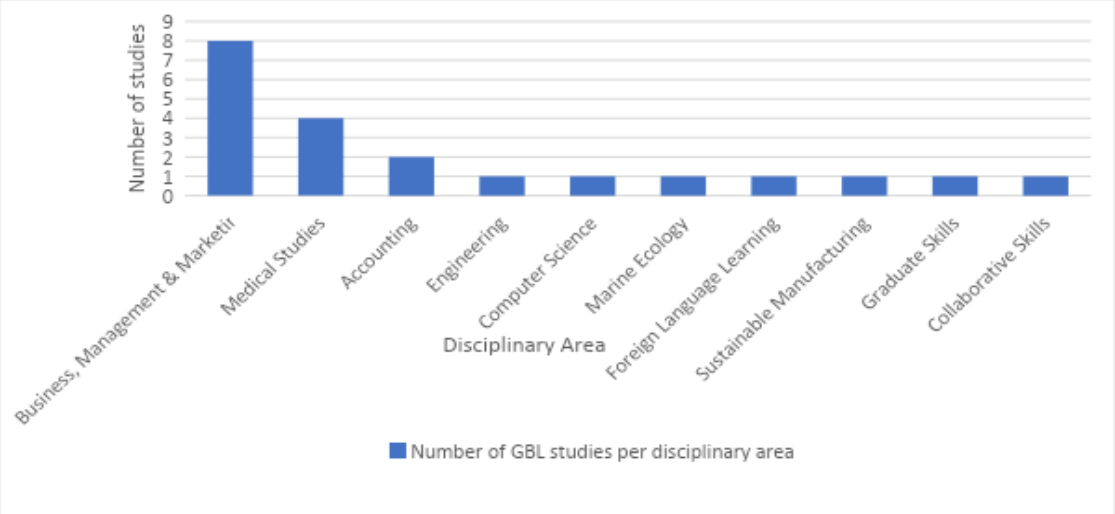


Figure 4.3 – GBL studies per disciplinary area

In terms of the game development process, six of the games were developed externally, either fully or via university collaboration with external developers, five were developed in-house, and five were available off-the-shelf. Eight of the studies did not report on the game development process. Interestingly enough, most of the reviewed papers do not elaborate on how the games were sourced or funded – a piece of information which would be useful for this Systematic Review and interesting for other educators or institutions to consider.

Where stated, there appear to be variations in the amount of time spent by students participating in educational games ranging from a few hours of gameplay (Taillandier and Adam, 2018; Mullor *et al.*, 2019), to a few weeks and months (Buil, Catalán and Martínez, 2018; Middeke *et al.*, 2018; van Goor, Luursema and IJgosse, 2018; Chon *et al.*, 2019) and academic years (Beatriz Hernandez-Lara and Serradell-Lopez, 2018; Ameerbakhsh *et al.*, 2019; Buil, Catalán and Martínez, 2019; Silva, Rodrigues and Leal, 2019). This is in line with Vlachopoulos and Makri's (2017) finding as part of their systematic literature review on "[t]he effect of games and simulations on higher education", which we discussed in a previous section. The authors' review found that sessions lasted a variety of time periods, from single sessions, to several weeks and months.

The games used in the 24 reviewed GBL studies were played via computer (offline) or web-browser (online). Only one game required the use of specialised equipment (for

laparoscopic training) in addition to a computer (van Goor, Luursema and IJgosse, 2018). In terms of game genres, one study used a variety of high-end commercial video games as part of their intervention, including role-playing and strategy games (Barr, 2018). The rest of the reviewed studies included games specifically developed for educational purposes, within the genres of simulation-type games, action-adventure and digital board games.

Simulation-Type Games: In 14 out of 24 studies, students assumed the role of a professional in their respective field, e.g. a company manager or a medical professional, and made various decisions throughout the game to achieve a goal or reach optimal results (Beatriz Hernandez-Lara and Serradell-Lopez, 2018; Buil, Catalán and Martínez, 2018, 2019; Hernández-Lara, Serradell-Lopez and Fitó-Bertran, 2018; Middeke *et al.*, 2018; Perini *et al.*, 2018; Taillandier and Adam, 2018; Ameerbakhsh *et al.*, 2019; Buzady and Almeida, 2019; Calabor, Mora and Moya, 2019; Chon *et al.*, 2019; Matute-Vallejo and Melero-Polo, 2019; Mullor *et al.*, 2019; Siala, Kutsch and Jagger, 2019). Other simulation-type interventions included the 3D virtual world implemented in Palomo-Duarte *et al.* (2019), where students interacted with room objects and completed individual and collaborative language activities.

Action-Adventure Game: In Corda *et al.* (2019), students played an adventure-type game, which was designed to look like the inside of a dungeon. The game had an "above view" and students navigated in the dungeon rooms and completed challenges using Unix commands on their keyboard and using their mouse to interact with room objects and game characters. Also, in van Goor *et al.* (2018) students played the serious game "Underground", as part of which they were tasked to clear obstacles and nudge robots back to the surface from the underground, by making movements with a pair of robotic arms similar to laparoscopic instruments.

Digital Board Game: In Silva *et al.* (2019), students played an online board game, which included quiz questions from the syllabus. Students moved on the board squares when they answered questions correctly. Each correct answer rewarded the player with a lit star. The objective of the game was to light all stars and reach the centre of the board. The game included additional game elements such as badges, countdown time, and high score rankings.

Beneficial Outcomes of GBL Interventions

All game-based learning interventions deployed in the reviewed studies showed predominantly promising results, and many discussed lessons learned, possible improvements in GBL implementation and potential for further research.

The game-based learning approach appears to be well-received by students, with students finding GBL interventions as a positive and enjoyable experience (Perini *et al.*, 2018; Taillandier and Adam, 2018; Chon *et al.*, 2019; Corda *et al.*, 2019; Siala, Kutsch and Jagger, 2019; Silva, Rodrigues and Leal, 2019). Moreover, the following studies offered encouraging evidence of increased competencies and overall enhanced learning experience of students:

- In Buzady and Almeida (2019), students who played the online business game FLIGBY, found that the game supported their development of entrepreneurship competencies. This is in line with findings from Subhash and Cudney (2018) systematic review, who cite a study by Antonaci *et al.* (2015) on a gamified course in entrepreneurship. The said study found that serious games can support the development of entrepreneurial motivation, business competence, and business acumen.
- Similarly, in their study on business games, Hernández-Lara, Serradell-Lopez and Fitó-Bertran (2018) found that students perceived business games as appropriate tools for fostering generic and specific managerial skills.
- Corda *et al.* (2019), who integrated an adventure video game in a Computer Science course, found that the game achieved the expected learning outcomes.
- Palomo-Duarte *et al.* (2019), who explored the effectiveness of a 3D virtual video game in supporting foreign language learning, found that the game helped some students in improving their writing and grammatical competence.
- In the field of manufacturing, Perini *et al.* (2018) found that the Life Cycle Assessment game (LCA) was effective in improving students' procedural knowledge and skills.
- Following pre-test and post-test evaluation, Taillandier and Adam (2018) found that implementing a simulation-based serious game in a territorial risk management course increased students' performance in the topic.

- van Goor, Luursema and IJgosse (2018), who used a serious game to investigate its potential in laparoscopic skills development, found evidence of skills transfer from the serious game to a virtual simulator, which is a validated virtual tool for laparoscopic basic skills training.
- In Calabor *et al.* (2019) the accounting lecturers who participated in a Delphi study agreed that serious games can support experiential learning, they facilitate the connection of concepts with the real world, and they make learning more enjoyable.
- In Barr (2018) students perceived the selection of commercial games they played as effective in developing communication skills and adaptability.
- Martínez-Cerdá *et al.* (2018), who compared nine ICT-supported pedagogical approaches used in online universities for collaborative skills development, found that digital games used in STEM studies are useful for developing collaborative skills.
- Finally, in the field of psychology, Mullor *et al.* (2019), who compared a serious game with more traditional methods in terms of how they can reduce stigma toward mental health illness, found that the game was as effective as other methods.

Game-based learning has also been proved to support or benefit the instructional design and teaching process for higher education instructors.

- Middeke *et al.* (2018), who compared a serious computer game to small-group problem-based learning to teach clinical reasoning, found that the game allowed students to "be exposed to a high number of cases in short time without hampering learning outcome in specific cases" (2018 p12). Using the game in teaching clinical reasoning, could allow for better exposure to the topic in less amount of time.
- Corda *et al.* (2019), report a similar finding. The authors, who used a Computer Science video game, found that the game was useful in reducing time spent teaching difficult subjects, such as Unix commands, in this case.
- Mullor *et al.* (2019), found that the serious game they used to reduce stigma toward mental health can be an easy and economical solution for large audiences.

- Calabor *et al.* (2019), who examined accounting lecturer's attitudes towards using serious games in their discipline, report various perceived benefits for universities and lecturers. There was agreement amongst the lecturers that serious games can give an image of modernity to the university and help standardise teaching tools in universities. Moreover, there was consensus amongst the lecturers around the perceived benefits of serious games for faculty. The lecturers agreed that serious games help increase student motivation and willingness to work, they allow for practical application of concepts, and they make teaching easier and more dynamic.

Observations on GBL Design Elements

Some of the reviewed studies examined specific elements of the GBL approach, aiming to understand which factors contribute to or perhaps hinder its effectiveness. The main findings are summarised below:

- Buil, Catalán and Martínez (2019) highlighted the importance of *intrinsic motivation* in GBL. The authors found that intrinsic motivation enhances student engagement during gameplay, which in turn supports the development of generic skills, such as team work and decision-making. According to the study findings, intrinsic motivation was positively influenced when students' need for *competence* and *autonomy* were satisfied. This has a design implication, according to the authors. Game-based activities should be designed with meaningful challenges and other mechanisms to satisfy competence, and also with various opportunities for players/learners to make autonomous choices.
- *Cultural context* is another factor considered in the reviewed studies. In their cross-cultural study, Siala, Kutsch and Jagger (2019), highlighted that culture plays an important role in students' decision to adopt a serious game. The study found a significant difference in how different cultures perceive in-game rewards, and the level of their contribution to the learning experience. Moreover, the study showed that the game's learning curve was steep for some cultural groups. The authors urged educators using such games with diverse audiences to include various assessments and point collection mechanisms, as extrinsic motivation seemed to drive adoption more than intrinsic in this study. Hernández-Lara,

Serradell-Lopez and Fitó-Bertran (2018) also highlighted that students' different cultural context affected how they perceive the effectiveness of business games in supporting them acquire specific managerial skills.

- *Interactivity* was highly valued by the students in the serious game, as well as the *formative assessments* throughout the game (Buzady and Almeida, 2019). As part of this study, the students played FLIGBY, an off-the-shelf web-based serious game presented in movie format. Players had to make strategic decisions, choosing from 2-5 options each time. The element of "interactions" was also positively received by students who participated in this game (Siala, Kutsch and Jagger, 2019). Other elements that students enjoyed were the dialogue, the real-life scenarios and the progression levels.
- *Student Interaction:* Barr (2018) explored students' perceptions on the effectiveness of games in developing skills, such as communication and adaptability. The 20 interviewed students had previously participated in a games-based intervention (they played a series of commercial games), that was part of a quantitative study by the same author (Barr, 2017). The 2018 follow up study showed a positive perception in games-based skill development. However, significant factors in skills development appeared to be the interaction between students, who had to communicate with each other in order to win, and also the high-pressure nature of the game scenarios, which made it necessary for players to communicate effectively in order to progress. According to the authors, this suggests that interaction between the students was an important factor that contributed to the effectiveness of the games.
- *Element of fun:* Barr (2018) examined students' attitudes towards the effectiveness of selected commercial video games[19] in developing communication skills, resourcefulness and adaptability. While the students found the experience enjoyable, the author connected this with the fact that the video games used in the study were high-quality commercial titles, designed specifically to entertain, rather than educate. Barr (2018) highlights that students can detect when they are being tricked into learning by an educational product

[19] The games included: *Portal 2; Team Fortress 2; Gone Home; Minecraft; Papers, Please; Borderlands 2; Lara Croft and the Guardian of Light;* and *Warcraft III.*

that poses as fun. The importance of fun was also highlighted in Whitton and Langan (2019). In their study, the vast majority of student participants felt that university should be a fun experience. While not exclusively connected to games, the element of fun appears to be key for students - an observation which holds important design implications for educational games development.

- *Perceived Relevance of Games:* Martí-Parreño, Galbis-Córdova and Miquel-Romero (2018) investigated 128 students' attitudes towards the effectiveness of educational video games (EVGs) in developing competencies. They specifically looked at four attributes and how they influence students' attitudes: 1) perceived relevance, 2) perceived confidence, 3) media affinity, and 4) perceived self-efficacy. The results suggest that perceived relevance is a necessary condition for students' positive attitude. The term relevance refers to students' perception of EVGs as content that relates to their daily activities, can support them in developing their competencies and is worth learning. The implication for educators is that they should foster students' perceived relevance by educating them about the potential of educational video games for learning and competency development.
- *State of Flow*: Some researchers focused on factors or dimensions that can lead to students experiencing *flow* while playing an educational game:
    - An element that increased the likelihood of students being immersed in a state of flow, was *enjoyment*, according to Matute-Vallejo and Melero-Polo's study (2019), who highlight the importance of designing games that are fun.
    - Buil, Catalán and Martínez (2018), who explored which factors support flow during a business simulation, found that the elements of *challenge* and *instant feedback* positively impact flow, but noted that it was necessary to achieve a good balance of challenge and students' skills.
    - In contrast, Silva, Rodrigues and Leal (2019), who implemented two digital board games on Accounting and Marketing with university students, found that the element of feedback did not significantly affect students' flow within a GBL experience. According to the authors, this could indicate that having immediate access to individual and opponents' scores may not be essential to engage and immerse students in learning as part of the game. The authors used Flow Theory (Csikszentmihalyi, 2008) to examine the effectiveness of the

games in increasing students' performance, looking specifically on the impact of the following elements: Concentration, Clarity, Feedback, Challenge, Autonomy, Social, Interaction, and Perceived Learning. All the aforementioned dimensions had positive impact on student's flow, with the exception of Feedback (discussed above) and Clarity, i.e. giving students clear objectives. Based on the results of the questionnaire, which assessed the contribution of the game to the students' learning, the authors found that the element of Clarity had negative scoring. The authors speculate that it could be that the students did not perceive the real objectives of the game or perhaps they were playing without associating the goals with the intended learning.

Challenges and Considerations with using GBL

Discussing barriers and challenges with using GBL was not the main focus of the reviewed papers, however a number of them comment on potential challenges, based on their review of the relevant literature, and some discuss specific lessons learned from their own implementation of GBL within a higher education context. These challenges and considerations are summarised below.

- *Technical Issues* – In Buzady and Almeida's 2019 study, students reported technical issues while playing a web-based business game, aimed to enhance entrepreneurship skills. Specifically, students using devices that run Apple's IoS (iPhone OS) mobile operating system were unable to play the game due to its use of Flash. Students also reported networking issues, which forced them to replay the same scenarios multiple times. This highlights the important role of the instructor in making sure all student queries are resolved and the game runs smoothly. Technical concerns also appear to be a key consideration in Barr (2018), who used commercial games with higher education students. During the game selection stage, key considerations included logistical concerns, including hardware and network constrains, e.g. availability of reliable internet connection for online gaming.
- *Need for Pre Training* – Findings from Buzady and Almeida (2019) suggest that training on how to play the game is necessary prior to students being asked to play the game. Beatriz Hernandez-Lara and Serradell-Lopez (2018) support the

same finding, and point out that not understanding how the game works can lead to student demotivation.

- *Pressure and Anxiety* – Commenting on business simulations, Buil, Catalán and Martínez (2019) reviewed the literature and identified a number of possible challenges, including student anxiety and frustration. The authors comment that this is possibly caused by the competitive nature of such games, as well as the pressure of making time-sensitive decisions.
- *The Role of the Instructor* – Many studies reflect the importance of the instructor supporting the implementation of GBL. Buzady and Almeida (2019) stressed the importance of the instructor supporting students with technical issues and providing previous training on how to play the game. Similarly, Buil, Catalán and Martínez (2019) highlighted that instructor preparation is necessary, to address student questions and tackle possible frustration. Silva, Rodrigues and Leal (2019) highlight that traditional teaching is still important and it is necessary to find the best way to merge traditional teaching and educational games. Taillandier and Adam (2018), who used a simulation-based game to facilitate the teaching of territorial risk management, received feedback from students that debriefing with the lecturer after the game was important. A similar conclusion is found in Ameerbakhsh et al. (2019). The study compared two approaches of using an online game to teach marine ecology: A student-centred approach, where the students played the game on their own without demonstration from the lecturer, and a teacher-led approach, where the lecturer demonstrated the game and exposed various useful information. While students saw benefits in both approaches, the teacher-led approach resulted in statistically significant increase in performance, as students indicated that the lecturer walk-through made the exercise more beneficial. Martí-Parreño, Galbis-Córdova and Miquel-Romero (2018) found that the lack of student confidence in using educational video games (EVGs) influenced negative attitudes in using EVGs for competency development. The role of instructors was really important in this case, as according to the authors, students needed to be educated about the learning potential of games, to support them in overcoming this lack of confidence. Similarly, Matute-Vallejo and Melero-Polo (2019) pointed out that experiences and perceptions of educational games vary depending on students'

innovativeness, a term which the authors define as "the students' willingness to adopt innovative technologies that are new to them" (2019, p75). According to the study, instructors integrating educational games into their practice should consider students' personal innovativeness, as students who are less innovative may not favour the use of an educational game in their learning, and it is important for this group to perceive the game as easy to use. Finally, Beatriz Hernandez-Lara and Serradell-Lopez (2018), who analysed student interactions on an online discussion forum while playing a business game, found from the experience that the role of instructor is key in ensuring good teamwork, by detecting problems early on.

- *Need for Institutions and Instructors to Adapt* – A number of studies comment on the role of higher education institutions and instructors in using innovative pedagogies, such as GBL. Hernández-Lara, Serradell-Lopez and Fitó-Bertran, 2018, who analysed students' views on business simulation games and their effectiveness in a cross-cultural study, found that students from different cultural backgrounds assessed the effectiveness of business games in fostering specific managerial skills differently. The study concluded that cultural context impacts students' perception on the effectiveness of business games, with students who had been previously exposed to experiential learning approaches valuing games better and in turn benefiting more from them. The authors, therefore, suggested that more effort is needed in some parts of Europe to adapt to new, more experiential, pedagogical models. The authors acknowledged, however, the significant challenge that this presents, as it requires instructors to increase their knowledge about this gap, in order to guide students appropriately and support them in taking full advantage of the benefits these approaches can offer. As part of their study on fun and games in higher education, Whitton and Langan (2019) suggest that the ways in which institutions can support educators in implementing innovative pedagogical approaches can be a challenge, given that failure is perceived negatively in the higher education sector. The current climate of the sector, with the pressures and demands of achieving performance metrics such as student satisfaction, and balancing research and teaching, may not be encouraging of the risk-taking endeavour of introducing experimental teaching practices.

On a similar note, the higher education lecturers who participated in the study of Calabor *et al.* (2019) expressed the view that a key barrier to using educational games is the lack of resources. According to the authors' analysis, this lack of resources appears to be less related to financial resources, but rather to institutions not incentivising nor motivating faculty staff to invest their time in researching and using these teaching approaches – despite the perceived benefits of these amongst educators.

Finally, Sánchez-Mena, Martí-Parreño and Miquel-Romero (2019) found that perceived usefulness of educational video games (EVGs) was a key factor in influencing educator's intention to use them in their teaching practice. According to the authors, to increase educators' positive attitude towards adopting EVGs, higher education teacher training programs should emphasise the games' usefulness, and should provide support in using EVGs to educators who can be doubtful of their effectiveness.

Consider Students' Initial Competence – Palomo-Duarte *et al.* (2019) used a 3D virtual world video game to support students in learning German as a foreign language. The study provided evidence of improved lexical and grammatical competence, which seemed to occur at a faster pace for students with higher initial competence, compared to students with lower initial competence. While the results are promising, the authors caution that not all students benefit from GBL in the same way. The study findings indicated that the success of a GBL intervention may depend on students' initial competence in the subject domain.

Student Perceptions – The findings from the reviewed studies revealed that the way students perceive and experience game-based learning is key to the effectiveness of the approach. One study highlighted that students can lose motivation if they do not perceive the game to be realistic or they do not take the task seriously (Buil, Catalán and Martínez, 2019). Another study, which analysed students' interaction in an online forum while using a business simulation game in teams of four, showed that students were demotivated by not understanding how the game worked and how to achieve beneficial results in the game. Students also found scheduling of teamwork to be problematic, which had a negative impact on the experience (Beatriz Hernandez-Lara and Serradell-Lopez, 2018).

Focusing on student perceptions, Whitton and Langan (2019) investigated higher education students' perceptions on the element of fun in the university and what can

contribute to it. While student answers varied, the vast majority expressed the view that their university education should be fun. However, only a few students linked the element of fun with the use of games. In fact, Whitton and Langan suggested that the factors identified by students as contributors to a fun university experience are not unique to games, and therefore simply introducing a game to motivate students may not necessarily be an effective strategy.

Educators Perceptions – In their paper, Sánchez-Mena, Martí-Parreño and Miquel-Romero (2019) surveyed 170 educators using an adapted version of the Technology Acceptance Model (Davis, 1989, 1993), in an effort to investigate their intentions to use educational video games (EVGs) in their practice. The authors analysed the following variables: perceived ease of use, perceived usefulness, belief that EVGs can focus students' attention to the learning topic, and belief that the EVGs have learning value. The findings showed that educators' intention to use EVGs is not driven by the same variables for all. Using Fuzzy-set Qualitative Comparative Analysis, the study clustered educators into four groups based on their intention:

- Group 1: Those who would use EVGs because they can draw students' attention, but they do not believe they are relevant to the learning process
- Group 2: Those who would use EVGs because they are easy to use
- Group 3: Those who find EVGs relevant to the learning process, but believe they cannot draw students' attention
- Group 4: Those who believe that EVGs are useful to the learning process and can benefit the students

According to the authors, each of these groups presented its own risks. For example, Group 2 could fall into the trap of using only simple games, and miss out on exploring the full potential of games that support higher learning outcomes. The authors highlighted the importance of Instructor Training Programmes as part of university teaching degrees, and stressed that these programmes should be tailored accordingly to address the four groups of instructors.

Calabor *et al.* (2019) also focused on capturing educator perceptions. The study explored accounting lecturers' intentions to use educational games within the field of Accounting and revealed interesting insights about educators' perceived barriers to using GBL in

higher education. Overall, there was agreement amongst the surveyed lecturers that a key barrier to using GBL is the lack of information on games that would be appropriate for each course, and a general lack of educator knowledge on serious games.

Conclusions on GBL

The findings from the reviewed game-based learning (GBL) studies are overall positive, but there are certainly lessons to be learned. While reasonable attempts have been made to identify specific factors that impact the effectiveness of GBL, these appear to vary greatly depending on the specific learning context and various background variables, such as the students' specific learning needs, personalities and cultural diversity. The implication for designers and educators is that there is no "one size fits all" when it comes to GBL. Each integration needs to be carefully designed and/or adapted accordingly, to meet the learning needs of the target audience in question and the specific learning context.

Despite the absence of a "recipe for success", it is evident from the reviewed studies that educational games used for learning are considered fun and enjoyable endeavours that can increase student motivation and engagement with the learning materials. It is also apparent that when used in the right context, educational games can positively impact student performance, support with teaching complex topics, and train students in areas where it would be impractical or dangerous to learn through a real-world experience.

The findings of the reviewed studies point to the conclusion that GBL cannot replace traditional teaching methods – evidently none of the studies is making such a claim. On the contrary, it is recommended that GBL experiences take a supporting role in the learning experience, complementing other, more traditional, methods. It is also advisable for instructors to continue to be accessible during a GBL experience, to support students while engaging with the games, clarify questions, prevent technical or student collaboration issues, and to promote reflection by debriefing after gameplay.

Finally, the role of higher education institutions in supporting educators with using such innovative pedagogical approaches appears to be a key consideration. With no formal protocol around the use of GBL at university-level, and with institutions not currently incentivising educators to invest the time in researching and implementing such

approaches, GBL experiences take place in a non-mainstreamed manner and are typically the result of dedicated educators who are positively pre-dispositioned towards innovative teaching methods.

4.3.3.2 Gamified Learning (GL): Main Findings

Context and Theoretical Framework

The majority of reviewed studies on gamification (12 out of 17 studies) followed a quantitative approach, including experimental and non-experimental designs, surveys and pre-test post-test evaluations (Jurgelaitis, Drungilas and Ceponiene, 2018; le Maire *et al.*, 2018; Tsay, Kofinas and Luo, 2018; van Roy and Zaman, 2018; Brom *et al.*, 2019; Carlos Cuevas-Martinez *et al.*, 2019; Cerqueiro and Harrison, 2019; Grivokostopoulou, Kovas and Perikos, 2019; Jurgelaitis *et al.*, 2019; Mader and Bry, 2019; Ortiz-Rojas, Chiluiza and Valcke, 2019; Welbers *et al.*, 2019). The rest of the studies used a combination of qualitative and quantitative methods, including open-ended question surveys and student observation (Christopoulos, Conrad and Shukla, 2018; Glowacki, Kriukova and Avshenyuk, 2018; Felszeghy *et al.*, 2019; Hensen, Koren and Klamma, 2019; van Roy and Zaman, 2019).

While not all of the reviewed studies engage in discussion on their theoretical underpinnings, seven of the studies appear to be informed by Ryan and Deci's work , focusing on the concepts of intrinsic and extrinsic motivation, and examining gamification experiences from the perspective of the three basic psychological needs, according to Self-Determination theory, i.e. autonomy, competence and relatedness (Tsay, Kofinas and Luo, 2018; van Roy and Zaman, 2018, 2019; Brom *et al.*, 2019; Carlos Cuevas-Martinez *et al.*, 2019; Jurgelaitis *et al.*, 2019; Ortiz-Rojas, Chiluiza and Valcke, 2019). Two studies are inspired by the Cooperative Learning approach (Johnson and Johnson, 1999) to create collaborative gamified experiences (le Maire *et al.*, 2018; Cerqueiro and Harrison, 2019). Mader and Bry's (2019) gamified intervention is also designed as a social experience, informed by the concept of peer instruction (Mazur, 2017) and the approach of "learning by doing" (Bruce and Bloch, 2012). Felszeghy *et al.* (2019) are informed by Bauman's layered-learning model (Bauman *et al.*, 2014), which uses multimedia technology for scaffolding traditional teaching of course materials.

In terms of the research sample, the median number of study participants was 77, with lower number being 18, highest 600, and one study being unclear as to the exact number of participants. In all cases, the study participants are university students, with the exception of Hensen, Koren and Klamma (2019), who evaluated their gamified experience not only with students, but also with lecturers.

Defining Gamification

Amongst those papers that discuss important terms, it appears that gamification is commonly understood as "the use of game-design elements in non-game contexts", a definition found in Deterding *et al.* (2011, p9) and used in 11 out of the 17 reviewed gamification papers (Glowacki, Kriukova and Avshenyuk, 2018; le Maire *et al.*, 2018; Tsay, Kofinas and Luo, 2018; van Roy and Zaman, 2018, 2019; Brom *et al.*, 2019; Grivokostopoulou, Kovas and Perikos, 2019; Hensen, Koren and Klamma, 2019; Mader and Bry, 2019; Ortiz-Rojas, Chiluiza and Valcke, 2019; Welbers *et al.*, 2019). Cerqueiro and Harrison (2019) abide by a similar definition of gamification articulated by Kapp (2012). Kapp defined gamification as "a careful and considered application of game thinking to solving problems and encouraging learning using all the elements of games that are appropriate" (2012, pp15-16).

Only one study uses the term edu-gamification, to denote the use of game elements in educational contexts, however they still use Deterding et al. (2011) definition of gamification.

Three of the studies classify their learning experiences as gamification, but they do not define the term (Jurgelaitis, Drungilas and Ceponiene, 2018; Carlos Cuevas-Martinez *et al.*, 2019; Jurgelaitis *et al.*, 2019). Christopoulos, Conrad and Shukla (2018), who integrate a series of mini-games within a hybrid virtual world to increase motivation and engagement as part of a Computer Science course, do not refer to the learning experience as gamification nor game-based learning. The authors use the term educational games, without engaging in a discussion on terminology. For the purposes of this Systematic Review, it seemed appropriate to classify their endeavour as gamification, as the authors are not exploring the impact of fully-fledged educational games – they are rather

attempting to gamify a virtual world by including in it various mini-games, in the form of educational quizzes and leisure games.

Welbers et al. (2019) engage in an interesting discussion around the terms gamification and game-based learning, and how some learning experiences may not clearly fall into one or the other. The authors adopt Cheong, Cheong and Filippou's (2013) perspective, who view gamification as a spectrum, with serious games on one end, and activities with added game elements on the other end of the continuum. Welbers et al. (2019) classify their own learning intervention (a gamified multiple-choice quiz app) as an experience that would fall in the middle of this spectrum. The view of gamified learning as a continuum is certainly a compelling one and could explain the wide variety of learning experiences and differing levels of gamified elements discussed in the reviewed papers.

Why Gamification?

In the reviewed studies, it was clear that gamification is used in a wide range of disciplinary areas and for various reasons. For 10 out of the 17 studies, gamification was deployed in an effort to enhance student engagement and motivation (Christopoulos, Conrad and Shukla, 2018; Glowacki, Kriukova and Avshenyuk, 2018; van Roy and Zaman, 2018, 2019; Carlos Cuevas-Martinez *et al.*, 2019; Cerqueiro and Harrison, 2019; Grivokostopoulou, Kovas and Perikos, 2019; Jurgelaitis *et al.*, 2019; Lopez Carrillo *et al.*, 2019; Mader and Bry, 2019).

On some occasions, gamification was deployed to support the teaching of challenging topics, which involve large amount of information or require practical application of concepts (le Maire *et al.*, 2018; Grivokostopoulou, Kovas and Perikos, 2019; Jurgelaitis *et al.*, 2019).

Finally, gamification was used as an innovative active learning approach, aimed to appeal to digital natives (Felszeghy *et al.*, 2019), to increase performance and student retention in Science Technology, Engineering and Maths (STEM) subject areas (Ortiz-Rojas, Chiluiza and Valcke, 2019), and to increase student participation in classroom quizzes facilitated by audience response systems (Mader and Bry, 2019).

Game Elements & Gameplay

Similarly to the Game-Based Learning approach, gamification experiences in Higher Education appeared to be implemented in a wide range of disciplinary areas as illustrated in Figure 4.4. From the 17 reviewed gamification studies published between 2018 and 2019, five gamified interventions were conducted within the broad discipline of Computer Science, including programming and software design (Christopoulos, Conrad and Shukla, 2018; Jurgelaitis, Drungilas and Ceponiene, 2018; Jurgelaitis *et al.*, 2019; Ortiz-Rojas, Chiluiza and Valcke, 2019; van Roy and Zaman, 2019). Three of the studies were within the area of English language learning (Glowacki, Kriukova and Avshenyuk, 2018; van Roy and Zaman, 2018; Cerqueiro and Harrison, 2019), and three were within the field of medical studies (Felszeghy *et al.*, 2019; Hensen, Koren and Klamma, 2019; Prochazkova *et al.*, 2019). The rest of the reviewed papers were studies conducted in the following topics: university student life (Welbers *et al.*, 2019); natural sciences (Lopez Carrillo *et al.*, 2019); engineering (Carlos Cuevas-Martinez *et al.*, 2019); entrepreneurship (Grivokostopoulou, Kovas and Perikos, 2019); teaching a complex process, specifically how to brew beer (Brom *et al.*, 2019); and chemistry (le Maire *et al.*, 2018).

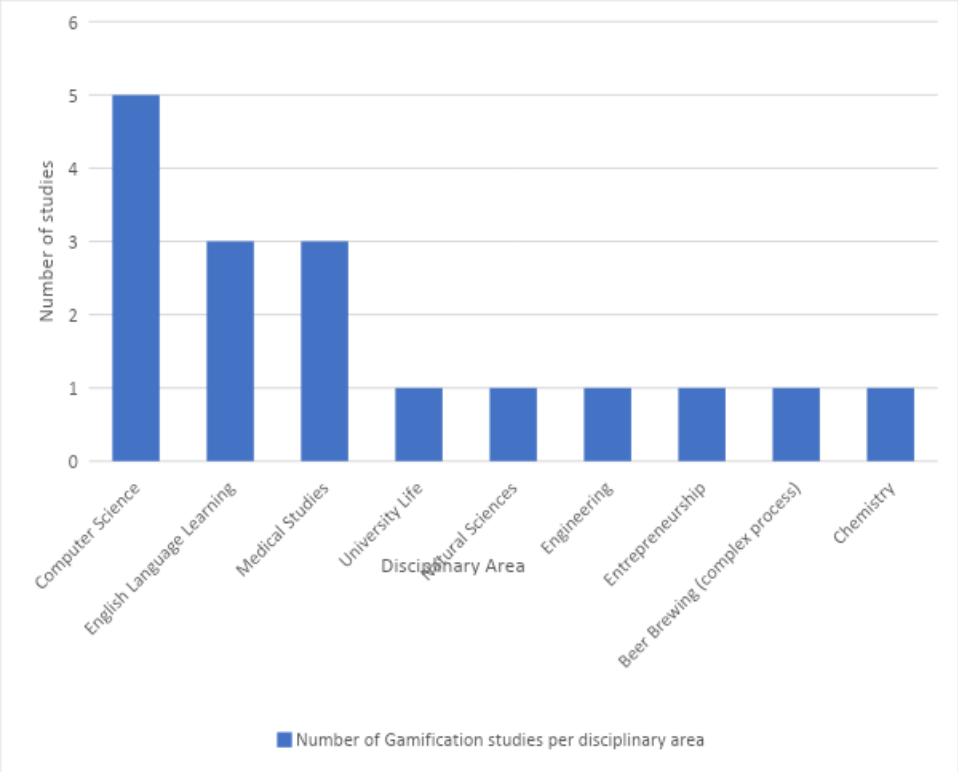


Figure 4.4 – Gamification studies per disciplinary area

There also appears to be a variety in time spent participating in gamified sessions, ranging from a few hours or weeks gameplay (le Maire *et al.*, 2018; Brom *et al.*, 2019; Grivokostopoulou, Kovas and Perikos, 2019; Mader and Bry, 2019), to several weeks, months and academic semesters (Jurgelaitis, Drungilas and Ceponiene, 2018; van Roy and Zaman, 2018, 2019; Felszeghy *et al.*, 2019; Jurgelaitis *et al.*, 2019; Ortiz-Rojas, Chiluiza and Valcke, 2019; Welbers *et al.*, 2019). Longer studies were conducted for the whole course of the academic year (Tsay, Kofinas and Luo, 2018; Cerqueiro and Harrison, 2019), with one experiment extending to 4 academic years, as the authors compared each year's student academic results (Carlos Cuevas-Martinez *et al.*, 2019).

In terms of platforms used to facilitate gamification interventions, six out of 17 studies developed gamification experiences on university Learning Management Systems (LMSs) (Jurgelaitis, Drungilas and Ceponiene, 2018; le Maire *et al.*, 2018; Tsay, Kofinas and Luo, 2018; Carlos Cuevas-Martinez *et al.*, 2019; Jurgelaitis *et al.*, 2019; Ortiz-Rojas, Chiluiza and Valcke, 2019). In five studies, students used their personal devices, such as mobile phones or laptops (Glowacki, Kriukova and Avshenyuk, 2018; Cerqueiro and Harrison, 2019; Felszeghy *et al.*, 2019; Mader and Bry, 2019; Welbers *et al.*, 2019). Three studies deployed gamified experiences using computers in a university computer-lab setting (Christopoulos, Conrad and Shukla, 2018; Brom *et al.*, 2019; Grivokostopoulou, Kovas and Perikos, 2019). Two studies used the Google+ social network platform (van Roy and Zaman, 2018, 2019), and finally one study was a mixed reality experience, which run on Microsoft HoloLens smartglasses and HTC Vive virtual reality equipment (Hensen, Koren and Klamma, 2019).

The reviewed studies utilised a wide range of game elements as part of their gamified experiences. The majority of studies, specifically 14 out of 17, implemented a points and rewards system (in the form of badges, virtual coins or other extrinsic-type reward) accompanied by leaderboard rankings (Glowacki, Kriukova and Avshenyuk, 2018; Jurgelaitis, Drungilas and Ceponiene, 2018; le Maire *et al.*, 2018; Tsay, Kofinas and Luo, 2018; van Roy and Zaman, 2018, 2019; Brom *et al.*, 2019; Carlos Cuevas-Martinez *et al.*, 2019; Cerqueiro and Harrison, 2019; Hensen, Koren and Klamma, 2019; Jurgelaitis *et al.*, 2019; Mader and Bry, 2019; Ortiz-Rojas, Chiluiza and Valcke, 2019; Welbers *et al.*, 2019). This was in line with a key finding from Subhash and Cudney's (2018) systematic review on gamified learning in higher education, which states that points,

badges, and leaderboards were the most used game elements in gamification experiences in higher education. Considering researchers and educators appeared to understand gamification in the same way (see section Defining Gamification), it was not a surprise that they followed similar design guidelines and game elements for their gamified experiences. The remaining three out of 17 studies utilised a quiz via the Kahoot application without use of leaderboard (Felszeghy *et al.*, 2019) and gamified activities such as quiz questions and mini-games within virtual worlds (Christopoulos, Conrad and Shukla, 2018; Grivokostopoulou, Kovas and Perikos, 2019).

Outcomes of Gamified Interventions

Gamification has been found to be a *motivating* experience, enhancing student *engagement* with the learning topic and materials (Christopoulos, Conrad and Shukla, 2018; Glowacki, Kriukova and Avshenyuk, 2018; Felszeghy *et al.*, 2019; Grivokostopoulou, Kovas and Perikos, 2019; Hensen, Koren and Klamma, 2019; Jurgelaitis *et al.*, 2019; Mader and Bry, 2019). However, there are occasions where the impact of gamification on student motivation or engagement has been non-significant. Brom *et al.* (2019), who integrated gamified elements, such as points, goals and virtual currency in a simulation game, found that these did not significantly improve students' intrinsic motivation levels. Similarly, Ortiz-Rojas, Chiluiza and Valcke (2019), who explored the impact of leaderboards in an engineering course, found that the inclusion of leaderboards did not impact students' intrinsic motivation or engagement.

In terms of learning outcomes, the findings appear to be largely positive, with some studies reporting neutral or mixed outcomes. This appears to be in line with findings from Subhash and Cudney's (2018) systematic review, who state that results on student performance are inconclusive, with some studies reporting improved performance, and others reporting increased perceived learning and enjoyment, but no significant impact on performance. The contradictory findings of the literature in terms of the effectiveness of gamification appears to be a concern for some researchers, who attempt to add to existing knowledge with their own studies (Tsay, Kofinas and Luo, 2018; van Roy and Zaman, 2018, 2019; Brom *et al.*, 2019).

Overall, the gamified experiences reported in European studies published between 2018-2019, which have been the focus of this Systematic Review, have resulted in significant

increase of student performance (le Maire *et al.*, 2018; Tsay, Kofinas and Luo, 2018; Carlos Cuevas-Martinez *et al.*, 2019; Jurgelaitis *et al.*, 2019; Ortiz-Rojas, Chiluiza and Valcke, 2019) and have supported deeper understanding of the learning materials. Grivokostopoulou, Kovas and Perikos (2019) found that students who participated in the gamified version of their intervention demonstrated deeper understanding of entrepreneurship concepts, and le Maire *et al.* (2018) observed that students who participated in the study's gamified activities developed enhanced understanding of the learning topic (Chemistry). In Felszeghy *et al.* (2019) students who participated in the Kahoot quizzes felt that their learning of the materials was more comprehensive. Furthermore, positive outcomes have been reported in terms of students' self-efficacy (Grivokostopoulou, Kovas and Perikos, 2019), students' perceived usefulness of the gamified experience (Jurgelaitis, Drungilas and Ceponiene, 2018), and increased student's sense of achievement (Glowacki, Kriukova and Avshenyuk, 2018).

In contrast with these findings, two studies found no significant impact on learning outcomes or student performance (Christopoulos, Conrad and Shukla, 2018; Brom *et al.*, 2019), however even in these cases, students had positive attitudes towards gamification (Brom *et al.*, 2019) and found the gamified activities engaging (Christopoulos, Conrad and Shukla, 2018).

The above findings are in line with Subhash and Cudney's (2018) systematic review, who concluded that "perceived learning was widely concluded as a positive effect of gamified learning", even where there was no significant improvement in student performance/exam scores (p204).

Other positive aspects reported from gamification learning experiences included student *enjoyment*, which was evidently increased in some cases (Glowacki, Kriukova and Avshenyuk, 2018; Jurgelaitis, Drungilas and Ceponiene, 2018; Cerqueiro and Harrison, 2019) as well as various benefits from an instructional design perspective. Specifically, the reviewed studies reported that the gamification approach can support flipped classroom and student-centered activities (Tsay, Kofinas and Luo, 2018), it can foster student participation and engagement in small classes (Mader and Bry, 2019) and it can satisfy the learning needs of diverse audiences, i.e. students of varying ability levels and

lifestyles, as it allows for a more autonomous and flexible learning experiences (Tsay, Kofinas and Luo, 2018).

Observations on Design Elements

A number of the reviewed studies discussed the impact of specific design elements on students' experience, whether positive or negative. The main findings of these are summarised below:

- *Audio Features:* Glowacki, Kriukova and Avshenyuk (2018), who explored the use of Kahoot to gamify an "English for Specific Purposes" course, found that the music and audio features of Kahoot, as well as the spirit of competitiveness, were particularly valued by students.
- *Badges:* Hensen, Koren and Klamma (2019) developed a gamified mixed reality[20] experience to support the learning process within the topic of 3D structures, which included badges, awarded for each quiz if all questions are answered correctly. According to the authors, students found the badges particularly motivating, as these encouraged them to complete the quizzes. For van Roy and Zaman's (2019) gamified experience on the Google+ platform, badges were also a motivating factor, but the authors observed that some students were repeatedly performing certain behaviours, for which they were already rewarded, to receive as many badges as possible.
- *Feedback:* In Felszeghy *et al.* (2019), students who participated in the gamified quiz competition using Kahoot felt that the timely feedback provided by the Kahoot platform helped discussions and supported peer learning. Welbers *et al.* (2019) who used Knowingo, a similar multiple-choice quiz app run on students' personal devices, focused on the use of feedback and uncovered interesting findings. The authors compared the effectiveness of different types of feedback provided as part of the gamified quiz, specifically: a) no feedback provided, b) generic feedback provided (i.e. the participant is anonymous), and c) personalised feedback provided (i.e. the participant is addressed by name, and shown their number of sessions played in the previous week). The study found that there was

[20] The merge of the real and virtual world, usually achieved with the use of virtual reality equipment.

no significant difference between the group who received no feedback, and the groups which received some type of feedback. Moreover, the study showed that generic feedback had more positive impact on student participation than personalised feedback. It is important, however, to note that the term "personalised feedback" in this case does not refer to any information that is of clear benefit to the student, e.g. comment on specific answers. This was a deliberate choice of the authors, and not the focus of this study.

- *Game Session Limit:* Welbers *et al.* (2019) explored the element of session limit, to avoid students' binge-playing, which could disturb the learning process. This was based on research that suggested that it is more effective to learn in short time intervals over several days (instead of a long session). The study findings suggested that including a daily session limit in such gamified apps can be a useful tool to promote distributed learning and prevent binge playing. On a similar note, Felszeghy *et al.* (2019), who explored the use of Kahoot in histology teaching, suggested that the learning may be more easily recalled, if students are quizzed frequently, but on smaller amounts of information.
- *Leaderboard:* The findings around the effectiveness of leaderboards appeared to be mixed. It was evident that some of the studies utilising leaderboards as one of their game design elements have reported overall beneficial outcomes (Jurgelaitis, Drungilas and Ceponiene, 2018; Tsay, Kofinas and Luo, 2018; Carlos Cuevas-Martinez *et al.*, 2019; Cerqueiro and Harrison, 2019; Hensen, Koren and Klamma, 2019; Jurgelaitis *et al.*, 2019). On the contrary, students who participated in the online gamified activities of the le Maire *et al.* (2018) study found the leaderboard as a negative aspect of the experience. As part of the online experience, the teaching assistant was assigning points to each participant based on their activity on the online platform, and displayed a rankings table with students' scores, which was seen negatively by some students. A similar finding is discussed in van Roy and Zaman (2019) who had developed a gamified experience on the Google+ social network platform, specifically designed to support satisfaction of the three psychological needs: autonomy, competence, and relatedness (Ryan and Deci, 2000). As part of the experience, students worked on group assignments and collected points, which were then displayed on a leaderboard showing points per group. While the competition and group rankings

were a motivating factor for many students, others felt that seeing their group's low rankings was diminishing their sense of competence. Similarly, some students participating in the Kahoot quizzes as part of Glowacki, Kriukova and Avshenyuk's (2018) study expressed nervousness when completing the quiz, derived from their fear of losing the competition.

- *Playing as a team***:** Felszeghy *et al.* (2019) found that students completing the Kahoot quizzes preferred team-based gaming to individual rounds. The students' self-assessment revealed that playing in a team made them feel more relaxed.

Challenges and Considerations with Gamification

The reviewed studies present various lessons learned from their integration of gamified learning experiences, referring to various facets of the experience, including considerations on specific design elements, technologies used, and aspects of instructional design. The main challenges and considerations with using gamification, based on the reviewed studies, are summarised below:

- *Adapting to Audience Needs:* The reviewed studies showed that several background variables can affect the effectiveness of a gamification experience, so it is imperative to adapt the experience to the specific learning situation and audience needs. In their study, van Roy and Zaman (2018) found that students' motivational levels over the course of the gamified course varied, as "effects of game elements are highly personal and can differ widely between different learners" (p293). The authors highlighted the need to explore new paths for personalised gamified experiences that take into consideration the students' individual differences. In a subsequent study, van Roy and Zaman (2019), pointed out that situational and cultural factors impacted the way students interpreted the various game elements of the learning experience. E.g. Several students could not keep up with the platform due to time demands (they prioritised their thesis and graded assignments), so it is important to adapt gamification to the specific needs of the target audience.
- *Cost of Equipment:* The reviewed studies did not engage in discussion around cost or source of funding of their gamified experiences, but it was evident, as discussed in a previous section, that educators and researchers tended to use

existing, readily available or low-cost technology solutions. Only one study, Hensen, Koren and Klamma (2019) used additional equipment to support their gamified mixed reality experience, which was designed to support the learning of 3D structures, and enhance student motivation and long-term memory. The experience made use of augmented reality technology (HoloLens and HTC Vive) through which students could view the 3D models and complete quests in the form of quizzes. While the experience was positively received by both student and lecturer participants, HoloLens was considered expensive and heavy. The authors commented that the technology was not yet suitable for private use, but it could perhaps be part of university courses as shared equipment.

- *Element of Challenge:* Results from Welbers *et al.* (2019) showed that students become demotivated when they perform above average on prolonged play. This could indicate that gamified systems should ideally record the history of a students' performance, and adapt the level of difficulty accordingly. The element of challenge was directly related to students' sense of competence (one of the three psychological needs of Self-Determination theory; Ryan and Deci, 2000) which occurred when successfully completing a task. For participants in van Roy and Zaman (2019), competence was highly valued – more so than the other two elements of Self-Determination theory, autonomy and relatedness.
- *Importance of Suitable Gamification Design*: van Roy and Zaman (2019) used Self-Determination theory (Ryan and Deci, 2000) to explore the impact of gamification on student motivation, focusing on whether the gamified experience satisfies the three basic psychological needs: autonomy, competence, relatedness. An important finding of the study was that game elements that can support satisfaction of a psychological need in one setting will not necessarily do the same in a different, non-game context. For example, while games playing as part of a team can create a sense of relatedness, in this study students were inhibited and cautious about how to word their feedback, to avoid conflict, protect their self-image and avoid embarrassing themselves in front of the teaching stuff. The authors cautioned designers to always keep in mind the three psychological needs as a whole, and consider how a game element which supports one need, may actually prevent another one. For example, in this study, the intervention used the element of group competition to satisfy the need for relatedness. However, some

students felt that when their team was at the bottom, this diminished their sense of competence.

- *Importance of Suitable Instructional Design:* With the term "instructional design" I refer to any other aspect of the learning experience that falls outside of the gamification design per se, e.g. student sitting arrangement in the classroom, the decision process of forming student groups for collaborative assignments etc. Specifically, in the case of Mader and Bry's study (2019), students' sitting position in the classroom played a significant role in the effectiveness of the experience. Mader and Bry (2019) conducted two social gamification experiments using personal response systems during lectures, in a small course and with a larger audience. While the approach was effective in a small class lecture, the large class lecture did not show willingness to cooperate or compete with other students. According to the authors, this could be attributed to the random assignment of teams, and the fact that they were not sitting close to each other. Similarly, in van Roy and Zaman (2019) random team assignment had a negative impact on some students' experience. Students who were teamed up with peers they were unfamiliar with expressed feelings of uncertainty about how they would be perceived by their team members, and as a result they were more cautious in how they expressed themselves on the online platform.
- *Role of the Instructor is Key:* This statement encompasses all other considerations discussed above, regarding the importance of instructional design and adapting to the target audience's needs. In addition to those essential tasks of the instructor, in some studies the instructor or teaching staff were heavily involved in supporting the gamification experiences. For example, in van Roy and Zaman (2019), the gamified experience included challenges, leaderboards and badges, which were all manually posted and monitored by the teaching staff. Such endeavours required significant time investment by educators, as also pointed out by le Maire *et al.* (2018) who, nevertheless, concludes that the investment is worthwhile.
- *Suitability of Learning Management Systems (LMSs):* Institutional LMSs appeared to be one of the readily available technologies that educators are using to deploy gamification experiences. However, it was evident from the findings of this systematic review that basic LMS functionality may not always support

gamification sufficiently. van Roy and Zaman (2018, 2019) implemented their gamified experience on the Google+ platform instead of their university's Blackboard (LMS), as they felt it did not support the implementation of gamification elements. The experience included weekly challenges, badges and group competition, and Google+ served as a platform for students to share content, ask questions and give feedback to each other. Similarly, the two studies by Jurgelaitis, Drungilas and Ceponiene (2018) and Jurgelaitis *et al. (*2019) who used Moodle LMS, installed two additional plugins[21] to support the gamified experience. This indicated that the basic Moodle functionality was not appropriately equipped to support gamification experiences. In contrast, Tsay, Kofinas and Luo (2018), who also implemented their gamified experience in Moodle, considered Moodle an appropriate platform for implementing gamification, not only because it allows the use of elements such as leaderboards, badges, but also it is likely a platform that students are familiar with from their university courses, and would therefore find it easy to use. Nevertheless, considering institutional LMSs are an existing technology available to educators who want to follow a gamified approach, the concerns discussed in the reviewed studies raise a question to be further explored with relevant stakeholders in the next phases of this study: Are existing university technologies appropriate to support gamification experiences? How can universities better prepare in terms of technology integration, to better support gamification learning experiences that meet the needs of students of the future?

Conclusions on Gamification

It is evident from the reviewed 2018-2019 European studies that educators and researchers, who follow the gamification approach, are largely guided by the same established guidelines for gamification experiences (Deterding *et al.*, 2011) and they integrate a combination of points and rewards systems, challenges, badges, and

[21] The plugins were Stash (https://moodle.org/plugins/block_stash) and LevelUp! (https://moodle.org/plugins/block_xp)

leaderboards. Moreover, educators and researchers tend to deploy gamification design elements utilising one the following:

- *Freely available social network sites* (van Roy and Zaman, 2018, 2019).
- *Low-cost readily available educational technologies,* such as Personal Response Systems (PRSs), e.g. Kahoot[22] and Socrative[23], which allow for participants to respond to questions posed during learning sessions by clicking or entering text on their mobile phones or tablet devices (Glowacki, Kriukova and Avshenyuk, 2018; Cerqueiro and Harrison, 2019; Mader and Bry, 2019; Welbers *et al.*, 2019).
- *Existing technologies,* such as institutional Learning Management Systems (Jurgelaitis, Drungilas and Ceponiene, 2018; le Maire *et al.*, 2018; Tsay, Kofinas and Luo, 2018; Carlos Cuevas-Martinez *et al.*, 2019; Jurgelaitis *et al.*, 2019; Ortiz-Rojas, Chiluiza and Valcke, 2019). As discussed earlier, on some occasions these systems were deemed as not suitable or fully equipped for supporting gamification (Jurgelaitis, Drungilas and Ceponiene, 2018; van Roy and Zaman, 2018, 2019; Jurgelaitis *et al.*, 2019). This raises the question on how institutions may need to better prepare for future integrations of gamified learning in higher education.

Overall, findings from gamification studies in higher education reported largely positive results, particularly in terms of student engagement and motivation, with a few studies reporting neutral or mixed outcomes (Christopoulos, Conrad and Shukla, 2018; van Roy and Zaman, 2018, 2019, 2019; Brom *et al.*, 2019; Mader and Bry, 2019). The studies appeared to be highlighting the role of designers and instructors in designing and implementing the experience carefully, ideally adapting it to the specific learning context and audience needs.

4.4 Conclusion

The Systematic Trend Review revealed that in the last decade there has been growing research interest in gamified and game-based learning as pedagogical approaches in

[22] https://kahoot.com/

[23] https://www.socrative.com/

higher education. However, with no formal framework or policies to streamline the adoption of these approaches, gamified and game-based learning experiences take place across the globe in a non-mainstreamed manner, and are typically possible due to the efforts of dedicated instructors or institutions, who assume the responsibility of incorporating these into their course curriculum. In the last decade, these experiences appear to be integrated in a variety of subject areas, ranging from science subjects to language learning, with the majority of game-based learning studies being conducted in Business Management and Marketing (Vlachopoulos and Makri, 2017), and the majority of gamification studies being conducted within the topic of computing (Subhash and Cudney, 2018).

Game-based learning experiences are typically deployed using computers and the web, and fall within a variety of genres and styles, including simulation-style games, strategy games, action-adventure games and digital board games. On the other hand, gamification experiences tend to integrate a combination of points and rewards systems, challenges, badges, and leaderboards, on easily accessible, affordable or existing technologies, such as institutional Learning Management Systems and students' personal devices. The outcomes from the integration of gamified and game-based learning experiences in higher education in the last decade were largely positive.

The game-based learning approach appears to be well-received by students, with students finding GBL interventions a positive and enjoyable experience. The findings show that GBL enhances motivation and student engagement, and can lead to enhanced student performance, including knowledge acquisition and enhanced understanding. GBL was also shown to have behavioural outcomes, such as increased soft skills and collaboration skills. The elements of fun and enjoyment appear to be key in supporting students' immersion in the game, so they become essential factors in educational game development. Game-based learning has also been proved to benefit the instructional design and teaching process for higher education instructors. Games can be useful in reducing time spent teaching difficult subjects, they allow for practical application of concepts, they make teaching easier and more dynamic, and can increase the instructors' own enthusiasm with the topic and with the learning process. Gamified and game-based learning is complementary to traditional teaching methods and not a replacement. These experiences take a supporting role in the learning experience, complementing other, more

traditional, methods. In fact, the findings suggest that the presence of the instructor is needed for effective game-based or gamification interventions. The instructors' role is key in to supporting students while engaging with the games, preventing technical problems, collaboration or other issues, and promoting reflection by debriefing after gameplay.

Gamification was found to increase student motivation, engagement with the learning topic and materials, and enjoyment. It can also lead to increased performance, increased perceived learning, self-efficacy and sense of self-achievement. In cases where there was no significant impact on learning outcomes or student performance, students still showed positive attitude towards gamification and found the gamified activities engaging. The gamification approach was found to also benefit the instructional design process. Gamification was found to support flipped classroom and student-centered activities, it can foster student participation in small classes, and it can satisfy the learning needs of diverse audiences, i.e. students of varying ability levels and lifestyles, as it allows for a more autonomous and flexible learning experiences. The findings around the effectiveness of competitive elements, such as leaderboards appeared to be mixed. Many studies incorporate leaderboards with positive outcomes; however, these can be seen negatively by some students. Some studies reported students feeling fear of losing the competition or feeling that their sense of competence diminished when their group was in the lower rankings of the leaderboard. Instructors are also advised to design any collaborative elements carefully. Studies showed that students who were teamed up with unfamiliar peers or were randomly assigned to peers who were not seated near them in large lecture halls, had a negative impact on the students' experience. The findings also showed that students can become demotivated when they perform above average for prolonged periods of time, which has a design implication. Gamified systems should ideally record the history of a students' performance and adapt the level of difficulty accordingly.

A main consideration with these approaches appears to be the absence of a "recipe for success". The effectiveness of these experiences appears to be dependent on a wide range of background and situational variables, such as the specific learning context, as well as the target audience, with its cultural diversity and its specific learning needs. Gamified and game-based learning experiences must always be tailored to meet the needs of the

target audience in question and the specific learning context. Some things to consider include the students' cultural background, their individual differences and their existing competence or knowledge on the subject. Students' cultural background can impact their perception and acceptance of educational games. Students who have been previously exposed to experiential learning approaches tend to value games better and in turn benefit more from them. This raises a consideration for institutions in parts of the world which may have note previously adopted innovative pedagogical models. Other considerations include technical concerns, such as the availability of reliable internet connection, hardware constraints and the suitability of existing Learning Management Systems in support gamification elements. Finally, the findings suggest that institutions are not currently incentivising nor motivating faculty staff to invest their time in researching and using the gamified and game-based learning approaches. With educators' general lack of knowledge of serious games, and lack of information on games that would be appropriate for their disciplinary area, adopting these approaches in a standardised manner becomes difficult.

The findings from this systematic review were further used to articulate a vignette of the present, which served as a stepping stone to phase two of this research study. Academic and technical experts critiqued the vignette of the present, as a possible future, generated alternate and desired futures, and considered the implications of these futures for present practice, vis-à-vis the integration of game-based and gamified learning within higher education.

Chapter Five – Phase Two: Delphi Survey

5.1 Introduction

The second phase of the research included a two-round hybrid Delphi survey with an expert panel of academics from various backgrounds, and industry experts in gamification, game-based learning, game design, and technology-enabled learning settings. The purpose of this phase was to critique the current state of higher education, particularly in relation to the use of gamified learning (GL) and game-based learning (GBL), consider current trends that can alter the direction of these approaches, reflect on barriers to change for the future, and explore multiple futures possibilities for higher education 10-15 years from today. This chapter presents the results of the thematic data analysis of the two rounds of the Delphi survey. Delphi round one is covered first, starting with an overview of the survey and its aim, followed by a description of survey results and how these were used to shape the second round. Subsequently, an overview of Delphi round two is presented, followed by the survey results.

5.2 Delphi Survey Round One: Overview

The first round of the Delphi survey aimed to capture participants' views on the current state of higher education, particularly in regard to the use of digital GL and GBL, and imagine futures possibilities. The survey opened with a series of multiple-choice questions to capture basic demographic information, such as age, industry of work, field of expertise, and years of experience. Participants were then asked a series of 10 open-ended questions aimed to solicit their views and collect initial factors for further discussion in the second round of the survey. The results of the total of 25 responses is presented below.

5.2.1 Level of understanding of survey terminology

At the start of the survey, participants were asked to share how they define GL and GBL. The aim was to establish the participants' prior/current level of understanding around these pedagogical approaches. Based on the open-ended responses, it was established that the majority of participants had a good level of understanding around these

approaches and the rationale for their use in educational settings. As subset of respondents (9), demonstrated a basic understanding of the terms as pedagogical approaches which use game-based techniques for learning purposes, but were not able to clearly highlight the difference between the two distinct approaches, either due to lack of in-depth knowledge around the approaches or due to providing a very short response to the open-ended question, which did not include clarifying details.

5.2.2 Vignette of the present – The projected future

Participants were then presented with an eight-minute video summary[24] of the findings from the systematic trend review, which took place in phase one of the research. The video, which was developed in the animated video creation platform Vyond[25], first clarified the terminology of GL and GBL, and then presented the process of the trend review and the main findings, including a vignette of the current state of GL and GBL in higher education. The vignette presented how digital GL and GBL has been used in higher education to date, and summarised the main outcomes of these interventions, including benefits and challenges.

5.2.3 Critique of the Present

Participants were first asked to critique the vignette of the present by identifying any digital GL or GBL trends today (both in higher education or industry practice) that they felt were missing from the video. Overall, the video was well-received as a comprehensive summary of the current state, in essence confirming the vignette of the present as a projected future, i.e. the most probable future expected if current trends and factors remain exactly the same (Voros, 2017). However participants listed some emerging technologies and practices that they deemed will play an important role in how GL and GBL will be shaped in the future. These include Augmented and Virtual Reality (AR/VR) technologies, the Metaverse, Artificial Intelligence (AI), the use of learning analytics for patterns of teaching-learning interactions, escape rooms, educational hackathons, and approaches used in teacher-education training, such as the use of Minecraft and Lego for science education and problem-solving skills development.

[24] Available here: https://youtu.be/xI5vXZJpHYU?si=HM1H8u_WaNjeZp4v
[25] https://www.vyond.com/

Continuing with the critique of the present, in the follow-up open-ended question participants were asked to identify any current technology innovations that may significantly alter the direction of GL and GBL learning in higher education. Based on the responses, these innovations include: a) AR and VR, particularly as they increasingly become lower-cost, more accessible and comfortable to use; b) Artificial Intelligence for personalised learning experiences; c) Metaverse, e.g. for immersive experiences and creation of artifacts; d) open source platforms and open access games, which can help drive down the cost of game development, and raise awareness around GL and GBL; e) eye-tracking; and d) advancements in accessibility and neurodiversity-enabled technologies.

Participants were also asked to identify any current socio-political, environmental, economic or other factors that could alter the direction of GL and GBL integration in higher education. Participants highlighted several factors that they felt can impact the direction of GL and GBL negatively or positively. In terms of factors that can *negatively* impact the adoption of GL and GBL include: a) issues of inequity of learner access to technology; b) climate change; and c) a potential push for "unplugged" outdoor learning, as a result of the recent pandemic. In terms of factors that can *positively* impact the adoption of GL and GBL, participants identified the following factors: a) the increasing adoption of hybrid learning particularly as a result of the recent pandemic; b) the increased familiarity of young people with technology and digital tools; and c) the increased availability and quality of tools and technology (e.g. resources, online tools, better networking speeds etc.).

Another outcome of the first round of the Delphi survey, which emerged through the questioning of futures possibilities and potential challenges from the integration of digital technologies and GL/GBL approaches in higher education, was the consideration of barriers that can potentially hinder the widespread integration of GL and GBL in higher education in the next 10-15 years. Indeed, the respondents identified a number of potential barriers that exist in the present and can impact the future, such as: a) the high costs associated with integrating GL/GBL approaches (e.g. equipment, upskilling staff, high speed internet and data security costs); b) the environmental impact of the approaches (e.g. energy usage, resource consumption for device development etc.); c) the inequity of student access to technologies (i.e. high-speed internet, devices,

equipment); d) the lack of institutional policies supporting GL/GBL approaches, and indeed the overall institutional resistance to change and innovation; e) the low-level of staff interest and indeed the insufficient staff training on how to effectively use GL and GBL pedagogies in their practice; f) concerns around the data privacy on GL and GBL systems and the lack of ethical code of conduct for AI in GBL; g) concerns over students' physical and mental health in GL and GBL contexts (e.g. screen time, cyberbullying, online safety); h) the lack of sufficient evidence-based examples of how to effectively use GL and GBL approaches; and finally i) the possible re-focus on non-digital modes learning as a result of the recent pandemic.

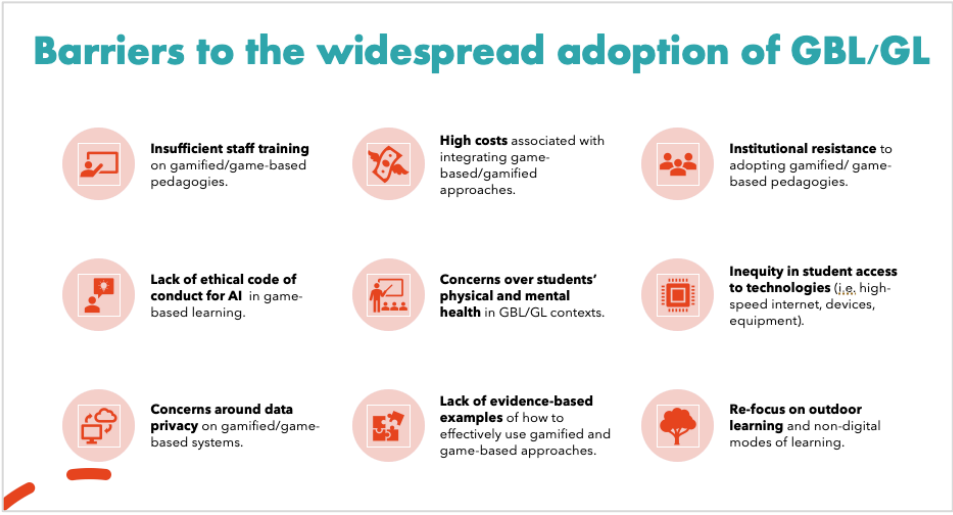


Figure 5.1 – A visual summary of the barriers to the widespread adoption of GBL/GL in higher education, based on the Delphi survey responses.

5.2.4 Envisioning futures possibilities for higher education

As part of the first Delphi round, participants were also asked to imagine higher education in 10-15 years in the future and describe their visions. The question was left intentionally "open", in order to first capture the panel's vision about the overall landscape of higher education. The adoption of digital technologies and GL and GBL approaches, in particular, were explored with follow-up open-ended questions.

Participants articulated various futures possibilities for higher education 10-15 years into the future. In terms of the overall higher education landscape and teaching and learning practices within it, participants envisioned that: a) higher education provision will be via

blended modes of learning, which will include both online and face-to-face learning; b) micro-credentials (certified short courses) will be more widely adopted as part of degree pathways and recognised for entry to university; c) programmes of study will equip graduates to address global challenges (e.g. climate change); d) higher education will be more vocationally oriented, connecting learning with industry, and programmes of study will integrate mandatory placements in real-world contexts; e) team-teaching of modules will become more widespread, as opposed to the current one teacher per module model; f) higher education learning will be more personalised to the students' needs; g) higher education will focus on pedagogical approaches that support the sustainable development goals, deep learning and understanding; h) there will be fewer physical university structures, making higher education more accessible without geographical limitations; and i) higher education will be less centralised and learners will gain qualifications from more diverse institutions.

Two participants also articulated some undesirable visions for higher education. In the first vision, in 10-15 years reading and writing will have been banned. Universities will be giant dystopian academies "that seek to improve all aspects of a human mind and soul through complex gamified experiences - these will include dancing that is monitored by high professors" (P9). In the second vision, P13 imagined a higher education sector which will be market driven, i.e. it will move away from fostering deep learning and understanding, and instead it will focus on mini-awards, online education, and the development of transferable skills.

Technology featured in all of the visions for higher education outlined by the 25 respondents. Specifically around technology, participants envisioned the following futures possibilities: a) VR, AR and Mixed Reality (MR) technologies will be more widely adopted for teaching and learning; b) virtual auxiliary avatars (e.g. chatbot simulators) will be integrated within programmes of study as supporting agents; and c) the Metaverse will be more widely adopted within programmes of study; d) AI will play a major role in content delivery; and e) digital approaches (including GL/GBL experiences) will be blended with outdoor/place-based education.

When it comes to the adoption of digital GL and GBL learning, all participants agreed that these approaches will indeed feature in higher education in 10-15 years, in a variety of ways, e.g. providing assistive support to students, combined with micro-credentials,

combined with AI for assessment of student skills, or used to support engagement with global challenges. Some described their preferred futures visions, where a) GL/GBL is fully integrated within entire curricula; b) students are participating in real-time gaming activities within virtual worlds, personalised to their individual needs with the support of AI; c) GL/GBL will support group problem solving of global issues; and d) games will have real-world outcomes, i.e. students' skills and capabilities will be represented in metrics (e.g. badges, points) which will have real-world applicability, i.e. they can be used to find jobs. Despite all participants noting that GL and GBL integration in higher education programmes in 10-15 years is expected, some added that, realistically, their use will not be widespread across all institutions.

As part of the survey responses, some participants also proactively identified factors that can support the effective future integration of GL and GBL in higher education, and opportunities for the use of these approaches – an action that indicates their positive disposition toward proactively shaping and enabling preferable futures through actions.

Specifically, the following opportunities for GL and GBL were identified by the participants, some of which can be considered as factors which ensure any future integrations of GL and GBL are effective: a) the co-development of gamified learning experiences by educators and learning designers; b) the integration of outdoor learning within digital gamified learning experiences, to counter sedentary lifestyles and ensure there are human-connection touchpoints as part of the learning experience; c) the integration of digital gamified learning experiences involving collaborative problem-solving of real world challenges; d) the use of AI to personalise gamified learning experiences; e) the use of gamification and digital games as a means of assessment, and a way to scaffold the learning process; and f) the use of gamified points and levels in the micro-credentials process.

5.2.5 Moving towards the Delphi Round Two

The survey responses from round one serves as a good basis for further exploration of the future of GL and GBL in higher education. The open-ended questions were an appropriate format for an initial touchpoint with the expert-panel participants, as a means

of soliciting their initial views on the topic. The first round of responses provided sufficient material for a deeper dive into the topic in round two.

It was not expected nor actively encouraged as part of round one to capture a common vision for higher education – in fact, a plurality of futures visions was expected, some of which would be probable futures based on the respondents' current knowledge and experience, and others desirable visions based on the respondents' personal preferences. While reaching consensus on a common future vision was not an aim of the Delphi survey, for the purposes of examining the future systematically, it was decided to explore whether there was common line of thought amongst the participants with a subsequent round. As evident in the relevant literature, most Delphi survey studies include at least two rounds of questionnaire, with the second round including a summary of responses from the first round, for the respondents to reflect on and to critique (indicatively: Hayes, 2007; Rieckmann, 2012).

As a result of the analysis of the round one responses, a list of current trends, factors that support the adoption of GL/GBL, and barriers to change was compiled, along with a wide-range of futures possibilities for higher education 10-15 from today. These were presented in round two for further critique, to assess their likelihood, desirability or importance for shaping the future. In addition, two short visions were developed as a summary of all participants' responses, to highlight the two main possibilities for GL and GBL in higher education 10-15 years in the future: a) GL and GBL will be widespread in higher education 10-15 years; or b) GL and GBL will *not* widespread in higher education 10-15 years. These were presented to the Delphi participants in round two, giving them the opportunity express their agreement or disagreement with one or more of the statements, make any important additions, or add an alternative vision. The two summary-visions are presented below:

- *Vision A: GL and GBL are widespread in higher education 10-15 years from now:* Digital gamified and game-based learning approaches become mainstream in higher education in the next 10-15 years. Supported by the increased use of various technologies and multimedia, gamified and game-based learning experiences are now fully integrated within the higher education pedagogies. The developments particularly within the Mixed-Augmented-Virtual Reality space and the Metaverse support the implementation of immersive gamified and game-

based virtual learning environments for increased engagement, action learning and assessment purposes. In addition, Artificial Intelligence is used extensively to tailor and personalise these learning experiences to learners' individual needs and preferences.

- *Vision B. GL and GBL are not widespread in higher education 10-15 years from now:* Digital gamified and game-based learning approaches are not universally adopted in higher education in 10-15 years. These approaches are predominantly used within fully online programmes only by academics interested in technology-enabled learning. Furthermore, the integration of gamified and game-based innovations typically happens at a module level rather than at a programme level, so their integration is not considered holistically within undergraduate programmes of study.

Further details on the second round of the Delphi survey, including the results of the thematic data analysis are presented in the following section.

5.3 Delphi Survey Round Two: Overview

The second round of the Delphi survey included a total of five questions. Participants were asked to rate (on a 5-point scale) and/or comment on various statements in relation to the future of gamified and game-based approaches in higher education, 10-15 years from today. The statements were developed based on the expert panel's responses in the previous survey round, as discussed above. The second round captured a total of 27 responses, with 25 respondents answering all questions, including the open-ended ones, and the remaining 2 responding only to the Likert scale questions. In terms of participation, 12 out of 27 respondents had previously completed the first round of the survey. The remaining 15 were new respondents representing the relevant academic or industry fields of Education, GL/GBL, technology-enabled learning, game design etc. This section of the chapter includes the results of the second survey round, which are presented per question.

5.3.1 Likelihood of futures possibilities

Question one included a total of 12 statements, each of which presented a future possibility for higher education. Participants were asked to rate the likelihood of each of those possibilities materialising in 10-15 years' time, on a 5-point scale: Very unlikely; Somewhat unlikely; Neither likely nor unlikely; Somewhat likely; and Very likely.

The expert panel's opinions around future possibilities varied greatly. No statement was considered likely by the totality of the expert panel; for each statement we observe uncertainty, to some extent, in terms of likelihood. While the Delphi tool has been traditionally used to gain group consensus on a topic (Okoli and Pawlowski, 2004), in this case the wide-range of opinions and the uncertainty on future possibilities is also telling and useful to frame the conversation with the expert-panel in the next phase of the study, i.e. the futures workshops.

Reaching consensus in the traditional sense was certainly not the aim of this second survey round, however it is still useful to understand whether there was a common line of thought between the expert panel on the discussed topic. Following the guidance in Barrios *et al.*, (2021) we consider as consensus the instances where we observed at least 75% agreement amongst the respondents. This type of agreement was observed in the following three statements, where over 75% of the respondents rated the statement as likely to some extent:

The majority of experts (24), i.e. 88.88% find that it is likely to some extent that the majority of education provision will be via blended modes of learning, which include both online and face-to-face learning, with 12 finding this very likely and 12 somewhat likely. From the remaining respondents, 2 remain neutral (neither likely nor unlikely) and 1 finds this somewhat unlikely. No participant found this statement very unlikely.

In relation to the role of micro-credentials (certified short courses), a total of 21 out of 27 respondents (77.77%) find it likely to some extent that these will be widely recognised for entry to university. Specifically, 10 find this very likely and 11 somewhat likely. From the remaining responses, 1 remains neutral (neither likely nor unlikely), 4 find this somewhat unlikely and 1 very unlikely.

When it comes to the role of Virtual Reality, Augmented Reality and/or Mixed Reality, a total of 21 out of 27 respondents (77.77%) find it likely to some extent that these technologies will be widely adopted for teaching and learning. Specifically, 11 respondents find it somewhat likely and 10 find it very likely. One respondent finds this neither likely nor unlikely, 3 find it somewhat unlikely, and 2 find it very unlikely.

For the remaining of the statements, opinions vary, confirming that there is not a singular probable future amongst the panel of respondents, but rather a series of possibilities that could lead to various alternative futures. The breakdown of responses is provided below.

The expert panel showed uncertainty about the possibility of outdoor education being widely adopted in programmes of study in higher education. Specifically, 10 respondents found this possibility neither likely nor unlikely, 6 found this somewhat unlikely, and 5 very unlikely. Only 6 respondents found this statement likely to some extent, with 5 finding this very likely, and 8 somewhat likely.

In relation to delivery of learning, a total of 13 respondents (48.14%) agreed that is somewhat unlikely (7) or very unlikely (6) that the majority of education provision will be via remote modes of learning, with no requirement for physical presence of students on campus. Only 8 (29.62%) found this possibility likely to some extent, with 1 responding that this is very likely, and 7 that it is somewhat likely. The remaining 6 found this neither likely nor unlikely. It is evident that while remote modes of learning were widely utilised as a result of COVID-19, part of the expert panel continues to find students' physical presence on campus as a likely requirement in the universities of the future.

Commenting on the possibility that all programmes of study will equip graduates to address global challenges (e.g. climate change), a total of 13 respondents (48.14%) found this statement likely to some extent, with 5 finding this very likely, and 8 somewhat likely. The remaining experts (14) were uncertain of this future possibility materialising, with 5 responding that it is neither likely nor unlikely, 6 finding this somewhat unlikely, and 3 very unlikely.

A total of 17 experts (62.96%) found it likely, to some extent, that the majority of study programmes will integrate mandatory placements in real world settings. Specifically, 6

found this very likely, 11 found this somewhat likely, 5 found this neither likely nor unlikely, 3 found this somewhat unlikely, and 2 found this very unlikely to materialise.

In relation to the possibility of modules being taught by a team of educators, as opposed to one teacher teaching one module, a total of 12 experts (44.44%) found this a likely possibility to some extent. Specifically, 3 found this very likely, 9 found this somewhat likely, 7 found this neither likely nor unlikely, 5 found this somewhat unlikely, and 3 found this very unlikely to materialise.

Commenting on the possibility of gamification being used more than game-based learning in programmes of study, a total of 16 experts (59.25%) found this likely to some extent, with 3 finding this very likely, and 13 somewhat likely. Even though no respondents find this possibility unlikely, a total of 11 remained neutral, by responding that this is neither likely nor unlikely.

A total of 16 experts (59.25%) found it likely to some extent that virtual auxiliary avatars (e.g. chatbot simulators) will be widely integrated within programmes of study. Specifically, 5 found this very likely and 11 somewhat likely. From the remaining respondents, 4 found this neither likely nor unlikely, 5 found this somewhat unlikely, and 2 very unlikely.

In relation to the possibility of the Metaverse being widely used in programmes of study, the expert panel showed uncertainty. Only 8 respondents (29.62%) found this a likely possibility to some extent, with 1 finding this very likely, and 7 somewhat likely. From the remaining respondents, 8 remained neutral (neither likely nor unlikely), 6 found this somewhat unlikely and 5 found this very unlikely. The uncertainty around the Metaverse is also echoed in participants' open-ended responses throughout the survey (details of these responses will be presented later on in this chapter).

In terms of whether digital games will be widely adopted within programmes of study, a total of 16 respondents, i.e. 59.25% found this likely to some extent, with 4 responding that this is very likely, and 12 somewhat likely. From the remaining respondents, 7 found this neither likely nor unlikely, and 4 found this somewhat unlikely. No panel member found this very unlikely.

Overall, it is evident from these results that the probable future looks different for everyone, but the expert panel responses show agreement on the likely possibility of a higher education which provides the majority of programmes via blended modes of learning, i.e. both online and face-to-face learning. It is also expected that micro-credentials (certified short courses) will also gain acceptance and will be widely recognised for entry to university. Finally, the expert panel shows agreement around the use of Virtual Reality, Augmented Reality and/or Mixed Reality technologies, which will be widely adopted for teaching and learning.

5.3.2 Importance of factors for effective integration of GL and GBL

Question two included 10 statements, which described different approaches in designing and implementing gamified and game-based learning experiences in higher education. Participants were asked to rate each statement in terms of how important they considered it to be in ensuring gamified and/or game-based learning would integrated effectively in higher education programmes in 10-15 years. The 5-point scale included the following options: Not at all important; Slightly important; Moderately important; Very important; and Extremely important.

In this case, we observed a common line of thought amongst the panel in instances where the totality of the respondents found a statement important to some extent, and no panel member chose the option 'Not at all important'. This type of consensus was observed in four statements, where all members of the expert panel (100%) agreed, to some extent, on the importance of the following approaches in ensuring gamified and/or game-based learning is integrated effectively in higher education programmes in 10-15 years:

- The integration of digital gamified learning experiences involving collaborative problem-solving of real-world challenges, was deemed important. From the expert panel, 16 found this 'extremely important', 9 found this 'very important', 2 'moderately important' and 1 'slightly important'. As the majority of respondents (25), i.e. 92.59%, considered this either extremely or very important, we observe strong panel agreement on this statement.

- The co-development of gamified learning experiences by educators and learning designers, was also rated as highly important. From the expert panel, 12 found this 'very important', 11 found this 'extremely important', 2 found this ‘moderately important’ and 3 ‘slightly important’. As the majority of respondents (23), i.e. 85.18%, considered this either extremely or very important, we observe strong panel agreement on this statement.
- Another factor that was deemed highly important, was the integration of gamified experiences that enhance the personal agency of learners. From the expert panel, 12 found this ‘extremely important', 11 found this very important', 3 ‘moderately important’ and 2 ‘slightly important’. As the majority of experts (23), i.e. 85.18%, considered this either extremely or very important, we observe strong panel agreement on this statement.
- Finally, the integration of gamification as a means to scaffold the learning process was deemed important. From the expert panel, 10 found this 'extremely important', 9 found this 'very important', 8 found this moderately important, and 1 only slightly important. Given the total of 19 experts, i.e. 70.37% considered this factor either extremely or very important, we can conclude that there is panel agreement on this statement.

For the rest of the statements, we observed a variety of opinions, with a small percentage of the expert panel finding the below factors as not at all important in ensuring gamified and/or game-based learning is integrated effectively in higher education programmes in 10-15 years.

The integration of outdoor learning within digital gamified learning experiences.	92,59% of respondents find this important to some extent. Specifically, 4 find this extremely important, 9 very important, 6 moderately important, 6 slightly important, and 2 not at all important.
The awarding of game-based points and levels to micro-credentials (certified short courses).	92,59% find this important to some extent. The majority of responses, 9 in total, i.e. 33.33% of all respondents, find this factor as 'Moderately important'. A total of 3 find this extremely important, 6 find this very important, 7 find this slightly important, and 2 not at all important.
The use of Artificial Intelligence to personalise gamified learning experiences.	92,59% find this important to some extent. The majority of responses, 9 in total, i.e. 33.33% of all respondents find this factor as 'Extremely important'. A total of 8 find this very important, 6 find this

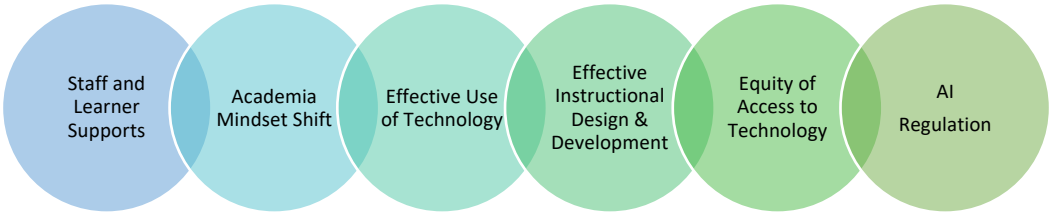
	moderately important, 2 find this slightly important, and 2 not at all important.
e integration of gamification as a means of essment.	96,29% find this important to some extent. Specifically, a total of 5 find this extremely important, 8 find this very important, 8 find this moderately important, 5 find this slightly important, and 1 not at all important.
e integration of gamification for online-blended ivery.	96,29% find this important to some extent. Specifically, a total of 10 find this extremely important, 8 find this very important, 6 find this moderately important, 2 find this slightly important, and 1 not at all important.
e use of game-based learning (digital games) as neans of assessment.	88,88% find this important to some extent. Specifically, a total of 9 find this extremely important, 9 find this very important, 4 find this moderately important, 2 find this slightly important, and 3 not at all important.

Overall, it is evident from the ratings that all of the above-mentioned statements are considered important factors by the majority of the expert panel. As observed, four factors were considered as important (to some extent) by the totality of the expert panel in ensuring gamified and/or game-based learning will integrated effectively in higher education programmes in 10-15 years. These factors are:

- The integration of digital gamified learning experiences involving collaborative problem-solving of real world challenges.
- The co-development of gamified learning experiences by educators and learning designers.
- The integration of gamified experiences that enhance the personal agency of learners.
- The integration of gamification as a means to scaffold the learning process.

5.3.3 Importance of factors for effective integration of GL and GBL (open-ended)

The follow-up open-ended question asked participants to note any other factor(s) or approach(es) that they considered important to ensure gamified and/or game-based learning is integrated effectively in higher education programmes in 10-15 years. From the total of 25 responses, the proposed factors are grouped below in six categories:



The specifics of each of these categories are presented below, along with a selection of anonymised participant quotes.

Staff and Learner Supports

This includes a wide-range of supports for academic staff and learners. Specifically, participants highlighted the need for staff training programmes to address awareness and professional development, as well as learner supports to ensure digital and data literacy, both for educators and learners. Other key factors identified were the availability of GL/GBL content, as opposed to educators developing content from scratch; and the availability of financial and technological resources within higher education, to enable the development of games "that have a comparable graphic design and technical standard as many online games of the private sector have"(P22). Finally, from a US perspective, union support of these approaches was deemed an important factor.

Academia Mindset Shift

This includes the view that academic leadership and staff buy-in is essential to the effective integration of GL and GBL. Indeed institutional resistance to change and innovation and change featured heavily in the both rounds of the survey as a barrier to the integration of GL and GBL in higher education. Participants commented: "There needs to be buy in for staff […] for it to be effectively integrated it will take a lot of mind shift change" (P14); and "Educational leaders need to see the benefits of gamification in order to pursue it" (P2). Other factors that could support the effective integration of GL/GBL includes "re-framing teaching as (learning) experience design" (P24), a factor that, again, would require significant mind-set shift from academic staff and decision-makers.

Effective Use of Technology

This category includes the expert panel's views around the types of technology and types of digital learning experiences that should be implemented, to ensure GL and GBL is integrated effectively. This includes the wider adoption of MR, AR and VR into programmes of study, e.g. for VR hackathons or to support virtual student travel in time and space. On the topic of VR, a participant highlighted the need to incorporate self-care and VR mindfulness in learning experiences which utilise VR. The use of AI and learning analytics was also deemed important and supportive of GL and GBL, particularly as a way of personalising the GL/GBL experiences. Finally, participants highlighted the need for technologies to be efficient and reliable, e.g. to support interoperability with Learning Management Systems, and also technology foundations to be solid, i.e. networks, systems, devices and learning platforms "all need to work 100% to advance more complex technologies" (P18).

Effective Instructional Design and Development

This includes the expert panel's views around instructional design and various approaches of learning experience development, to ensure GL and GBL is integrated effectively. A factor that was highlighted as important was the need for more evidence-based research that demonstrates the effectiveness of these approaches. Participants also highlighted the need for curricula to be updated for relevance and inclusion of technology, and some commented that GL/GBL should be fully integrated into the curriculum. Other recommendations include: a) student and university collaborations, e.g. in laboratories where students "can bring their ideas to life and collaborate" (P21), or through digital exchanges with other universities; b) the co-design and implementation of GL/GBL experiences between educators, students and designers; c) the adoption of human-focused design, putting the needs of the learners at the heart of the design; d) a focus on higher order skills "and not just lower order knowledge based activities" (P14); and e) an awareness of where it is meaningful and necessary to use digital GBL approaches, and where non-digital approaches would be more effective. As a participant put it: "I think that it is important for education to hold spaces that are beyond/away from digital technology" (P17).

Equity of Access to Technology

This category includes a potential barrier, which according to participant views must be addressed to ensure effective integration of gamified and game-based learning approaches in higher education. This barrier was also highlighted in the first Delphi round, and it relates to the inequity of access to technology, which remains a barrier for many students, "particularly those from low income families" (P7).

AI Regulation

The final category highlights the need for regulation of Artificial Intelligence (AI), to support the responsible use of AI in teaching and learning. Participants highlighted that serious regulation of AI, as well as AI explicability[26] are key factors for the development of effective and responsible GL and GBL activities.

As an overall observation, many of the above-mentioned factors correspond to the barriers for effective integration of GL and GBL, particularly around the perceived lack of staff support and current academic mindset or status quo. The following survey question addressed these barriers in further detail.

5.3.4 Importance of barriers to the adoption of GL and GBL

Question four included 12 factors that can potentially hinder the widespread adoption of GL and GBL in higher education. Participants were asked to rate each factor in terms of how important of a barrier they considered it to be to the widespread adoption of GL and GBL in higher education in 10-15 years.

We observed a common line of thought amongst the panel in instances where the totality of the respondents found a factor important to some extent, and no panel member chose the option "Not at all important". This type of consensus was observed in five statements, where all members of the expert panel (100%) agreed, to some extent, on the importance of the following barriers:

[26] Floridi *et al.*, (2018) discuss the principle of explicability, as part of an ethical framework for AI: "for AI to promote and not constrain human autonomy, our 'decision about who should decide' must be informed by knowledge of how AI would act instead of us" (p700).

Insufficient staff training on gamified/ game-based pedagogies.	From the expert panel, 15 find this 'extremely important', 9 find this 'very important', 2 'moderately important' and 1 'slightly important'. As the majority of respondents (24), i.e. 88.88%, consider this either extremely or very important, we observe strong panel agreement on this statement.
High costs associated with integrating game-based/gamified approaches (e.g. equipment, upskilling staff, high speed internet and data security costs).	From the expert panel, 12 find this 'extremely important', 10 find this 'very important', 4 'moderately important' and 1 'slightly important'. As the majority of respondents (22), i.e. 81.48%, consider this either extremely or very important, we observe strong panel agreement on this statement.
Institutional resistance to adopting gamified/ game-based pedagogies.	From the expert panel, 10 find this 'extremely important', 11 find this 'very important', 4 'moderately important' and 2 'slightly important'. As the majority of respondents (21), i.e. 77.77%, consider this either extremely or very important, we observe strong panel agreement on this statement.
Lack of ethical code of conduct for Artificial Intelligence in game-based learning.	From the expert panel, 17 find this 'extremely important', 2 find this 'very important', 3 'moderately important' and 5 'slightly important'. As the majority of respondents (24), i.e. 70.37%, consider this either extremely or very important, we observe strong panel agreement on this statement. It is also worth noting that this is one of two statements were we observed the highest number of 'extremely important' responses (17) .
Concerns over students physical and mental health in games-based/ gamified learning contexts (e.g. screen time, cyberbullying, online safety).	From the expert panel, 8 find this 'extremely important', 5 find this 'very important', 9 'moderately important' and 5 'slightly important'.

The above are aligned to some extent with the responses received in the aforementioned question three, where the expert panel expressed their views on factors that can support the effective integration of gamified and game-based learning approaches in higher education. Notably, participants had highlighted the need for academic staff training and mindset shift, AI regulation, and need for game development resources.

For the rest of the question four statements, we observed a variety of opinions, with a small percentage of the expert panel finding the below factors as not at all important as barriers that can potentially hinder the widespread adoption of gamified and/or game-based learning in higher education in 10-15 years.

In terms of the issue of inequity in student access to technologies (i.e. high-speed internet, devices, equipment), a total of 26 respondents (96.29%) find this barrier important to some extent. Specifically, 17 rate this barrier as extremely important, 3 as very important, 2 as moderately important, 4 as slightly important, and 1 as not at all important. It is worth noting that this statement is one of two with the highest number of 'extremely important' responses (17), the second one being the aforementioned statement on the lack of ethical code of conduct for Artificial Intelligence in game-based learning.

In terms of the lack of Institutional policies supporting gamified/ game-based approaches, a total of 26 respondents (96.29%) find this barrier important to some extent. Specifically, 9 rate this barrier as extremely important, 11 as very important, 2 as moderately important, 4 as slightly important, and 1 as not at all important.

When it comes to the barrier of low levels of staff interest in gamified/ game-based pedagogies, a total of 26 respondents (96.29%) find this barrier important to some extent. Specifically, 9 rate this barrier as extremely important, 13 as very important, 4 as moderately important, and 1 as not at all important.

In regard to concerns around data privacy on gamified/game-based systems, a total of 26 respondents (96.29%) find this barrier important to some extent. Specifically, 10 rate this barrier as extremely important, 8 as very important, 3 as moderately important, 5 as slightly important, and 1 as not at all important.

In terms of the lack of evidence-based examples of how to effectively use gamified and game-based approaches, a total of 26 respondents (96.29%) find this barrier important to some extent. Specifically, 12 rate this barrier as extremely important, 8 as very important, 4 as moderately important, 2 as slightly important, and 1 as not at all important. A total of 26 respondents (96.29%) find this barrier important to some extent. Specifically, 12 rate this barrier as extremely important, 8 as very important, 4 as moderately important, 2 as slightly important, and 1 as not at all important.

Regarding the barrier of a potential re-focus on outdoor learning and non-digital modes of learning, a total of 22 respondents (81.48%) find this barrier important to some extent. Specifically, 3 rate this barrier as extremely important, 8 as very important, 6 as moderately important, 5 as slightly important, and 5 as not at all important.

Finally, when it comes to the environmental impact of game-based learning (e.g. energy usage, resource consumption for device development etc.) A total of 20 respondents (74.07%) find this barrier important to some extent. Specifically, 3 rate this barrier as extremely important, 8 as very important, 6 as moderately important, 3 as slightly important, and 7 as not at all important. It is worth noting that this statement has the highest number of 'not at all important; responses (7) compared to the rest of the statements of this question.

Participants' open-ended comments throughout the survey echo many of the above barriers, particularly around the current mindset in Academia, the lack of staff support, and the lack of and need for evidence-based implementations. The relevant participant responses are presented below, structured in the following categories:

Academia Non-progressive Mindset

This is a barrier that has been highlighted multiple times by many of the Delphi participants, who highlight the institutional resistance to change and need for an overall mind-set shift in academic spaces. As a participant put it: "There are far too few visionaries in higher ed, so program wide adaptation is unlikely and online colleges are still far too formulaic and factory based models" (P10).

Lack of staff support

Again, a barrier regularly pointed out by the Delphi participants, who with their open-ended responses highlight the lack of staff readiness to adopt GL and GBL approaches due to insufficient training and support infrastructure, and a lack of capacity, given staff's responsibilities with teaching, research and administration. Participants also highlighted the lack of available resources that can support staff developing GL/GBL materials, such as available and affordable technology.

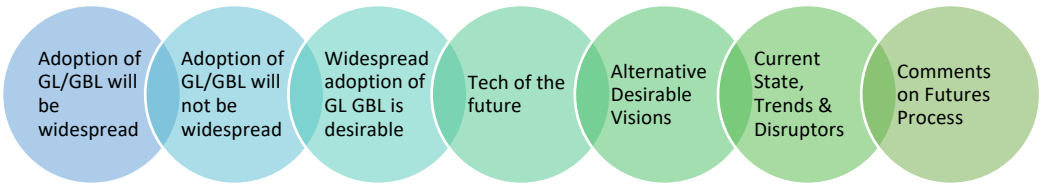
Lack of evidence-based implementations

While participants recognise the potential of GL and GBL activities for higher education, many pointed out that the lack of evidence-based implementations is an important barrier to the wider adoption of these approaches. As a participant put it: "it is very important to have high quality research to demonstrate its benefits and contribution to increasing high quality standards and evaluation in higher education" (P23).

5.3.5 Comments on two futures summary-visions for GL and GBL

Question five asked participants to comment on two brief future visions, which presented how gamified and game-based learning may be used in higher education in 10-15 years. The visions were constructed based on the expert panel's responses in the first survey round (see section 5.2.5). The first vision presented a future where the gamified and game-based learning approaches were widely adopted in higher education, whereas the second vision presented a future where the gamified and game-based learning approaches were not widely adopted in higher education. Participants were asked to comment on each of these visions, by way of making any important additions, expressing their agreement or disagreement with one or more of the statements, or adding an alternative vision.

Many participants commented on the likelihood of these visions materialising in 10-15 years, but their responses also uncovered a series of possibilities, specifically around the technologies that may or may not be used in the future, the role of technology in the future, alternative desirable future visions, and factors that need to be addressed before widespread integration of game-based and gamified learning can become a reality. These factors have been presented above, in question four, as part of the consideration of potential barriers. The results of question five are presented below in the following categories:



Adoption of GL and GBL will be widespread

While this statement, presented in vision A, was desirable for a subset of the respondents, the responses did not reveal confidence that this is a realistic or likely scenario. A subset of the expert panel expressed the view that the field of GL and GBL will grow and that the approaches will be adopted to some extent, however there is uncertainty around the level of adoption.

A number of participants expressed agreement with this vision, e.g. P2 states: "I agree with this vision. To some extent, every higher education program will adopt (digital) game-based learning in 10 - 15 years". In addition, while some participants pointed out that GL and GBL research and implementation will grow, some indicated that the level and type of their adoption will vary. As P3 put it: "The use of game-based learning will be widespread, but the level of digitalization of this practice and frequency of use will vary considerably among institutions and programs".

Adoption of GL and GBL will not be widespread

Many participants expressed the view that a widespread adoption of GL and GBL is not realistic in the next 10-15 years, for various reasons, and the vision that shows these approaches as being widely adopted is "overly optimistic" (P8). Some clarified that adoption will be gradual, incremental or sporadic, but not widespread. For example, P20 pointed out that "it's going to me more widespread every year forward, but how widespread is uncertain".

Widespread adoption of GL GBL is desirable

Regardless of how likely the future vision of a higher education which widely adopts the GL and GBL approaches, some respondents expressed the view that this vision would be desirable. Participants indicated that this is a desirable vision in various ways, e.g. "[t]his is the best case scenario" (P13); "[t]hat has been my vision for over 20 years now"; and "[t]his is extremely important and will continue to be extremely important because of the way students in particular younger students use technology today" (P23).

Technologies of the future

A subset of the respondents elaborated on the technologies that they see being used in the future, and the way in which these technologies may be implemented, e.g. the concept of hyper scanning, "to make sure that students are interacting in a shared space" (P1). Others identified technologies which, they believe, will not play an important role in higher education in 10-15 years.

Opinions between the expert panel varied, particularly when it comes to the potential contribution and future use of Artificial Intelligence (AI), Virtual Reality (VR), Mixed Reality (MR) and Augmented Reality (AR) technologies in higher education.

Specifically, we observed two main groups of opposing opinions: 1) Those who believe that AI will be widely adopted, versus those who believe AI will not be widely adopted; and 2) Those who believe VR-AR-MR will be widely adopted, versus those who believe VR-AR-MR will be not widely adopted. It is worth noting that only two of the participant comments support the view that VR-AR-MR will not be widely adopted. This is in line with the ratings in question one, where the majority of respondents (77.77%) find it likely, to some extent, that VR-MR-AR technologies will be widely adopted for teaching and learning.

It is interesting to note that, unlike the first survey round, where the Metaverse featured as a technology that can potentially contribute to the integration of GL GBL in higher education, this second round of responses revealed disbelief in the potential of the Metaverse – in fact, some respondents expressed the view that this technology is failing and will not feature in higher education in 10-15 years. This shift could be explained by the declining revenue of Zuckerberg's "Meta" in 2022[27], and subsequent mass layoffs[28], which occurred in between the two survey rounds.

Alternative Desirable Visions

One of the respondents articulated an alternative desirable future vision, which ensures equal access to immersive experiences: "I would tend to prefer a scenario where everyone can access immersive experiences (with or without the use of technology) rather than a scenario where the potential offered by technology is exploited to the maximum, but only by a few" (P21). This is a vision which shows the participants' values-thinking, when it comes to showing concern for others – a concept of futures consciousness that will be discussed further in the next chapters.

Current State, Trends & Disruptors

Some respondents expressed views around the current state of things, current trends and possible disruptors that can shape the future. For example, P22 shared knowledge around the present use of AI in English or Western literature. "In China, for example AI is already

[27] Published in the Meta Earnings Presentation Q3 2022, available via: https://s21.q4cdn.com/399680738/files/doc_financials/2022/q3/Q3-2022_Earnings-Presentation.pdf
[28] https://about.fb.com/news/2022/11/mark-zuckerberg-layoff-message-to-employees/ https://www.theguardian.com/technology/2023/may/24/meta-layoffs-final-round-facebook

integrated in teaching and learning at higher education level". Others pointed out possible disruptors, such as the possible reduced employment due to the wider use of AI, and the possible climate breakdown, which will shape education: "In 15 year's time, at our current trajectory, climate breakdown will be shaping our context to any even greater extent - and the purpose of education (and of approaches such as game-based learning) may be questioned from perspectives that are hard to imagine" (P17).

Comments on the futures process

While commenting on the two presented visions, some respondents expressed views about the futures process, particularly around the uncertainty of the future and the difficulty in drawing future scenarios. Participants made statements such as: "it is always hard to draw future scenarios" (P11); and "I am not sure, it depends on so many actors. Highly complex and related to so many other global developments" (P22). Moreover, one respondent was critical about how the two summary-visions were articulated, as the approaches of gamification, game-based learning and other immersive experiences are being considered together, rather than separately: "This is a hodgepodge of three different things: gamification, game-based learning, and non-game immersive environments. Each leads to different responses. […] So I say the vision is not clearly stated" (P4). This raises the question of whether it would perhaps be more clear or effective to articulate separate visions for each approach, or perhaps be more detailed in the description of the summary-visions.

5.4 Conclusion

This chapter presented the results of the second phase of the research, which included a two-round Delphi survey with an expert panel of academics from various backgrounds, and industry experts in gamification, game-based learning, game design, and technology-enabled learning settings. The purpose of the first round was to solicit the expert-panel's initial views on the topic, including current trends and challenges, and futures possibilities for higher education overall, and GL and GBL adoption in particular. Following an analysis and synthesis of the responses from round one, these were presented to the Delphi participants in round two for further reflection and critique. Participants of round two were asked to rate the likelihood of futures possibilities, the

importance of various factors and barriers to the wide adoption of GL and GBL in higher education, and comment on two summary-visions for GL and GBL and their role in higher education 10-15 years in the future.

Through the two-round Delphi survey, participants identified and discussed emerging technologies that can have an impact on the integration of GL and GBL in higher education, including Artificial Intelligence, Extended Realities (AR, VR, MR), and the Metaverse. They also identified a number of barriers to the widespread integration of GL and GBL in higher education, with main barriers being the institutional resistance to change, the lack of staff training and support, the high costs associated with integrating these approaches, the inequity in student access to technologies and equipment, and the lack of sufficient evidence-based examples of how to effectively use GL and GBL in higher education settings. In terms of which factors can support the effective integration of these approaches in higher education, participants pointed our as highly important the collaboration of educators and learning designers for the development of these activities, the integration of collaborative problem-solving of real-world challenges as part of GL/GBL activities, the development of GL/GBL designs that enhance the personal agency of learners, and the use of gamification as a means to scaffold the learning process.

In terms of probable futures, while a desirable scenario for many participants, it was deemed highly unlikely that digital GL and GBL would be widely adopted in higher education settings in 10-15 years. A more likely scenario appeared to be the gradual, incremental and sporadic adoption of these approaches within some institutions. However, as part of the futures exploration process, participants articulated various other futures possibilities, including various desirable visions regardless of how realistic or probable they may be, e.g. they imagined a future where higher education is accessible to learners beyond geographical restrictions, the degree pathways are non-traditional and include the use of micro-credentials, digital games are fully integrated in curricula, and GL/GBL combined with AI cater for learner needs, providing tailored, personalised learning experiences.

Chapter Six – Phase Three: Futures Workshops & Futures Consciousness Dimensions

6.1 Introduction

This chapter presents phase three of the research, which included: a) the completion of a series of futures workshops with a subset of the Delphi participants, as well as some new participants representing the relevant fields of academia and industry, and the thematic analysis of these conversations; and b) the examination of the workshop and Delphi survey datasets for the presence of Futures Consciousness dimensions. The chapter begins with providing an overview of the futures workshops and the activities that took place, it then proceeds with the thematic analysis of these, providing a narrative of the futures visions that were articulated for GL and GBL in higher education, and the actions that were identified for shaping preferred futures. The final layer of analysis is then presented. Through a critical review of the datasets using a model of Futures Consciousness, the chapter presents the dimensions and characteristics of Futures Consciousness that emerged in the datasets.

6.2 Overview of Futures Workshops

The workshops took place over three two-hour sessions, with a total of 16 participants. In terms of background and expertise, 12 out of 16 participants worked in Academia as educators and/or researchers, and 4 joined the conversation in their capacity as practitioners in technology-enabled learning settings, game-design, and/or gamification and games-based learning.

In terms of their involvement with previous phases of the research, out of the 16 participants, 6 had completed both rounds of the Delphi survey, 6 had completed one of the two rounds (equal split, i.e. 3 had completed round one, and 3 had completed round two) and 4 had not participated in previous stages. In terms of gender representation, out of the 16 participants, 12 identified as male and 4 identified as female.

Each workshop opened with a short introduction from the researcher reiterating the topic of conversation and sharing a quote from Sohail Inayatullah on futures studies: "Futures

studies is getting very smart people to think differently to create different futures"[29]. The quote was chosen to set the tone of the workshop as a conversation between the expert panel with the aim of exploring various futures, and to clarify my role as the facilitator of these conversations, rather than an expert in the topic of conversation.

Following this introduction, each participant was asked to briefly introduce themselves and their relevant work, and to share, if they were aware, of any emerging technologies currently being used or having the potential to be used in education. The latter part of the question was added at the outset of the workshop to allow for a critical examination of how well-informed participants were of technological developments, and their imaginings in this regard for the future.

In addition to the group introductions, 3-5 minutes were spent: a) clarifying how the terms game-based learning and gamified learning were understood in the context of the workshop, to ensure all panel members were on the same page in terms of terminology; and b) briefly showing what efforts preceded the workshop stage (i.e. phases one and two of the study). Figure [x] shows snapshots of the introduction.

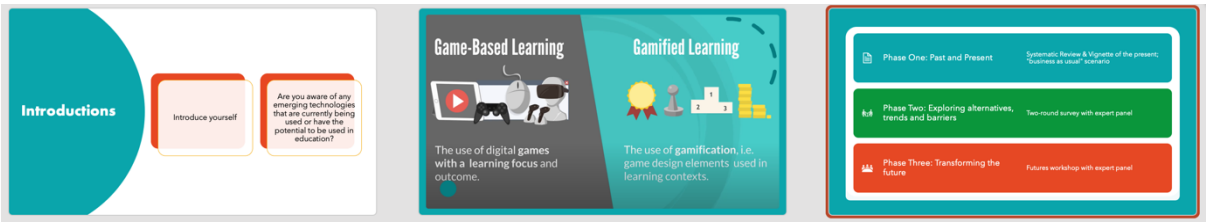


Figure 6.1 – Snapshots from the workshop introductory slides

The introductory part of the workshop, which lasted approximately 15 minutes, was followed by the following futures exercises:

Visioning: During this activity, participants discussed their visions (preferred or other) of what higher education looks like 20 years from today (i.e. 2043) and exploring the place of game-based and gamified learning approaches within those visions. The exercise took on average 60 minutes. To guide the conversation, a selection of the following questions

[29] Direct quote from Inayatullah's online course *Become a Futurist*, Section 1.1., video timestamp 02:36 – 02:53, available on the Metafuture platform: https://www.metafuture.org/ Accessed online in July 2020.

were asked in a semi-structured manner: What does the university look like? Is there a physical campus? How do students access their course materials? Who is the academic staff? How do students interact with each other and with staff? What kind of technologies are being used and how? Do game-based or gamified learning feature in your vision? How are these approaches being used in 20 years?

Backcasting: During this activity, participants discussed what actions or measures may need to be taken today in terms of policies and/or practices in order to achieve the preferred future(s), and identify the main actors who need to act in this regard. The exercise took on average 40 minutes. To guide the conversation, a selection of the following questions were asked in a semi-structured manner: Let's imagine your preferred vision has materialised. Now, let's work backwards: What events and trends transpired to create this future? What are three pivotal things that happened? Who are the main actors that took these measures?

The last 5-10 minutes of the workshop were dedicated to capturing participants' thoughts and experience with participating in a futures-focused study. Sample of questions asked: How did you find taking part in a futures-focused conversation (survey and/or workshop)? What worked well? What was challenging? Any opportunities for improvement? At this final stage, participants thanked the facilitator and each other, and many proceeded to share contact details.

6.3 Thematic Analysis of Futures Workshops

The dataset captured as part of the three workshops was first examined using a qualitative thematic analysis approach. The analysis was focused on: a) exploring the potential futures of games-based and gamified learning in higher education; and b) identifying actions for shaping preferred futures. The results of these two layers of analysis are presented below.

6.3.1 Future(s) of GL and GBL in Higher Education

Similarly to the two-round Delphi survey phase, the possible, probable and preferable futures of GL and GBL in higher education were not examined in isolation. A large

portion of the workshop conversation focused on the overall landscape of higher education in 2043, within which gamified and game-based approaches were positioned and discussed. From the patterns and common themes of the three futures conversations, a collective vision for the university of 2043 emerged.

6.3.1.1 University of 2043

The participants imagined a university where hybrid models of teaching and learning coexist, providing a diverse and dynamic learning experience for higher education students. This vision features a multitude of online, digital collaborative spaces, removing the constraints around the time and place where learning takes place, ultimately extending higher education to a greater community reach, including what is today considered non-traditional students (e.g. over the age of 23 years). An added benefit to this is the decrease in need for student travel, which ultimately has a positive impact on climate change.

The existence of university "Megaliths", in terms of physical structure, has become obsolete in 2043. Physical university spaces still exist to allow for human-to-human interaction, but these spaces are repurposed. Some institutions repurpose their physical structures as research centres or modular service centres, where students access studio spaces, digital support, and other services that can support them advance their projects and ideas. In some cases, higher education is more distributed, with the existence of local learning hubs across the city in various forms (e.g. collaboration spaces or café-hubs) making learning more accessible to local community and more in line with a sustainable lifestyle.

The coexistence of models applies to the university degree pathways as well. The traditional degree path is still available in some fields, driven by a desire to preserve the tradition and integrity of higher education. However, in 2043 the traditional model coexists with more dynamic models and accreditation systems. These models include the offering of a wide-range of micro-accreditations and short online courses, ultimately supporting learners in a more tailored and targeted way, that meets individual learner needs. In addition, some universities offer progressive degree models, where rather than picking a study field, students choose a global challenge they wish to address and then their degree roadmap is tailored to tackle that challenge. Artificial Intelligence (AI) tools

support to generate these tailored learning pathways for students, and even support with exploring solutions.

In 2043, the overall role of higher education is different. With the changes in employment that Artificial Intelligence (AI) brings, the role of higher education is no longer focused on creating careers and developing job skills, but rather becomes more integrated with the needs of its audience and returns to a model where it exists for the edification of humanity. Moreover, by 2043, with the use of AI technologies students have access to information at their fingertips. This has impact in many areas. Firstly, specialising in a topic is no longer needed, as AI provides that specialised information faster. Also, the traditional models of assessing learning (e.g. via written essays) change significantly. As a workshop participant mentioned, "if you've got something which a machine can now do, then that is not fit for purpose for assessing how well human beings are operating" (P2 workshop 3). Universities in 2043 leverage these AI technologies and tools to allow students to engage in performances of understanding. Universities now focus on fostering student's ability to synthesise, create, innovate, develop new technologies, and propose solutions based on the information they access. They also nurture student's ability to be versatile with the information they access, i.e. to be able to deepen their knowledge on topics and bridge categories where needed.

University learning experiences are now often the result of collaborations between multidisciplinary teams, which include academics, pedagogical specialists, instructional designers and game designers. Learning experiences in 2043 are varied and personalised, and are informed by a wide-range of pedagogical approaches. For example, we see a blend of digital immersive technologies, such as Augmented Reality tools, with outdoor or place-based learning. Learners create the learning paths that meet their needs and learning preferences. This variety is also evident in the assessment of student learning, ensuring it meets student's ability and special educational needs and particularities. Moreover, knowledge is no longer channelled via the authority figure of "the professor". Educators and learners are now learning partners, and peer learning is prevalent across the university experience.

Games-based and gamified approaches have a place in 2043 higher education, not as part of a mainstream framework, but as part of the wide-range of pedagogical approaches available in the university learning experience. These approaches include a wide-array

of interactive learning opportunities and playful approaches, utilised in a variety of ways, e.g. for formative assessment, for application of learning, for promoting social emotional learning, as part of gamified micro-accreditation processes, and as collaborative spaces for problem-solving global challenges.

In 2043, it is recognised that the concept of play is part of core pedagogy, and not necessarily tied to a specific technology. In fact, a number of technologies are available in 2043 that support playful approaches and immersive learning. Metaverse technologies, Virtual Reality and haptics have developed to the point where they are comfortably used by educators and learners to simulate environments or support immersive collaborative spaces. For example, with the use of wearable technology, in 2043 learners can be in the same room in a holographic capacity, fostering connectedness with others even if geographically distributed.

The role of academic staff is also reconfigured, as another result of the wide use of AI in higher education. AI tools unleash educators' ability to easily create and customise learning content, artifacts and resources, including games in their respective fields, without having to invest time in learning skills like coding. With AI freeing up educators' time of certain tasks, from filtering bodies of knowledge and quickly answering specific questions, to spending considerable amount of time to create personalised learning experiences for students, educators have more time for research.

6.3.1.2 Dystopian Futures

As part of the workshop conversations, the participants touched on futures possibilities that are non-desirable, or even dystopian. While these were brief mentions (as fleshing out dystopian futures was beyond the scope of the two-hour workshop) it is worth noting these alternative futures possibilities – many of which relate to the use of Artificial Intelligence:

- AI continues developing unregulated. Eventually it surpasses human intelligence and takes control.
- AI completely replaces academic staff.
- Using AI, universities engage in excessive tracking of learner data, including physical and emotional data (e.g. physical health and anxiety levels).

- As AI takes away manual or menial tasks and frees up educators' time, this results in Academia demanding more and more output from academics (e.g. more research, more publication, more funding).
- Due to the capabilities of AI in instant translation, learning foreign languages is no longer required. The gap between neighbouring countries increases, leading to societal isolation.
- Smaller universities, especially private for-profit universities, are not able to compete in the global marketplace, and eventually consolidate towards the larger well-established higher education institutions. This results in homogenised distribution of information and perspectives of knowledge, i.e. information coming only from one source.
- Due to the ease of access to information via AI, the value of deep understanding of concepts is gradually lost, and students lose the ability to critically engage with or innovate based on the information that is presented to them.
- The trend of large technology industries offering direct employment learning opportunities grows, becoming a threat to higher education institutions, as people no longer see the value in a university degree.

6.3.2 Actions for shaping preferred futures

At the second part of the workshop, participants were asked to engage in a back-casting exercise. Participants were asked to imagine that we are already 20 years in the future and their preferred vision has been achieved. By way of remembering the past, participants were asked to identify which events, actions or measures took place (e.g. in terms of policies and/or change in practices) in order to realise this future. They were also asked to identify the main actors who needed to act in this regard, in order to achieve the preferred future(s).

A wide range of actions were proposed. These are summarised under the following themes: Regulations; Changes in academic practices; Changes in hiring academic staff; Funding; Teacher training programmes; and Technology milestones.

Regulations

Echoing an action that was previously identified as part of the two-round survey, it is proposed that AI must be regulated properly. It is understood that a global regulation may not be possible, as what may work for one part of the world may not be suitable for another, but regional regulations should be in place, particularly when it comes to the data privacy of students. In addition, if AI is to be used effectively and have beneficial outcomes in higher education, it must be available to everybody in an equitable way. A structure should be in place to ensure not only that everybody can access AI, but also that everybody possesses AI literacy, i.e., they understand what the technology offers, how it works, who is it developed by and who is it developed for. Finally, given the trend of micro-credentials is growing and is expected, according to the study participants, to play a role in higher education in 2043, it was discussed that it would be beneficial for some formal quality control of micro-credentials to be put in place.

Changes in academic practices

It was proposed that a de-emphasis on standardised testing would be beneficial, particularly to encourage the integration of game-based and gamified approaches in higher education. Specifically, as part of the first workshop we discussed that "standardised tests do a lot of harm in experimentation, because teachers are often forced to teach to the test, and […] aren't inclined to try too many creative ways to deal with that" (P2 W1). In addition, given the current higher education system places value on density of knowledge, it was proposed that a shift to shorter courses, rather that students completing a series of academic semesters, may incentivise and foster more creativity in pedagogical approaches. Finally, given high cost of game-based and gamified learning development was previously identified as a barrier to the adoption of these approaches, the participants proposed as a potential low-cost option the collaboration of higher education institutions with the private sector and civil organisations where possible: "Just thinking in terms of that barrier around costs […] and I think there's opportunities in terms of collaborations with organisations outside of university […] within maybe the private sector, but also in that civil society space as well" (P4 W1).

Changes in hiring academic staff

One of the barriers highlighted in the study was that in the present, higher education institutions are increasingly hiring adjunct or part-time faculty, which is likely not as invested in the university experience as full-time, tenured faculty staff. As a result of that

discussion, a change in hiring practices, which puts less emphasis on hiring part-time/adjunct staff, was identified as a beneficial action. It was also proposed that new academic hires are selected for their ability to be versatile with knowledge, and once hired, training in teaching skills is provided. In addition, it was proposed that institutions create multidisciplinary teams, who will be responsible for designing learning experiences.

Funding

To increase reporting of evidence-based examples of game-based and gamified learning, it was suggested that funding relevant research in a variety of contexts would be beneficial. Funding would also be essential for hiring multi-disciplinary design teams, which create learning experiences. In addition, in the context of developing game-based and gamified experiences, a main barrier that was highlighted repeatedly in the Delphi survey rounds was the high cost of developing such endeavours. As part of the workshops, a participant proposed that in the absence of adequate funding, higher education students are empowered to develop open sourcing tools: "institutions are one of the last remaining places […] where I can spend time and tell a student to do an open source project and we're not worried about the commercial ramifications of that […] I think universities create really special places for that" (P7 W2).

Teacher training programmes

The conversation around the value of teacher training programmes was rich. As an action to foster the meaningful integration of game-based and gamified approaches in higher education, it was highlighted that the fundamentals of play must become part of teacher training programmes. The specific mechanics of gamification and game-based learning can be covered by additional micro-accreditations, but the foundations of playful approaches should be part of the core pedagogy taught in teacher education programmes. To improve the effectiveness of these programmes, it was also proposed that the programmes include the sharing of models of innovative playful approaches and practical examples of implementation. They should also be taught by educators with various backgrounds. As a participant put it: "I think to actually change the system, which is my concern, […] you need people that are bringing other ways of thinking into the system, not perpetuating the same thinking" (P2 W1).

Technology milestones

Finally, to achieve the preferred visions of the future, it was proposed that in the next 10-20 years extended realities and generative AI must become as accessible and mainstream as holding your mobile phone or wearing glasses: "The next would be getting extended reality spatial computing to be mainstream, because it really isn't. […] people have tried it for fun, but this is not something that somebody is wearing for 8 hours a day" (P7 W2). Also: "for augmented reality […] it still has the same challenges of wearing a toaster on the front of your face […] we are still at least 10, maybe 15, maybe more than 20 years away from the industrial […] innovations that would be required to reduce those down to […] a pair of something that akin to wearing a pair of regular glasses" (P2 W2).

6.4 Presence of Futures Consciousness Dimensions

The final layer of data analysis was informed by the conceptual model of Futures Consciousness dimensions (Ahvenharju, Minkkinen and Lalot, 2018). Each workshop and Delphi survey round was examined in an effort to identify which (if any) of the Futures Consciousness dimensions manifested as part of the conversations, and which characteristics within each dimension were prominent. As discussed in chapter three, each dataset was examined through a coding frame, which was developed by the researcher as an extension of the Futures Consciousness model (see Appendix F) to support the application of the model in analysing the study datasets. In addition, the data was reviewed through a reflexive analysis lens, which allowed for new coding opportunities. As part of this process, a set of new Futures Consciousness dimensions and characteristics were identified, which consider participants' cognitive processes, perceptions, dispositions, beliefs and values thinking. The presence of Futures Consciousness in the collected data is discussed below, structured under the following Futures Consciousness dimensions:

- Temporal perception
- Critique of the present
- Disposition toward future possibilities
- Agency beliefs
- Proactive planning of futures

- Systems perception
- Concern beyond the self

6.4.1 Temporal Perception

As part of this dimension, the datasets were examined for characteristics relating to participants' perception of time, their awareness of past and future as linked together, their engagement with long-term, futures thinking, and their ability to place probable future events onto a future timeline. The table below lists the characteristics within this dimension of Futures Consciousness (FC) that manifested in each dataset.

Dimension	Characteristics	D1 [30]	D2	W1	W2	W3
Temporal perception	1a. Demonstrating awareness of time as past and future linked together			x		x
	1b. Engaging in long-term futures thinking			x	x	x
	1c. Challenging the "timing" used for the futures projection*	x	x	x	x	x
	1d. Placing probable events onto a future timeline*		x	x	x	x
	**Indicates a new characteristic not considered in Ahvenharju, Minkkinen and Lalot, 2018 model.*					

Table 6.1 – Temporal perception: Dimension and Characteristics

1a. Demonstrating awareness of time as past and future linked together

A characteristic of Futures Consciousness that became visible in the workshops was participants' awareness of time as past and future linked together, which derives from the concepts "sense of time" (Lombardo and Cornish, 2010), "the meaning of time" (Bell, 2003) and "connectivity" (Mische, 2009). In the instances shown below, participants from workshops one and three demonstrated an expansive awareness of the time continuum, making connections between events taking place in the past, present and future.

[30] For the remainder of the chapter, the abbreviations D1-2 and W1-3 will be used to distinguish between datasets, namely Delphi round one, Delphi round two, and Workshops one, two and three.

Notably, participants made connections around learning practices and human characteristics that continue across the time continuum: i.e., our connection to nature in the past and the return to place-based learning in the future with the support of augmented reality technologies; and how the human drive to be competitive will continue into the future, and the potential of gamification in fulfilling that drive. The table below presents a sample of relevant statements:

W	P	Quote	Initial Code	FC Characteristic
1	P2	We look back to our past as hunters and gatherers. It was all location-based learning, right? […] I do think that augmented reality kind of can fulfil that vision of returning learning, because that's where learning originally takes place.	Participant identifying connectivity across past, present, and future	Demonstrating awareness of time as past and future linked together
1	P1	I think we are by nature very competitive […] And I don't think that that's going to go away. […] I think that it is […] sort of fundamental to some of our hard wiring […] but certainly gamified elements, you know, lend themselves towards that healthy sense of competition, whether with self or with peers.	Participant identifying connectivity across past, present, and future (i.e. participant is highlighting that the human drive to be competitive continues into the future)	Demonstrating awareness of time as past and future linked together

1b. Engaging in long-term futures thinking

In terms of how far into the future participants' projected, long-term futures thinking became evident in all three workshops to some extent. This was guided by the visioning activity, during which participants discussed what higher education looks like in 2043. The majority of participants actively engaged in long-term projections, i.e. 20 or more years into the future, in line with Inayatullah's "horizon three" (Inayatullah, 2013). This characteristic of futures consciousness is consistent with concepts such as Berger's ability to "look far away" (Berger quoted in Godet and Roubelat, 1996) and Heinonen and Raleigh's "long timeframe" (Heinonen and Raleigh, 2015). Note that the characteristic focuses on the extension of participants' time perspective, i.e. how far into the future they were envisioning, rather than the *content* of their vision, which is discussed under a different dimension. Examples of long-term futures thinking are included below, where participants are envisioning futures possibilities on a long timeframe, i.e. 20 years or more.

W	P	Quote	Initial Code	FC Characteristic
1	P2	any of the things that make virtual reality unwieldy or uncomfortable now will certainly be, I think, resolved [i.e. in 20-30 years]	Participant envisioning 20+ years into the future	Engaging in long-term futures thinking
1	P4	best case scenario, in 2043, you know, maybe we have begun to tackle some of the climate-related issues that we're faced with	Participant envisioning 20+ years into the future	Engaging in long-term futures thinking
1	P2	I can't imagine a future 20 years from now or beyond that will not have discovered infinitely more dynamic, engaging, informative ways to deliver the information than through a traditional lecture	Participant envisioning 20+ years into the future	Engaging in long-term futures thinking

*1c. Challenging the "timing" used for the futures projection**

In terms of how participants perceived time, what manifested both in the workshops, and to a smaller extend in the Delphi rounds, was the view that it was difficult projecting into the future given the rapid developments in technology in the present. This element of perception of time relates to Sande's concept of "length", i.e. how far one can see into the future (Sande, 1972). For some, 30 years ahead can be perceived as near-future, whereas for others it can be perceived as far into the future. However, the context of futures thinking needs to be taken into consideration. In this case, the rapid technological advances that we are experiencing[31] present additional challenges to those projecting into the future. What might be considered a middle-term forecasting exercise (e.g. 10-15 years) in non-technological contexts, in this case it can equate to 20 plus years ahead, given the rapid and unexpected innovations in the technology sector.

As a result, a new characteristic was added in the "temporal perception" dimension, to signify cases were participants challenged the "timing" used for the futures projection of the visioning activity. In other words, in cases where they expressed difficulty projecting 10-15 years ahead (Delphi survey) or 20 years ahead (workshops), challenging the feasibility of such a long-term projection, specifically due to the rapid technological advancements taking place – and expected to continue in the future. Sample quotes expressing this view are included below.

[31] For example, according to a recent online post, since the 60's and 70s, computer speed and power have been doubling every 18-24 months. (McCain, 2023)

D/W	P	Quote	Initial Code	FC Characteristic
D1	P23	the current pace of technological developments is disturbingly accelerated, hindering the potential to accurately predict what will happen	Participant expressing difficulty projecting due to rapid tech developments	Challenging the "timing" used for the futures projection
W1	P3	looking 20 years in the future is incredibly difficult in this context. […] I mean in any context I guess, but especially for technology that's moving forward so fast […]	Participant expressing difficulty projecting 20 years ahead due to rapid tech developments	Challenging the "timing" used for the futures projection
W3	P4	it's very difficult to see in 2043 that nothing else new will be announced or created or developed between this and then […] Things are changing too fast, and there'll be something else, you know, in 5 years' time	Participant expressing difficulty projecting 20 years ahead due to rapid tech developments	Challenging the "timing" used for the futures projection

Interestingly, a workshop participant challenged the "timing" used for the futures projection, but in contrast with the quotes presented above, the participant being an experienced futurist, they indicated they were comfortable with projecting further into the future, and a 20-year projection was likely very near for them to project:

W	P	Quote	Initial Code	FC Characteristic
W1	P2	20 years is pretty near for me to think about. My work is usually like much further out. So it's kind of fun to do this	Participant expressing personal view that thinking 20 years ahead is near	Challenging the "timing" used for the futures projection

In addition, a Delphi participant, while critically commenting on a future vision that saw digital GL and GBL being widely adopted in higher education within 10-15 years' time, challenged the timing of the projection, pointing out that it is unlikely such a significant shift in practices will materialise within such a short period of time:

D	P	Quote	Initial Code	FC Characteristic
D2	P7	10 years is a relatively short period of time in terms of such a shift in educational practice, both in terms of equipment and material and teaching practices.	Participant critically commenting that timing used for future projection/vision is too short for such shift	Challenging the "timing" used for the futures projection

*1d. Placing probable events onto a future timeline**

As part of the workshop discussions, and to a lesser extent as part of the second round of the Delphi, a few participants appeared comfortable to place probable events onto a future timeline and indicate at which point in time these events may materialise. This

characteristic does not indicate participants' ability to make short-term, middle-term or long-term projections, but rather it is an indication of participants' ability to critically consider the future timeline and attempt to place future events at specific points in time. Some examples are presented below:

D/W	P	Quote	Initial Code	FC Characteristic
D2	P23	As for artificial intelligence integration, it will probably take about 20 years for it to be genuinely useful.	Participant projecting timing of AI developments	Placing probable events onto a future timeline
W1	P1	And being able to marry generative AI and large language models […] I really think that, that's maybe not where 20 years is gonna be, but certainly in the next 3 to 5	Participant projecting likelihood of event materialising 3-5 years into the future	Placing probable events onto a future timeline
W2	P2	we'll still probably see […] a consolidation [of smaller universities] towards some of the larger more well-established higher education institutions as well. So I would kind of put that on that mid 10 year to 15 year timeline as well.	Participant projecting likelihood of event materialising 10-15 years into the future	Placing probable events onto a future timeline

6.4.2 Critique of the Present

This dimension of Futures Consciousness focuses on participants' considerations around the present. This is a new dimension which became evident in the dataset, and it connects to Inayatullah's first pillar of futures thinking: Mapping. By understanding our past and present, we can get a clearer view of where we are headed (Inayatullah, 2013). As part of this dimension, the Delphi and workshop datasets were reviewed for evidence of participants' understanding of current trends and signals of change in the present, understanding of present challenges, critical consideration of barriers to change, evidence of critical thinking in the form of questioning assumptions, and finally, knowledge of emerging factors or practices, and consideration of their potential for the future. The table below lists the characteristics within this dimension of Futures Consciousness (FC) that manifested in the data.

Dimension	Characteristics	D1	D2	W1	W2	W3
Critique of the present	2a. Demonstrating understanding of current trends	x	x	x	x	x
	2b. Identifying signals of change in the present*	x	x	x	x	x
	2c. Demonstrating understanding of current challenges	x	x	x	x	x

	2d. Demonstrating critical thinking: questioning assumptions	x	x	x	x	x
	2e. Critically considering barriers to change for the future*	x	x	x	x	x
	2f. Recognising potential of emerging factor or practice for the future*	x	x	x	x	x
	**Indicates a new characteristic not considered in Ahvenharju, Minkkinen and Lalot, 2018 model.*					

Table 6.2 – Critique of the Present: Dimension and Characteristics

2a. Demonstrating understanding of current trends

Evidence of participants' knowledge of current trends was strong in the first round of the Delphi survey, as participants were specifically asked to comment on technological, socio-economic, political, environmental and other factors that can impact the direction of GL and GBL integration in higher education. Knowledge of current trends was also clearly evident in all three workshops. According to Lombardo and Cornish (2010), a comprehensive understanding of current trends and challenges the world is facing is a requirement of heightened futures consciousness. This characteristic is also aligned to Berger's concept of "looking in depth", i.e. "to find the factors and trends that are really important" (outlined in Godet and Roubelat, 1996 p. 164). As part of the workshops, the discussion focused on present technological trends, such as Augmented and Virtual Reality; current teaching and learning practices, such as place-based learning and short-form video learning; and employment practices, such as tech industries offering learning opportunities linked to employment. The table below shows notable examples of this characteristic:

D/W	P	Quote	Initial Code	FC Characteristic
D1	P14	VR and AR tools may have a significant impact on the kinds of experiences that can be created and used.	Participant identifying present technology innovations/trends [i.e. AR/VR]	Demonstrating understanding of current trends
W1	P3	So then there's a massive trend at the moment towards short-form video.	Participant demonstrating knowledge of present trends [i.e. short-form video]	Demonstrating understanding of current trends
W2	P2	[…] large technology industries offering direct to employment learning opportunities. This is already a trend that's been growing for several years now	Participant demonstrating knowledge of present trends [i.e. tech industries offering learning opportunities/ employment]	Demonstrating understanding of current trends

*2b. Identifying signals of change in the present**

This is the second characteristic within the "critique of the present" dimension that became visible in the datasets, and it relates to participants identifying signals of change in the present. As discussed in chapter two, the terms *trend* and *signal* are not used interchangeably in futures studies. While a trend is typically considered a visible factor or pattern that has been gradually and steadily causing change (Saritas and Smith, 2011), signals of change are an indication in the present that something is *starting* to change, and could potentially become a driver of change or a new trend (Saritas and Smith, 2011; Bourgeois, 2015). While the existing FC model (Ahvenharju, Minkkinen and Lalot, 2018) currently includes the understanding of current trends as a characteristic of futures consciousness, it was felt that participants' understanding of present *signals* of potential change should be considered as a distinct characteristic. Delphi and workshop participants referred to such early signals as part of the conversation, with many highlighting emerging technologies, such as generative AI, the Metaverse and other immersive technologies:

D/W	P	Quote	Initial Code	FC Characteristic
D1	P12	Using AI and Metaverse to provide a personalised game-based learning experience.	Participant identifying present technology innovations/trends and practices	Identifying signals of change in the present
W2	P2	what I'm speaking about most right now is just non-stop artificial intelligence and the role of generative AI and what role that will play across all the disciplines	Participant demonstrating awareness of emergent technology	Identifying signals of change in the present
W3	P2	things like sort of narrative creating tools. So things like Twine. And [...] Quest, which is [...] a Javascript library for creating text adventure.	Participant demonstrating awareness of emergent technologies	Identifying signals of change in the present

Other signals of change identified include teaching and learning practices, such as remote learning, the growing use of micro-credentials, and the increasing appearance of game design university programs, as well as socio-economic and environmental factors, such as the COVID-19 pandemic and the subsequent increase in remote working. These signals were identified as part of the futures workshops. The table below demonstrates some notable examples:

W	P	Quote	Initial Code	FC Characteristic
W1	P2	game design programs are appearing in almost every university or at least every major you know city center […] and that's more game designers going into the bloodstream than there are jobs for game designers	Participant identifying emerging practice/factor [i.e. increase in game design programs]	Identifying signals of change in the present
W2	P3	even traditional age students are asking for more online opportunities and some of this came out of the COVID crisis epidemic, where all the learning for a period of time had to be online.	Participant identifying emerging practice/factor [i.e. remote learning]	Identifying signals of change in the present
W2	P3	Another thing […] that is becoming bigger and bigger is the idea of micro credentials, which as you said could be offered directly by industry, such as Google, where they would offer these short term, courses in very specific areas that they find desirable for their particular, you know, work model	Participant identifying emerging practice/factor [i.e. micro-credentials offered by industry]	Identifying signals of change in the present

2c. Demonstrating understanding of current challenges

In addition to identifying established trends and signals of change in the present, some participants demonstrated understanding of current challenges. This characteristic is in line with Lombardo and Cornish' (2010) concept that "heightened future consciousness requires a comprehensive understanding of contemporary trends and challenges facing humanity—seeing the big picture of ongoing developments in the world and the problems facing us" (Lombardo & Cornish, 2010 p. 35). For the purposes of the data analysis, understanding of trends was presented separately to understanding of challenges, as there were instances where only one of the two factors was visible in participants' statements. Among other factors, participants are critically considering current issues within higher education, such as the lack of government funding, the cost of entry to education, the inequity in student access to technology, and the ineffective faculty hiring process. They are also commenting on the current political and economic landscape, as well as the impact of the pandemic on human connection. Some examples are provided below:

W	P	Quote	Initial Code	FC Characteristic
W1	P1	I think from the perspective of American education, you've got the inequity in student access to technologies. I would even remove the "to technologies", you know, the sheer barrier that is the cost of entry to education is something significant	Participant critically considering current issues within higher education [i.e. inequity in access to tech; cost of entry to education]	Demonstrating understanding of current challenges

W2	P7	I think that is more and more this isolation that we've seen of society. Pandemic obviously has accelerated all this, but this was a trend I think that was happening anyway.	Participant considering impact of pandemic on human connection	Demonstrating understanding of current challenges
W3	P1	I just think currently higher education is completely underfunded. Most of what we do is self-funding, where we're constantly being forced to bring in money.	Participant highlight a challenge with funding model in higher education	Demonstrating understanding of current challenges

2d. Demonstrating critical thinking: questioning assumptions

The participants also demonstrated critical thinking, in the form of questioning assumptions to some extent. This characteristic is aligned to Miller's "questioning the assumptions of present decisions" (Miller, 2007), Sardar's view that the study of the future should be sceptical of one-dimensional solutions to complex problems, as the aim is not to foreclose the future, but to open pluralistic potentials (Sardar, 2010), and the characteristic of critical thinking and constant questioning, identified by Heinonen & Raleigh as a key characteristic of futures thinking (Heinonen and Raleigh, 2015).

As part of this category, participants critically considered and questioned the assumptions of past, present and future factors and decisions, e.g. assumptions around generative AI; the value or lack thereof of adding technology as part of GBL experiences; the notion of a traditional degree path and whether this will become an outdated concept; the changing role of higher education for edification, as opposed to career preparation; the paradigm of uniformity when it comes to how we deliver education across the globe; the effectiveness of current practices in learning assessment; the effectiveness of current practices in online/remote learning; etc. This type of questioning is an important step to move away from the present and create new, alternative future possibilities (Inayatullah, 2013). The tables below show notable examples of participants' quotes that show the type of critical thinking and assumptions questioning that took place.

D/W	P	Quote	Initial Code	FC Characteristic
D1	P3	I don't think technology adds much- in fact the opposite. LMS dominate higher Ed, they are standardized, and they allow for very little innovation	Participant being critical around value/effectiveness of technology (LMS) in education	Demonstrating critical thinking: questioning assumptions
W2	P4	do we really need assessment, grading, etc.? Games don't assess as much as give	Participant critically	Demonstrating critical thinking:

		opportunities to learn, fail and learn from failure. In education nowadays we punish for mistakes instead of providing learning opportunities and empower.	questioning current assessment practices	questioning assumptions
W2	P1	If we're honest with ourselves […] most online learning so far has been designed to benefit the organization that is providing it - not to benefit the learners.	Participant critically questioning a current practice [i.e. online learning]	Demonstrating critical thinking: questioning assumptions

Participants also critically questioned systemic issues with higher education, such as the frantic nature of academia, the impact of the COVID-19 pandemic on institutions' decision making, the concept of academic degrees, and the role of education in general:

D/W	P	Quote	Initial Code	FC Characteristic
W1	P1	is the notion of a degree in a lot of cases going to be an outmoded concept? […] are we talking about moving towards a more skills-based model that prepares people […] in a more tailored way than […] a traditional degree model?	Participant contemplating the implications of change/s for future practices [i.e. concept of degree]	Demonstrating critical thinking: questioning assumptions
W3	P4	I think there was a huge fear [post-pandemic] in some of the publicly funded universities to justify their existence or re-justify their existence. Because if I don't need to go to a university to attend the college and I can go anywhere, then why should the Government continue to fund the public university	Participant critically reflecting on impact of COVID-19 on public university decision-making	Demonstrating critical thinking: questioning assumptions
W3	P4	what would we do with our time [i.e. when AI frees up our time], then, what happens? […] everything is too frantic in higher education now. You know, it's all you got to publish X amount every year. And you're writing to publish, you're thinking to write. You're not thinking to reflect and pause and consider	Participant critically reflecting on current practices within higher education [i.e. frantic nature of academia; need for publishing; lack of time to reflect]	Demonstrating critical thinking: questioning assumptions

Finally, participants questioned assumptions about Artificial Intelligence (AI) – the conversation in workshop three was particularly rich on this topic. Specifically, participants critically commented on the negative rhetoric around AI, they questioned the way AI is currently being used, the potential of this emerging technology the future of education, but also critically reflected on potential risks from using it ineffectively:

W	P	Quote	Initial Code	FC Characteristic
W2	P7	And my worry is that because of things like generative AI, just like we already have with search engines, it becomes very	Participant critically questioning a current practice [i.e. use of AI	Demonstrating critical thinking: questioning assumptions

		easy to justify 'why am I going to learn all these exact… like learning dates'	can change what we choose to learn]	
W3	P2	when chat GPT was picking up momentum […] a lot of the rhetoric around education was[…] 'This is going to destroy education' […] Yes, it's going to destroy this model, of students writing essays, and that being the be-all and end-all of how you assess them. But that doesn't mean that AI should go away. That means you need to change that model, because if you've got something which a machine can now do, then that is not fit for purpose for assessing how well human beings are operating.	Participant critically reflecting on negative rhetoric around AI	Demonstrating critical thinking: questioning assumptions
W3	P1	from the learning perspective AI might allow us to expose students to more stuff more quickly. But they still need time to engage with it, process it	Participant critically reflecting on current practices within teacher education programmes and use of AI	Demonstrating critical thinking: questioning assumptions

*2e. Critically considering barriers to change for the future**

In addition to critically questioning assumptions, there were many instances where participants identified and critically considered barriers to change for the future. This was identified as a new characteristic, which differs from the characteristic of identifying "current challenges". The latter refers to broader contemporary problems the world is currently facing (Lombardo and Cornish, 2010), whereas in this case the participants were not only considering issues of the present, but they were critically reflecting on the implications of those issues on the future, and considering them as barriers to change in higher education.

Examples of where this characteristic manifested included: the institutional resistance to change; inequalities that impact access to education; fatigue caused by interacting in online gamified experiences; issues with data privacy; educators' lack of digital design skills required for the development of gamified and game-based learning experiences; the lack of sufficient evidence-based examples of using GL/GBL effectively in higher education; the financial and environmental cost of immersive technology; and gamification getting less traction than emerging technologies, like AI. Sample participant statements within this category are presented in the tables below.

D/W	P	Quote	Initial Code	FC Characteristic
D1	P9	The environmental costs of digital learning e.g. energy consumption, device obsolescence and churn could become factors in adoption of digital pedagogies in the future.	Participant critically commenting on barriers to change	Critically considering barriers to change for the future
D2	P5	Insufficient staff training and lack of GBL visibility and advantages	Participant critically commenting on barriers to change	Critically considering barriers to change for the future
W1	P1	And then to that point there the concerns around data privacy, particularly if you're talking about a global solution you know, what works in North America does not work […] across Europe	Participant critically considering barriers to change for the future [i.e. issue of data privacy/ security]	Critically considering barriers to change for the future
W2	P3	We also have massive inequity in American education and globally massive social inequities where technology is a more a dream than a reality	Participant critically considering barriers to change for the future [i.e. social inequities/ access to tech]	Critically considering barriers to change for the future

Moreover, participants stressed as major barriers the institutional, educator and societal resistance to change:

D/W	P	Quote	Initial Code	FC Characteristic
D2	P20	Educators and administrators have to be motivated to change the curriculum. This is the biggest barrier to all of this and will continue to be the biggest barrier.	Participant critically commenting on barriers to change [lack of institutional leader buy-in]	Critically considering barriers to change for the future
W2	P4	the leadership of tomorrow is chained in today's system. So they are in a way limited. And there, I don't think there's enough people who are progressive and who really want to change something	Participant critically considering barriers to change for the future [i.e. institutional and educator resistance to change]	Critically considering barriers to change for the future
W3	P1	No [higher education will not be free in the future]. […] I don't think governments are always going to fund fully. […] it is a business ultimately, and whatever money they can bring in they'll move to that approach, I think, to be honest.	Participant expressing view that higher education funding model will remain the same [i.e. the model will continue as is as higher education is a business]	Critically considering barriers to change for the future

Finally, participants commented on issues that are potential barriers specifically to the wide adoption of gamified and/or game-based learning in higher education. Some of the issues highlighted include barriers that were not previously identified as part of the Delphi survey, e.g. the fatigue that can be caused by using gamified platforms, the current

\status of gamification and game-based learning in comparison to emerging technologies that have gained more traction recently (e.g. AI), and the lack of availability of easily customisable gamified software that can edited by educators to ensure it is fit for purpose. A selection of participants' quotes highlighting these issues is provided below:

W	P	Quote	Initial Code	FC Characteristic
W1	P3	Also, like, fatigue towards games […] it can get really tiring and fatiguing when everything you do is giving you points and you got to keep track of all these different platforms that you're signed up to […]	Participant critically considering barriers to change for the future [i.e. fatigue caused by interacting in online gamified experiences]	Critically considering barriers to change for the future
W3	P4	if you're talking about teacher education, it's difficult to see how gamification gets a spot at the moment as a core element […] of teacher education, when you've got very loud players like AI and VR and AR […]	Participant critically reflecting on barriers to change [i.e. gamification is less current than AI and other tech]	Critically considering barriers to change for the future
W3	P4	So my one of my big gripes with, you know, technology in education is very often it's the big monoliths that create this software and then teachers just use. And they don't really have any input into how to use it, what specifics might work for them and their subjects.	Participant critically commenting on challenges with current technologies/ gbl/gl [i.e. they are not customisable; not fit for purpose]	Critically considering barriers to change for the future

*2f. Recognising potential of emerging factor or practice for the future**

A final characteristic that became visible as part of the Delphi and the workshops datasets within the dimension "critique of the present", was identifying emerging factors or practices and recognising their potential for the future. Participants highlighted the potential of emerging technologies and practices, particularly the potential of AI transforming higher education in various ways, e.g., supporting personalised learning, allowing for more research time, and enabling academic staff to create learning content and games. Other technologies and practices discussed included Virtual Reality and remote/virtual learning, and the potential of those in bringing geographically dispersed higher education students together. Micro-credentials were also discussed for their potential to transform higher education, by supporting a move away from traditional degree paths. Other practices which were recognised for their potential were targeted learning (where students tackle global challenges rather than major on a topic), and peer learning. The tables below present a selection of notable quotes from the workshops.

Potential of AI: First, many participants highlighted the potential of AI for higher education in 2043. It was discussed that AI can enable personalised learning, support students as a virtual assistant through playful learning, create customised course roadmaps for students, break language barriers, support educators in developing resources, and even support with finding solutions to global challenges:

D/W	P	Quote	Initial Code	FC Characteristic
D1	P5	AI in GBL is indeed an innovation that can have a positive impact in education especially for open-ended tasks in terms of creating automative games and play through virtual assistants, pedagogical agents, in-game adaptive conversations for creative learning.	Participant recognising the potential of emerging technologies for the integration of GL/GBL [i.e. AI as virtual assistant]	Recognising potential of emerging factor or practice for the future
W3	P2	I do think it [AI] will take a lot of the jobs which don't require that imagination. But I don't view the reduction of labour as necessarily a pessimistic thing, as long as AI, and the companies that are in charge of AI are taxed properly, it should open up opportunities for things like universal basic income and free people up to get on with stuff that we really should be putting our imagination towards, like solving the climate crisis.	Participant recognising potential in emerging practice/ technology; i.e. AI will release us from types of labour; AI will open opportunities for universal basic income; free people up to work on more important issues, e.g. solving climate crisis	Recognising potential of emerging factor or practice for the future
W3	P4	AI tools and the potential they have to unleash teacher's ability to create games around curricular areas that are under served. […] And I think tools like chat GPT, which now has a code interpreter, so you can get it to spit out code for you, it removes a layer of complexity for educators and teachers	Participant recognising potential in emerging practice/ technology; [i.e. AI can support teacher's ability to create games; AI removes obstacles of creating GL/GBL]	Recognising potential of emerging factor or practice for the future

Potential of Extended Realities: Participants also highlighted the potential of extended reality technologies, such as Augmented Reality and Virtual Reality worlds and simulations. Participants discussed the potential of AR for place-based education, the potential of VR to support the teaching and learning of abstract subjects and concepts (e.g. chemistry), as well as the assessment of medical subjects via simulations:

D/W	P	Quote	Initial Code	FC Characteristic
D1	P4	VR and AR have greatly expanded the possibilities in the use of simulation type games, particularly in	Participant recognising the potential of emerging	Recognising potential of emerging factor or

		the areas of locating learning in specific environments of allowing access to technology that may not be otherwise accessible.	technologies for the future [VR/AR]	practice for the future
W1	P2	Augmented reality I think is a really powerful tool to kind of layer information onto physical spaces and start kind of creating citywide games and turning the city into a classroom	Participant recognising potential in emerging practice	Recognising potential of emerging factor or practice for the future
W3	P1	what I'm interested in is conceptual understanding, particularly for chemistry, because it's such an abstract subject. […] in terms of something like virtual reality there may be spaces to look at how to support students, to almost concretize what they're trying to explore	Participant recognising potential in emerging practice/ technology; [i.e. potential of using VR to study abstract subjects]	Recognising potential of emerging factor or practice for the future

Potential of game-based learning, gamified learning and game design: When it comes to digital games and gamification, participants highlighted the potential of these experiences in being used to tackle real-world challenges; foster connectedness and collaboration between students; the potential of games becoming seamless and integrated in higher education as interactive experiences; the potential of games and gamification supporting formative assessment, skills development, student motivation, and strategic planning. Finally, based on the increasing number of game design programs appearing in universities, a participant recognised that there will be an opportunity to absorb future game design graduates into higher education, as part of multi-disciplinary teams of learning designers:

D/W	P	Quote	Initial Code	FC Characteristic
D1	P12	The climate and biodiversity crisis poses huge challenges, which GBL can have a role in tackling, through a meaningful, action-oriented engagement with significant real-world issues.	Participant recognising the potential of tech/ practice for the future [gbl to tackle real-world issues; environmental challenges]	Recognising potential of emerging factor or practice for the future
W1	P2	that's more game designers going into the bloodstream than there are jobs […] multidisciplinary teams would be a really interesting way to approach education and […] there's going to be a lot of game designers out there that can be resourced for those types of jobs	Participant noting potential of indie game designers in the present and future	Recognising potential of emerging factor or practice for the future

W3	P4	the idea of game based learning, following the principles that very successful game designers use has incredible potential […] in terms of skills and communication, and motivation and the use of badges and scoreboards and leader boards.	Participant recognising potential in emerging practice/ technology; [i.e. gamification and game-based learning for skills and motivation]	Recognising potential of emerging factor or practice for the future
W2	P7	I think games are phenomenal for your formative assessment. […] I do think a lot of courses have the ability to have certain bits of knowledge that you can gamify.	Participant recognising potential in emerging practice/technology [i.e. potential of games for formative assessment]	Recognising potential of emerging factor or practice for the future

Potential of other practices in teaching and learning: Finally, participants highlighted the potential of various other practices in higher education. The discussion included emerging practices, such as remote learning and how it can reach more students, and targeted learning, and how it can support a move away from students studying a specific major or topic, and rather focus on tackling global challenges. The discussion also included some established practices, which have the potential to grow in the future, e.g., peer learning.

D/W	P	Quote	Initial Code	FC Characteristic
W2	P4	The 42 school was founded in Paris. It's not a university. There are no professors. It's peer learning. […] to get in there, you do an assessment […] and then you work on projects […] And I think that's a really good example of how […] an institution can go against everything that is established.	Participant recognising potential in emerging practice [i.e. peer learning model in higher education institutions]	Recognising potential of emerging factor or practice for the future
W3	P1	I've just finished a European project which was looking at remote inquiries and science education. […] we reached probably 500% more teachers than we would have if it were face to face workshops. […] So in that context I can see it opening up	Participant recognising potential in emerging practice/ technology; [i.e. remote learning]	Recognising potential of emerging factor or practice for the future

6.4.3 Disposition Toward Futures Possibilities

To evaluate participants' disposition toward futures possibilities, the datasets were examined for participant statements that indicated optimism or pessimism about the future, and statements of futures envisioning, i.e., articulating alternative/possible futures for higher education, which demonstrates their openness to future possibilities. The table

below lists the characteristics within this dimension of Futures Consciousness (FC) that manifested in the data.

Dimension	Characteristics	D1	D2	W1	W2	W3
Disposition toward futures possibilities	3a. Envisioning futures	x	x	x	x	x
	3b. Expressing optimism about the future			x		x
	3c. Expressing pessimism about the future	x			x	
	**Indicates a new characteristic not considered in Ahvenharju, Minkkinen and Lalot, 2018 model.*					

Table 6.3 – Disposition Toward Futures Possibilities: Dimension and Characteristics

3a. Envisioning futures

All study participants engaged in envisioning futures to some extent, be it probable, possible, preferable or undesirable, as part of the Delphi survey and the visioning activity of the workshop. This characteristic (3a) is closely aligned to Mische's concept of "breadth", i.e., "the range of possibilities considered at different points in time" (Mische, 2009 p. 699), with some people seeing one single trajectory and others seeing a range of possibilities. It is also linked to the futures thinking characteristic "alternative thinking" (Heinonen and Raleigh, 2015) and Slaughter's concept that future alternatives mean we have new choices in the present (Slaughter, 1993).

The characteristic of "envisioning futures" is related to that of "recognising the potential of emerging factor or practice for the future" (2f). However, the latter is a process deeply rooted in the present. In the examples we reviewed in section 6.2.4.3 (characteristic 2f), participants discussed emerging technologies, practices, and other factors, which already exist in the present in some shape or form. Therefore, the characteristic fits best within the dimension "critique of the present". In the case of "envisioning futures" (characteristic 3a), some of the aforementioned emerging technologies and practices do make an appearance as part of the conversation, but in this case the participants are actively using them to envision various future possibilities.

It is also important to note that the characteristic of envisioning futures refers to the *capacity to envision*, rather than the content of the visions per se. The content of participants' visions was presented earlier in this chapter as a plausible scenario for the

university of 2043. The following tables present notable examples from participants' visions, which demonstrate their process of envisioning possibilities. The main visions are presented below in categories and summarised for readability.

University Campus & Models of Learning: A large part of the workshops discussion focused on the university campus, and what that might look like in 2043. Many participants felt that the physical space of universities will likely still exist, but it will be repurposed to support more dynamic and hybrid models of teaching and learning. In all datasets, and particularly within the three workshops, there was a strong sense that various models will coexist. The question of presence or absence of a physical campus in the future was not explicitly asked in the Delphi survey, however it appeared in the responses, albeit to a smaller extent compared to the workshops.

D/W	P	Quote	Initial Code	FC Characteristic
D1	P4	There will be fewer bricks and mortar institutions, and learners will be able to access learning without geographical limitations.	Participant articulating a possible/preferable future	Envisioning futures
W1	P2	I can't imagine a future 20 years from now or beyond that will not have discovered infinitely more dynamic, engaging, informative ways to deliver the information than through a traditional lecture.	Participant engaging in futures envisioning [i.e. repurposing of physical university space/ move to more dynamic teaching and learning models]	Envisioning futures
W2	P7	there's going to be a big change in our interaction with students […] there's going to be one whole branch, they'll go online learning and credentials. And I think the bigger universities, we will be building students for research in very high level areas.	Participant engaging in futures envisioning [i.e. co-existence of models]	Envisioning futures

Micro-credentials: Participants' futures visions in all three workshops, and to some extend in the Delphi survey, also included the use of micro-credentials in higher education. Visions include a move away from traditional degree paths. In place of these, participants envisioned a dynamic, personalised accreditation system, supported by increased data analytics:

D/W	P	Quote	Initial Code	FC Characteristic
D1	P17	I also see more personalised learning with micro-credentials also being an important piece of the puzzle	Participant engaging in futures envisioning [i.e. use of micro-credentials]	Envisioning futures
D1	P1	I can imagine a HE landscape in which students are increasingly provided with non-traditional structures to fit their increasingly traditional-divergent career pathways	Participant engaging in futures envisioning [i.e. non-traditional degree pathways]	Envisioning futures
W1	P2	[the] university experience […] I think it might become more piecemeal. You'll take a course from here, a course from there. There'll be some kind of a dynamic accreditation system, I think, to account for the various places and give value to things that we don't normally give value to right now.	Participant engaging in futures envisioning [i.e. dynamic accreditation system]	Envisioning futures

Overall Higher Education Landscape: In terms of the overall landscape and the role of higher education in 2043, participants' futures visions included various possibilities. Participants envisioned: a higher education which reaches non-traditional students through online and open courses; a higher education which leverages student data analytics; and a higher education which employs multi-disciplinary teams who create learning experiences. Other visions included: a return to education for the edification of humanity, rather than job preparation; a consolidation of smaller universities towards larger, more established universities; and the possibility of universal basic income, and as a result a free higher education, driven by the changes in employment caused by AI. Relevant examples of participants' quotes are provided below:

D/W	P	Quote	Initial Code	FC Characteristic
W1	P2	we're gonna see more and more data, like the more, you know, heart rate, eye movement, but then emotional data. Right? […] we have measurements for everything now and it'll be much more granular and I think analytics are gonna play much more of a role in education.	Participant envisioning future possibilities [i.e. increased use of data analytics]	Envisioning futures
W3	P2	And now the advent of AI and the potential for massive changes in employment. I'm wondering if we might not be looking at situations where there's things like universal basic income. And if democracy itself might not be, or the current model of democracy, Western democracy, might not change fundamentally as a result of these challenges from technology.	Participant envisioning future possibilities [i.e. universal basic income, current western model of democracy changes; free higher education]	Envisioning futures

Games and Gamification: In terms of whether games and gamified experiences have a place in higher education 2043, and in what way they may be used, participants envisioned various futures possibilities. Many expressed in their visions that game-based and gamified learning experiences will indeed be part of the university experience, to some extent. For example, these experiences may take the form of gamified missions designed by multi-disciplinary teams of designers and educators, or large-scale games, both competitive and collaborative. Other notable comments included: a) the view that gamification will be used more than game-based learning, as digital games can be difficult to develop; b) the view that game-based and gamified learning will be one of many other options of learning, allowing for students to choose the paths that suit their learning preferences. Examples of participant's quotes are presented below:

D/W	P	Quote	Initial Code	FC Characteristic
D1	P5	Students participating in real time gaming activities emancipated in virtual worlds, where learning is contextualised and personalised through AI that suggest games, learning strategies and pedagogy that is most suited to students needs.	Participant articulating a possible/preferable future [i.e. virtual immersive gaming activities, personalised via AI]	Envisioning possible futures
W1	P3	I think it's gonna be games at a really large scale, and I think we mentioned games in the competitive sense, but also in a collaborative sense, I think using games in a cooperative mode for play and learning is really powerful.	Participant engaging in futures envisioning [i.e. large-scale games, competitive and collaborative]	Envisioning possible futures
W1	P2	instead of kids sitting in a classroom and you know waiting for you to lecture or hand out sheets, […] you activate the experience and then for the next 3 days they're doing missions searching for things, whatever the case may be.	Participant engaging in futures envisioning [i.e. gamified learning experiences]	Envisioning futures

3b. Expressing optimism about the future

In terms of dispositions toward future possibilities, there were instances where participants expressed optimism about the future. This characteristic derives from the concepts of "optimism" (Sande, 1972), "optimism about the future" (Lombardo and Cornish, 2010) and "affect" (Trommsdorff, 1983; Beal, 2011), i.e. the positive or negative emotion tied to people's future anticipations. Some participants expressed optimism on how certain technologies will significantly improve and positively impact the future of

higher education, and were hopeful that some of the barriers to using game-based and gamified learning more widely in higher education will be naturally resolved.

W	P	Quote	Initial Code	FC Characteristic
W1	P2	So any of the things that make virtual reality unwieldy or uncomfortable now will certainly be, I think, resolved […]	Participant expressing certainty that virtual reality technology will improve	Expressing optimism about the future
W1	P4	the momentum of our cultural moment will eventually start permeating more aspects of society [i.e. new teachers who have been encultured to games will be more receptive to their inclusion in learning in the future]. So a lot of these barriers that currently exist will just kind of fall by the wayside I think, even without a deliberate intervention.	Participant expressing optimism around solving the dispositional barriers to using GBL/GL	Expressing optimism about the future
W3	P2	I'm actually quite optimistic about how AI will influence society. And that's why I talk about changes in employment, rather than going 'AI is going to make loads of people redundant and get rid of people'[…] I am quite optimistic.	Participant expressing optimism about use of AI in the future	Expressing optimism about the future

3c. Expressing pessimism about the future

On the other hand, there were some (fewer) instances where participants expressed pessimism about the future, indicating a lack of belief that their desired futures will materialise, and a cynicism about the feasibility of future change:

D/W	P	Quote	Initial Code	FC Characteristic
D1	P3	Change will only happen when forced. COVID demanded online learning, higher Ed showed no initiatives; students will demand more customization so only grassroots effort will bring about anything progressive.	Participant indicating pessimism/cynicism about feasibility of future change	Expressing pessimism about the future
W2	P4	But like in, in my vision, which is not gonna happen I know that, but in my vision like the whole, a whole city could become a learning campus.	Participant expressing pessimism about their preferred future materialising	Expressing pessimism about the future

6.4.4 Agency Beliefs

To evaluate participants' agency beliefs, the data were examined for evidence of participants' trust (or lack thereof) in their ability to influence the future, either individually or as a collective, their level of motivation to shape future events, and

whether they acknowledged the importance of futures thinking for shaping desired futures. The table below lists the characteristics within this dimension of Futures Consciousness (FC) that manifested in the data.

Dimension	Characteristics	D1	D2	W1	W2	W3
Agency Beliefs	4a. Expressing belief in ability to influence the future as an individual				x	
	4b. Expressing belief in ability to influence the future as a collective			x	x	x
	4c. Acknowledging the importance of futures thinking for shaping futures			x	x	

Table 6.4 – Agency Beliefs: Dimension and Characteristics

4a. Expressing belief in ability to influence the future as an individual & 4b. Expressing belief in ability to influence the future as a collective

While envisioning a future for higher education, one of the participants considered the possibility of reducing the density of content students are expected to learn, and the implications of this on their wellbeing. As part of that discussion, the participant made a statement which demonstrates a belief in ability to influence the future as a collective, as they foresee that such change will take place due to the pressure of social forces.

W	P	Quote	Initial Code	FC Characteristic
W1	P2	there's a lot of kids that really suffer in school […] I do think we have an opportunity to genuinely make a change now in a way that we couldn't before, and largely because of the pressure of social forces.	Participant expressing view that social forces will drive change	Expressing belief in ability to influence the future as a collective

Another participant expressed the view that learners will drive change in higher education, as they will demand better education:

W	P	Quote	Initial Code	FC Characteristic
W3	P3	I think the driving force there will be also the learners, the students. […] I think learners will not be okay with receiving education or just overall knowledge that they are able to access themselves. So there needs to be an added value. […] So I do believe that learners are there to demand for better.	Participant expressing view that learners will drive change in higher education	Expressing belief in ability to influence the future as a collective

Other participants also indicated belief in their ability to influence the future as an individual and/or collectively. In the examples below, participant expressed the view that individual empowerment is needed for change:

W	P	Quote	Initial Code	FC Characteristic
W2	P1	If we don't try to make the future we want, then we're stuck with the future we get. And oftentimes people don't feel empowered to make things happen for themselves. […] that doesn't mean we can't empower individuals to try to build towards something that they want. […] If we really want this, then we should be working towards it.	Participant expressing view that individual empowerment is needed for change	Expressing belief in ability to influence the future as an individual
W2	P4	it's very hard to go against an institution, but I also believe in the power of the individual. And I think that if we empower enough young teachers and young people to think for themselves, it might change and the institutions might change because the people in those institutions become older as well.	Participant highlighting the need to empower young educators and young people in order to change the system	Expressing belief in ability to influence the future as an individual/ as a collective

4C. Acknowledging the importance of futures thinking for shaping futures

A participant made a statement around how the futures workshop may benefit them and their students, in other words acknowledging the importance of futures thinking for shaping futures. This is a characteristic of futures consciousness that derives from one of Bell's key assumptions of futures studies: "futures thinking and action", i.e. the concept that in order to make conscious decisions for action, futures thinking is essential (Bell, 2003).

W	P	Quote	Initial Code	FC Characteristic
W1	P5	So my interest in this particular project [...] is to do with how to prepare students to think about […] what their life is gonna be like, what society is going to be like into the future. So, thinking about how curriculum and curricula can be designed for people to live in a very rapidly changing world.	Participant explaining how futures thinking will benefit them and their students	Acknowledging the importance of futures thinking for shaping futures

This characteristic manifested in two more instances, where participants highlighted at different times during the conversation the importance of focusing on the future or engaging in futures thinking practices:

W	P	Quote	Initial Code	FC Characteristic
W2	P4	I believe we are a world community […] we all have the same problems and we need to solve them together, not apart. So basically, I think we need to focus more on the future	Participant highlighting need for global community to focus more on the future	Acknowledging the importance of futures thinking for shaping futures
W2	P2	as we walk away today, a hundred more ideas and thoughts will come up. […] Knowing that the goal for today is not to find the solution, right? But it's to start talking about […] thinking collaboratively about how do we do this. […] looking at what are those incremental little pieces of change […] to try to change the discourse, as we want to try to reach that preferred future, as opposed to ones that could be thrust upon us.	Participant critically reflecting on importance of futures thinking	Acknowledging the importance of futures thinking for shaping futures

6.4.5 Proactive Planning of Futures

This is a new Futures Consciousness dimension, which relates to participants' strategic thinking about the future, and it includes evidence of proactive planning for the various futures possibilities discussed in the workshops. Specifically, participants engaged in identifying emerging issues, future surprises, and considered factors that can enable their preferable futures. The below characteristics within this dimension manifested across all datasets:

Dimension	Characteristics	D1	D2	W1	W2	W3
Proactive planning of futures	5a. Identifying emerging issues and anticipating surprises	x	x	x	x	x
	5b. Identifying factors that could enable preferable futures*	x	x	x	x	x
	**Indicates a new characteristic not considered in Ahvenharju, Minkkinen and Lalot, 2018 model.*					

Table 6.5 – Proactive Planning of Futures: Dimension and Characteristics

5a. Identifying emerging issues and anticipating surprises

As part of the workshops, and to a lesser extent as part of the two-round Delphi survey, participants engaged in identifying emerging issues and anticipating future surprises. This is a characteristic aligned to one the main elements of futures thinking highlighted by Heinonen and Raleigh, and it includes "[i]dentifying emerging issues, discontinuities, disruptions, tipping points and anticipating surprises" (Heinonen & Raleigh, 2015 p. 14).

Participants contributed to the discussion by identifying potential emerging issues, e.g. the possibility of the increased engagement in VR heightening people's exposure to harmful radiation; the possibility of GBL contributing to students' short attention span; the dystopian possibility of excessive amount of sensitive student data being captured for surveillance; the possibility of AI bias when it comes to assessing applicants for entry to university; the possibility of issues with the quality of micro-credentials; the risks arising from AI continuing unregulated; and the possible negative impact of AI on various other factors, e.g. on students' ability to critique information, and on educators' ability to verify authentic work.

Identifying emerging issues and surprises is an important anticipatory capacity, as it can help reduce the risk of these materialising as fully-fledged problems, and helps proactively plan for an appropriate response to these challenges (Inayatullah, 2013). The table below presents a selection of participant quotes that demonstrate this characteristic of futures consciousness. Many of the emerging issues identified as part of the workshops were used to articulate undesirable or dystopian futures, which were presented in section 6.3.1.2 of this chapter.

D/W	P	Quote	Initial Code	FC Characteristic
W1	P3	I was just imagining […] things like eye movement tracking, attention tracking, that sort of stuff. If that ever finds its way into higher education, I think we're in trouble.	Participant envisioning a non-desirable future [i.e. where data is used for student surveillance]	Identifying emerging issues and anticipating surprises
W2	P7	I would be very concerned in the next 20 years […] [if] most of your citizens don't talk the same language as the person beside you I think that is more and more this isolation that we've seen of society	Participant envisioning a non-desirable future [i.e. where foreign language learning becomes obsolete due to AI translation, and drives human disconnection]	Identifying emerging issues and anticipating surprises
W3	P4	I think AI has potential there, but also there's lots of dangers there in moving away from the value of students being able to really critique and engage with what they see in front of them.	Participant cautioning around possible future challenge with AI use in higher education [i.e. leading to students not building ability to critique information]	Identifying emerging issues and anticipating surprises

*5b. Identifying factors that could enable preferable futures**

Finally, a second new characteristic of Futures Consciousness, which became visible as part of the Delphi and the workshop datasets, refers to instances where participants identified factors that could enable preferable futures. While linked to beliefs of agency (in terms of shaping our desirable futures), identifying and critically examining factors that can enable preferable futures implies not mere motivation or agency beliefs, but engagement in cognitive deliberation and proactive planning on the part of the participants. Many participants contributed to this part of the discussion within the workshops, and their contributions were presented in detail in section 6.3.2 of this chapter. The below table presents a selection of relevant quotes, which demonstrate the manifestation of this futures thinking characteristic in the data.

D/W	P	Quote	Initial Code	FC Characteristic
D2	P11	Ultimately important are digital and data literacy of both learners and educators. AI regulation is also a promising step towards the establishment of a responsible relationship between AI and teaching & learning.	Participant identifying factors that support the integration of GBL/GL [digital and data literacy; AI regulation]	Identifying factors that could enable preferable future
W1	P2	standardized tests and game based learning don't work well together. So a de-emphasis on […] standardized testing	Participant identifying factors that support the integration of GBL/GL [i.e. through diverse modes of assessment]	Identifying factors that could enable preferable future
W3	P2	If we want gamification and games-based learning to be used well in education, it needs to become part of the initial teacher training.	Participant identifying factors that support the integration of GBL/GL [i.e. through integration of GL/GBL in initial teacher training]	Identifying factors that could enable preferable future

6.4.6 Systems Perception

To evaluate participants' systems thinking, the datasets were examined for participant statements that indicated a consideration of the future in a holistic and systematic manner. In other words, indications of recognition of the interconnectedness of factors and phenomena, and the complexity of the topic discussed. Characteristics within this dimension were less prominent, compared to the previous dimensions discussed. The table below lists the characteristics within this dimension that manifested in the data.

Dimension	Characteristics	D1	D2	W1	W2	W3
Systems perception	6a. Thinking about the future holistically	x	x	x	x	x
	6b. Recognising the complexity of the issue/topic		x			x
	6c. Demonstrating awareness that decisions have long-term consequences			x	x	x

Table 6.6 – Systems Perception: Dimension and Characteristics

6a. Thinking about the future holistically

Overall, there were some instances where participants demonstrated thinking about the future holistically. This characteristic of futures consciousness is closely linked to philosopher Berger's virtue of "looking breadthwise", which requires one to consider the complexity of phenomena and interactions (Godet and Roubelat, 1996). It is also aligned to Bell's concept of interdependence and holism (Bell, 2003) and Heinonen and Raleigh's key characteristic of futures thinking, which includes a "focus on connections between different fields and spheres" (Heinonen & Raleigh, 2015 p.14).

In certain instances, participants demonstrated a critical consideration of various interconnected factors, providing evidence of thinking about the future in a holistic manner. For example, they considered the impact of AI on employment practices, which in turn will change the role of higher education, and the possible positive impact of virtual learning on climate change, due to the decrease of student travel. Some participants also highlighted the need to consider the discussion topic holistically, taking into consideration the broader political-economic landscape. Another participant, reflecting on the various democracy and technology challenges humanity is faced with, recognised how these may lead to fundamental changes in the current western model of democracy, including the introduction of universal basic income – a reflection which demonstrates the participant's recognition of the interconnectedness of factors, decisions and consequences. Sample quotes demonstrating this characteristic are presented below:

D/W	P	Quote	Initial Code	FC Characteristic
D1	P12	The climate and biodiversity crisis poses huge challenges, which GBL can have a role in tackling, through a meaningful, action-oriented engagement with significant real-	Participant considering the topic holistically/ critically considering various factors	Thinking about the future holistically

		world issues. At the same time, the impact of certain GBL instruments (e.g. digital technology) on these issues must be considered. For example, energy usage, technology components (e.g. rare earth metals)...and so on. Secondly, the Covid pandemic has exacerbated already existing inequalities in relation to digital learning		
W2	P3	when we're thinking about what's going to happen in 2043 [we have to think of] the larger kind of landscape of politics and economics and the global environment. […] So we gotta keep that in mind, and the volatility of politics makes it hard to do any real good predictions	Participant highlighting the need to consider the broader political-economic landscape when discussing the topic	Thinking about the future holistically
W3	P2	We've had lots of challenges, which are largely focused around technology, lots of challenges around democracy […] And now the advent of AI and the potential for massive changes in employment. I'm wondering if we might not be looking at situations where there's things like universal basic income. And if […] the current model of […] Western democracy, might not change fundamentally as a result of these challenges from technology.	Participant discussing interconnectedness of factors, decisions and consequences [i.e. democracy challenges and technology developments affect future: introduction of universal basic income, current western model of democracy changes]	Thinking about the future holistically

In many cases, where participants critiqued the present by recognising current trends or recent events and factors that have had a significant impact on the present state of higher education (e.g. the COVID-19 pandemic), their thought pattern also reveals a capacity for systems perception, by considering the topic from a holistic point of view:

D/W	P	Quote	Initial Code	FC Characteristic
D1		the shift to online and hybrid teaching during the COVID-19 pandemic has resulted in a demand for online content and delivery, which in my opinion requires aspects of gamification to maintain engagement and support peer relationships/collaborative working.	Participant considering the impact of the pandemic on learning practices/ interconnectedness of factors	Thinking about the future holistically
W3	P4	if we hadn't just come through a COVID pandemic […] I may have said that we'll wake up in 2043 and it'll be a much more [virtual, i.e. the university space]. I think that post COVID there's a […] renewed sense of purpose around the community that a university campus builds up and the space that people occupy when they get there.	Participant considering the impact of the pandemic on learning practices/ interconnectedness of factors	Thinking about the future holistically

6b. Recognising the complexity of the issue/topic

Closely related to thinking holistically about the future, another characteristic manifested in the data around recognising the complexity of the discussion topic**.** For example, while reviewing the barriers to the wide adoption of gamified and game-based learning in higher education (which were previously identified as part of the Delphi survey), a participant recognised the interconnectedness of the various barriers. They indicated that one barrier impacts the other, and highlighted the importance of searching for the roots of the issue – essentially acknowledging the complexity of the issue in discussion:

W	P	Quote	Initial Code	FC Characteristic
W2	P4	Well, when I look at the barriers on the slide, I think some of them are interconnected. I don't know where it all starts though […] We can't just look at the symptoms we need to search for the roots of that problem.	Participant recognising the interconnectedness of barriers to preferred futures	Recognising the complexity of the issue/topic

Another participant engaged in critical questioning of a possibility for the future (universal basic income and free higher education) but indicated that the topic is complex:

W	P	Quote	Initial Code	FC Characteristic
W3	P1	I think there will be a fight back against it [i.e. universal basic income/ universities being centrally funded]. But, you don't know, the expansion of the EU as well [...] it's one of the things that is talked about. […] But how would it play out? The problem is who owns it.	Participant critically questioning a complex future possibility [i.e. universal basic income, free higher education]	Recognising the complexity of the issue/topic

6c. Demonstrating awareness that decisions have long-term consequences

Finally, some participants demonstrated awareness that decisions have long-term consequences, which shows a recognition of interconnection between factors and systems. For example, in the instance presented below, the participant reflected on the potential risk of a future scenario, whereby larger players absorb smaller institutions, leading in the longer term to a homogenised distribution of information and knowledge.

W	P	Quote	Initial Code	FC Characteristic

W3	P4	there's lots of threats that smaller players […] get pushed out and you end up with a very homogeneous approach to what education and learning is.	Participant critically reflecting on potential risk of future scenario [i.e. large organisations absorbing smaller institutions can lead to homogeneity of knowledge]	Demonstrating awareness that decisions have long-term consequences

Many of the examples presented earlier in the chapter, where participants are identifying emerging issues (characteristic 5a) also provide evidence of systems thinking, specifically an awareness of the interconnectedness of factors and the fact that decisions in the present have long-term consequences. For example, participants discussed the possible long-term implications of widely using AI in higher education, which could result in societal isolation, and lack of student ability to critique information, and widely using micro-credentials, which could lead to only superficial knowledge and skills development.

6.4.7 Concern Beyond the Self

The final dimension of futures consciousness focuses on instances where participants showed evidence of concern beyond the self. The data were examined for statements that indicated a sentiment that we should strive for better futures for everyone, e.g., for the benefit of higher education students or for the wellbeing of humanity. This dimension includes participants envisioning preferable futures for all (i.e., going beyond articulating *personal* preferable futures), instances where participants indicate that the future should be for the wellbeing of others, instances where they are actively considering the impact of a future possibility on others, and finally, instances where participants articulate specific factors that can enable these preferable future for others.

The table below lists the characteristics within this dimension of that manifested in each dataset. Two new characteristics were identified, which are not considered in the existing FC model, but do, in our opinion, demonstrate participants' concern beyond the self.

Dimension	Characteristics	D1	D2	W1	W2	W3
Concern beyond the self	7a. Envisioning preferable futures for all	x		x	x	x
	7b. Indicating that the future should be for the wellbeing of others				x	x

	7c. Considering the impact of the future on others*		x	x	x	
	7d. Identifying factors of a preferable future for others*			x	x	x
	**Indicates a new characteristic not considered in Ahvenharju, Minkkinen and Lalot, 2018 model.*					

Table 6.7 – Concern Beyond the Self: Dimension and Characteristics

7a. Envisioning preferable futures for all

This characteristic manifested in all three workshops, and in the first round of the Delphi survey to a smaller extent. Without explicitly being asked to do so as part of the Delphi survey or the workshop visioning activity, participants engaged in envisioning preferable futures for all, i.e. futures which take into consideration and benefit others. Some of the instances where participants "envisioned futures", which is a futures consciousness characteristic (3a) within the dimension "disposition toward futures possibilities", also provided evidence of "concern beyond the self", then they refer future possibilities which benefit others.

Given the context of the conversation, in many cases these are futures which benefit the learners and the learner experience. For example, participants imagined futures where the higher education learning space is accessible, democratic and collaborative, and equips learners to serve their local community and global society for good. They also imagined futures were higher education prioritises the student needs and their learning experience, rather than focusing on meeting market needs and job preparation. In other examples, participants imagined futures where we have begun to solve climate-related issues, and futures where the technologies are human-centric and exist for the benefit of humanity. Some relevant quotes are presented below:

D/W	P	Quote	Initial Code	FC Characteristic
D1	P12	The HE I would hope to see is a place which serves its local community, the wider region and global society, and provides learners with the knowledge and skills to contribute towards and creatively shape these spaces for good.	Participant articulating a preferable future where HE equips learners to shape community & society for good	Envisioning preferable futures for all

W1	P5	I think the space would be much more collaborative in the future. […] Where knowledge comes through and where it comes from and who owns it I think is rapidly changing. […] So I think, it opens up possibilities for more engagement and more democratic learning space […]	Participant imagining a future where the learning space is more democratic	Envisioning preferable futures for all
W2	P1	I would love it if we were more integrated with the needs of our audience. But also leading those needs to a certain extent, rather than just trying to predict and meet those needs. [...] I'm hopeful that we can become more of that [i.e. job preparation] […] rather than just kind of […] trying to respond to market needs.	Participant articulating a future where learner needs (rather than market needs) are the priority	Envisioning preferable futures for all

7b. Indicating that the future should be for the wellbeing of others

In addition, there were various instances as part of the workshop conversations where participants made statements indicating that the future *should* be for the wellbeing of others. In workshop two, two statements pointed to this characteristic - both instances by the same participant. The participant emphasised the notion that we are a global community with common problems, and highlighted a global future which benefits the students, as they build our future:

W	P	Quote	Initial Code	FC Characteristic
W2	P4	You know, I'm an idealist and I believe that education is not just focusing on the present […] It's focusing on a global future. […] kids in school today and the kids at university they both are our future […] and I believe that we should move towards this social framework, that actually learning is not just a personal issue to get a job, but it's something that we need in order to collaborate.	Participant expressing view that the future should benefit students [i.e. learning is a necessity to collaborate and not just to get a job]	Indicating that the future should be for the wellbeing of others
W2	P4	basically I believe we are a world community. An international community, we all have the same problems and we need to solve them together, not apart. So basically, I think we need to focus more on the future	Participant highlighting need for global community to work together on solving common global problems	Indicating that the future should be for the wellbeing of others

The characteristic also became visible in workshop three, where a participant felt very strongly about ensuring the preferable future is inclusive of and benefits others:

W	P	Quote	Initial Code	FC Characteristic
W3	P4	it's struck me with your quote at the start […] where you talked about very smart people envisioning the future. […] it's not just very smart people creating things for very smart people. […] Whose future is that? […] there are all these possibilities from the future. But it requires that there's a future for everybody in it	Participant highlighting the need for the envisioned future to be inclusive and benefit others	Indicating that the future should be for the wellbeing of others
W3	P4	the conversation of the future has to be couched in the importance of what's right and what good for society within that. So you've climate, you've money, but you've more than that, too. I mean, you've got people's aspirations. You've got cultural issues. You've got people's access to other human beings.	Participant highlighting that the future should be beneficial to society, community, human beings	Indicating that the future should be for the wellbeing of others

*7c. Considering the impact of the future on others**

A new characteristic that was identified in the Delphi and workshop data refers to instances where participants considered the impact of future possibilities on others. This characteristic refers to participant statements which reflect a concern for the wellbeing of others, while discussing various futures. For example, a participant was considering the impact of current processes for entry to university to a certain part of the population, which is excluded from higher education due to their educational background and/or other factors. The statement below indicates a desire for a more inclusive future, by considering the impact of the future on people who would typically be excluded from higher education:

W	P	Quote	Initial Code	FC Characteristic
W1	P2	So examples of low barrier to entry […] extending the university to a greater community reach and that involves people who may be excommunicated from the university because of their history, their educational background	Participant considering the impact of present practices on others	Considering the impact of the future on others

In the second instance, while commenting on the changing role of the university campus physical structure (and a move to possibly remote, more dynamic ways of learning), the same participant indicated their concern for the impact of this future scenario on current academic roles, i.e. professors, researchers, mentors etc. This sentiment indicates a consideration for others and the impact of future possibilities on their wellbeing:

W	P	Quote	Initial Code	FC Characteristic
W1	P2	That doesn't invalidate the presence of professors as guides, mentors, coaches, researchers, all the other roles, and maybe a reconfiguration of those roles.	Participant considering the impact of futures scenario on others.	Considering the impact of the future on others

The same participant was reflecting on a future possibility of reducing the learning content students are required to learn, and considered how that change may positively impact them:

W	P	Quote	Initial Code	FC Characteristic
W1	P2	I think that there's an opportunity to make their lives better. I think more dynamic, more open, more, you know, differentiated to the way that they are, what they want from life, that type of thing.	Participant considering the impact of futures scenario on others.	Considering the impact of the future on others

The characteristic also manifested in workshop two, where participants considered the impact of futures scenarios on others: a) highlighting that technology does not replace the educator, but supports them; and b) expressing concern of how improper use of AI may lead to disconnection between nations and communities:

W	P	Quote	Initial Code	FC Characteristic
W2	P7	I'm recruiting a PhD student at the moment to explore using this new generative AI, specifically large language models, plug them into an avatar, create a VR world and make them be a teacher. […] Not to replace a teacher. I've always stressed in all my research the idea is not to replace the teacher, but to complement and help them out.	Participant considering the impact of futures scenario on educators [i.e. highlighting that the technology does not replace the educator, but supports them]	Considering the impact of the future on others
W2	P4	I'm a foreign language teacher and recently somebody said that with AI we wouldn't have to learn foreign languages anymore. That coming from a politician saying that you don't need French anymore, and we're really close to France and you know, that was a really bad thing to say	Participant expressing concern over possible improper use of AI by politicians [i.e. indicating concern over risks of disconnection between nations/ communities]	Considering the impact of the future on others

Concern of others also manifested within the Delphi datasets, albeit to a smaller extent. For example, participants considered the impact of future possibilities on learners who

do not have the same opportunities in terms of access to technology; and the possible consequence of technology leading to isolation:

D	P	Quote	Initial Code	FC Characteristic
D1	P4	Another significant challenge will be the inequality of access to these technologies for learners from different parts of the world. Of particular concern is the fact that is likely that those most affected by the issues which Higher Education will be endeavouring to solve, will be the same people who have least access to it.	Participant considering the impact of future scenario on those with difficulty accessing technologies	Considering the impact of the future on others
D2	P21	I would tend to prefer a scenario where everyone can access immersive experiences (with or without the use of technology) rather than a scenario where the potential offered by technology is exploited to the maximum, but only by a few.	Participant critically considering impact of future vision on others; equal access to immersive experiences is preferable	Considering the impact of the future on others

*7d. Identifying factors of a preferable future for others**

The final characteristic that became apparent in the workshops is another new addition to the dimensions of futures consciousness. In this case, participants went a step beyond envisioning preferable futures scenarios, to identifying factors that can enable these inclusive preferable future for others. This characteristic is closely related to "identifying factors that could enable preferable futures", which was a characteristic presented in the dimension "proactive planning of futures". However, the two characteristics differ in terms of *who* the future vision is for. The latter refers to instances where participants identify factors that can enable their personal preferable future(s), whereas the former describes instances where participants identify factors that can enable futures that benefit *others*, indicating not only a capacity for proactive planning, but also a consideration for others' wellbeing.

Notably, according to participants' statements, a preferable future for all includes the following elements: in-person, human-to-human interactions; increased use of virtual learning approaches, which ultimately have a positive impact to climate change; flexible pathways within learning that allow users to choose whether to engage in gamified learning or not; collaborative, transdisciplinary efforts to address global challenges; diverse and inclusive assessment practices that take into consideration students learning

and emotional particularities; clear AI regulation and efforts to ensure all people understand what AI is and how to use AI it. The table below presents some examples:

W	P	Quote	Initial Code	FC Characteristic
W1	P2	I just see it as one of the solutions to climate change, honestly, the less people travel, the less carbon we're putting in the air. […] I do feel that the more we can reduce traffic on the streets, the better we're working for climate. And returning people to their communities.	Participant recognising the positive impact of virtual learning to climate change and community	Identifying factors of a preferable future for others
W2	P5	I believe that we have to adapt learning not only depending on the type of students with special educational needs (from visual, auditory, motor or cognitive) or even with other particularities (anxiety, loneliness, lack of ability to perceive feelings, among others). We have to think that the teaching-learning and assessment processes have to be more effective and efficient, so that the students have time for themselves and to improve their emotional competences, which are the ones that will significantly enhance the cognitive ones.	Participant highlighting ways learning and assessment can be more effective and inclusive [i.e. to support students educational needs and improve their emotional competences]	Identifying factors of a preferable future for others
W3	P4	AI literacy, you know. […] So if you want a mass market of AI, it needs to be available to everybody, but in an equitable […] way, and they understand how to use it. But I think also they understand how the impact it's having on their lives, whether they know it or not, you know?	Participant highlighting the need for AI literacy, to benefit all	Identifying factors of a preferable future for others

6.5 Conclusions

The chapter presented the third and final phase of the research, i.e. a) the completion of a series of futures workshops and the thematic analysis of these conversations; and b) the examination of the workshop and Delphi survey datasets for the presence of futures consciousness dimensions.

Through the thematic analysis of the futures workshops, a narrative of the futures visions that were articulated for GL and GBL in higher education was developed. In summary, participants imagined a university of 2043 with hybrid models of teaching and learning. Some institutions preserve and repurpose their physical campuses as service centres for students, whereas other institutions are more distributed and accessible via local learning hubs across geographical locations. Artificial Intelligence features heavily in 2043, enabling a transformation in terms of learning assessment, supporting personalised

learning pathways, and aiding educators to easily and quickly create learning resources. Learning experiences are co-designed by multidisciplinary teams of educators and designers. GL and GBL experiences feature in 2043 higher education, not as a single solution or as part of mainstream framework, but as part of a wide-range of approaches.

Moreover, a number of actions for shaping preferred futures were identified. These include: a) targeted research to provide sufficient evidence-based examples of GL/GBL integration in higher education; b) improvements in teacher education, such as inclusion of playful pedagogies; c) various changes in academic practices, such as hiring instructional designers to work with educators, moving away from standardised testing, and partnering with non-governmental organisations to achieve games development at lower cost; and d) improvements in generative AI and extended realities, reaching a stage where they become mainstream and easily accessible.

The final layer of analysis demonstrated that various futures consciousness characteristics manifested throughout the workshops and to a smaller extent the Delphi survey responses. These characteristics provided evidence of participants' a) temporal perceptions; b) their ability to critique the present; c) their dispositions toward futures possibilities; d) their agency beliefs in terms of whether they have confidence in their ability to shape their preferred futures; e) their ability to proactively plan and enable preferable futures f) their systems thinking and capacity to think about the future in a holistic way; and finally g) their values thinking, which was demonstrated by showing concern beyond the self.

Chapter 7 – Conclusions

7.1 Introduction

This research study set out to explore visions for the futures of gamified learning and game-based learning in higher education, and to examine futures orientations and dimensions of futures consciousness therein. This chapter responds to the research questions, articulates the contribution to new knowledge and research, and highlights the key recommendations from this study.

7.2 Overview of Research Study

This qualitative study explored futures in relation to GL and GBL in higher education using a hybrid Delphi futures studies method. The study was guided by two research questions:

- What futures are envisioned for gamified and game-based learning in higher education, and how futures-oriented are these visions?
- What aspects of futures consciousness emerge in expert-led futures thinking exercises, and critique thereof?

The study unfolded in three phases. Figure 7.1 illustrates the output of each research phase, and the research questions addressed in each. In phase one, a systematic trend review of the integration of GL/ GBL in higher education was conducted, which explored the history of the issue in line with Inayatullah's "Mapping" pillar and the first two steps of questioning the future, i.e. "What is the history of the issue? Which events and trends have created the present?" (Inayatullah, 2013, p. 60). This type of mapping the past and present is an important enabler within futures exercises, as it provides contextual information for the past and present integration of GL and GBL in higher education. From a futures research process perspective, this mapping provided points for comparison, baselines in terms of past and current practices of GL/GBL integration. From a futures thinking (pedagogic) perspective, it provided participants with the continuities and

discontinuities in terms of GL and GBL integration in higher education in the past to the present, which allowed them to critically consider a range of possibilities for the future.

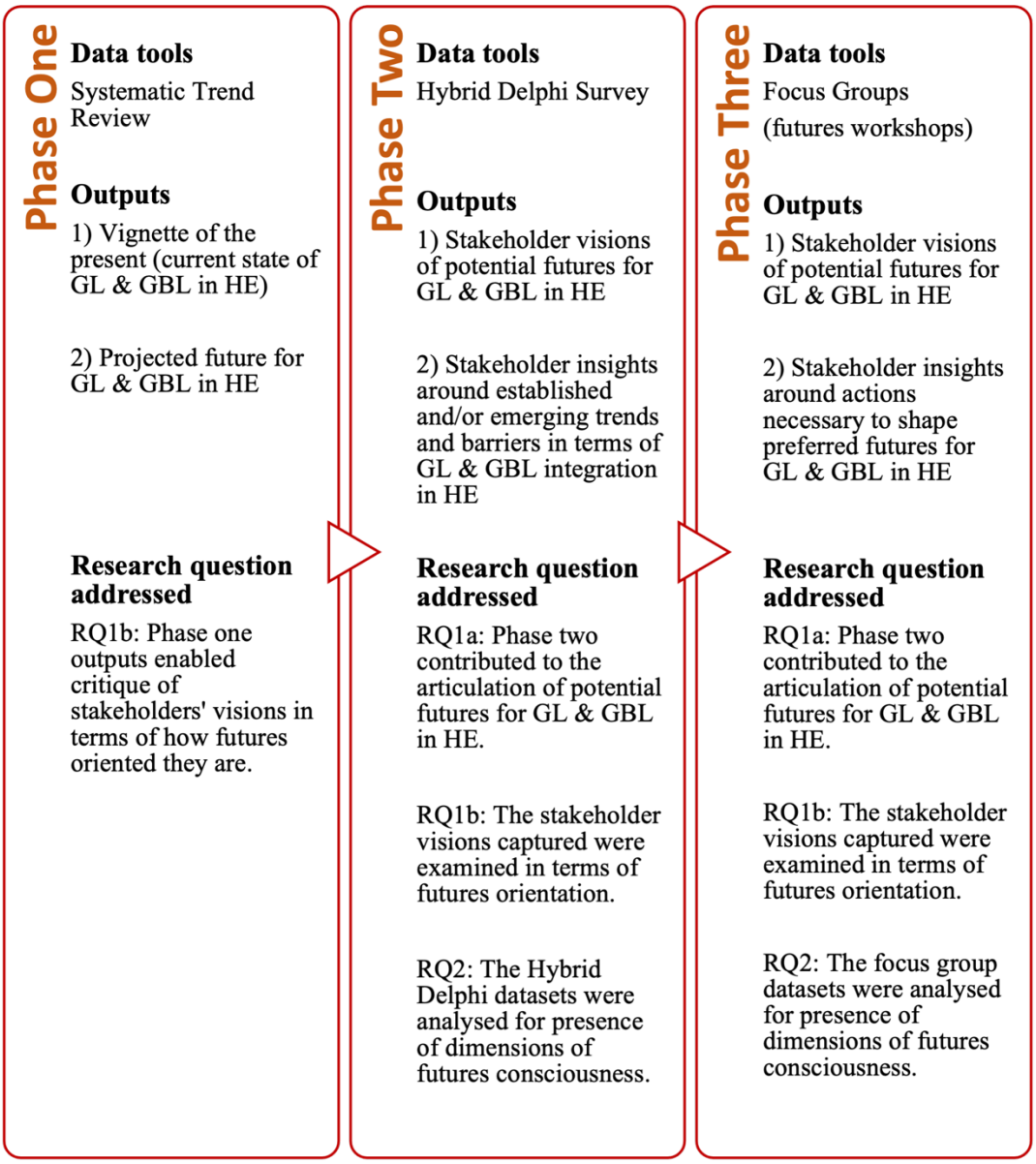


Figure 7.1 – Diagram showing the output of each research phase, and the research questions addressed in each

In phase two, a summary of the trend review findings, i.e. the vignette of the present, was presented to participants as part of the first round of the Delphi survey. The participants were an expert panel of academic staff and industry practitioners within the fields of GL,

GBL, game-design and other technology-enabled learning settings. Participants were given the opportunity to critique and respond to the vignette of the present - the "projected" future, i.e. a "business as usual" scenario or "most probable" of the probable futures if current trends continue (Voros, 2017). Participants were also given the opportunity to expand beyond this vignette by articulating alternative futures possibilities for higher education, particularly in terms of the potential future use of game-based and gamified learning experiences in 10-15 years. Participants also identified:

- current technological trends, and socio-political, environmental, economic or other factors that could alter the direction of GL and GBL integration in higher education.
- barriers that may hinder the widespread integration of GL and GBL in higher education.
- other factors that could support the effective integration of GL and GBL in higher education.

In phase three, a series of futures workshops took place with subsets of the overall expert panel, aiming to capture alternative futures possibilities, including desirable visions, as well as factors that need to change and actions that need to take place in the present, to shape the future. Thematic analysis was used to analyse the futures visioning, with a frame of analysis informed by dimensions of futures consciousness identified in the literature, utilised to explore dimensions and elements of futures thinking.

7.3 Responding to the Research Questions

7.3.1 What futures are envisioned for gamified and game-based learning in higher education, and how futures-oriented are these visions?

The visions articulated by participants within the Delphi survey responses and the workshop conversations share similarities to a great extent. This could be largely attributed to the fact that all participants based their visions on the same trends and signals of change in the present: the rise of AI and the Metaverse, the potential of AR and VR tools, and the increased use of micro-credentials – to name a few. By way of example, the Delphi survey responses showed agreement between participants on the likelihood of

a future higher education which will provide the majority of programmes via blended modes of learning. Micro-credentials were also expected to be widely recognised for entry to university, and VR, AR and MR technologies were expected to be widely adopted for teaching and learning. All these futures possibilities were also confirmed in the workshop visions as probable for higher education. Moreover, the potential of AI for the future of higher education featured in both rounds of the Delphi, and was also heavily discussed in the workshops. However, the workshop platform enabled participants to expand on the visions more robustly. Therefore, the potential of AI was described in the workshops in more detail, compared to the Delphi, e.g. AI was deemed useful not just for personalising learning experiences, but also as support to educators in developing resources, creating course roadmaps for students, supporting with solving global challenges, and enabling creativity. The visions that were articulated as part of all phases of the research are presented in more detail below.

The Projected Future

As a result of the systematic trend review (phase one), a projected future was developed. According to Voros, this could be considered the most probable of the probable futures (2017). In other words, if nothing changes and present trends continue into the future, this is what we can expect the future to look like. In the projected future, GL and GBL are integrated in higher education in a wide range of subject areas, as complementary approaches to more traditional teaching methods (e.g. lectures). However, with no formal framework or policies to streamline their adoption, these experiences take place in a non-mainstreamed manner, led by instructors or institutions who have specialist knowledge and/or interest in these approaches. In the projected future, GL and GBL experiences continue to have largely positive outcomes, particularly in terms of increased student motivation and engagement, but their effectiveness is dependent on a wide range of situational variables, such as the learning context, the target audience, and the learners' specific learning needs – very much in line with Facer and Selwyn's (2021) findings, whereby any outcomes of digital technology used in education are context-specific and not consistent. A number of present barriers to the widespread adoption of GL and GBL in higher education continue into the projected future, including concerns around the use of technologies (e.g. unreliable internet connection, limitations of institutional Learning

Management Systems) a lack of buy-in from institutions, and a lack of educator knowledge on how to use these approaches practically and effectively.

A Multitude of Potential Futures

As the future is not fixed and predetermined, anything beyond the present moment is considered a potential future (Voros, 2017). Indeed, as a result of the first round of the Delphi survey, a plurality of potential futures emerged for GL, GBL and higher education 10-15 years into the future. Participants engaged in futures envisioning and articulated various possibilities, some of which are probable, based on current trends and the respondents' knowledge and experience, and others are desirable visions based on the respondents' personal preferences or values system. The Delphi round-one participants imagined a higher education 10-15 years into the future, which:

- adopts blended modes of learning, i.e., online and face-to-face learning.
- recognises micro-credentials for entry to university and as part of degree pathways.
- integrates mandatory student placements in real-world settings.
- widely adopts a model of team-teaching of modules.
- focuses on personalising learning to meet student needs.
- focuses on pedagogies that support the sustainable development goals.
- moves away from physical structures, becoming more accessible to learners.
- includes various diverse institutions learners can pursue qualifications from
- adopts various technologies, such as AI, AR, VR, MR, and the Metaverse.

In terms of the use of digital GL and GBL in particular, Delphi one participants imagined a higher education which integrates these approaches 10-15 years in the future in a variety of ways, e.g., fully integrated in curricula; in conjunction with micro-credentials; in combination with outdoor, "unplugged" activities; or integrated in virtual worlds that are personalised to learners' individual needs with the use of AI. In these potential futures visions, GL and GBL approaches are used to achieve various goals, such as knowledge building; skills development; and to support group problem solving of and engagement with global challenges.

A Probable Future

Voros (2017) speaks of "Probable Futures" as futures that are "likely to" happen. In the second round of Delphi, among other activities, participants were asked to rate the likelihood of each of the above-mentioned potentialities materialising in 10-15 years. Many of the possibilities articulated in the first round of the Delphi survey were confirmed through this exercise as probable to materialise. In this "probable future" for GL and GBL i.e. the future that is likely to happen based on current trends (Voros, 2017), the majority of education provision is via blended modes of learning, but not fully remote. There is still some requirement for students' physical presence on campus. Micro-credentials are widely recognised for entry to university. In terms of technologies, VR, AR, and MR are widely adopted for teaching and learning. Digital GL and GBL grow as fields and are indeed included in higher education practices to some extent, however their adoption is not widespread. The level and type of their adoption varies considerably among institutions and programmes.

A Plausible Future

The three workshop conversations, which followed the two-round Delphi survey, focused first on the overall landscape of higher education in 2043 (i.e. 20 years from today - a longer horizon than the Delphi survey), within which gamified and game-based approaches were positioned and their role in the future was discussed. There were certainly some patterns and common themes in the participants' visions, from which a plausible future for the university of 2043 was developed as a summary of the three workshops. According to Voros (2017), a "plausible" future is one that *could* happen "based on our current understanding of how the world works". In this plausible future for higher education in 2043, various hybrid learning models of teaching and learning co-exist - there is no universal, single approach of doing things. This vision features online, digital collaborative spaces, removing the constraints around the time and place where learning takes place, extending higher education to a greater community reach. Some physical university spaces still exist to enable human-to-human interaction, and in some cases these structures are repurposed as research centres or student support centres. Some institutions are more distributed, with local learning hubs and collaboration spaces across the city, making learning more accessible to local community and more in line with a sustainable lifestyle (i.e. less travel needed).

Learning experiences in 2043 are personalised to the learner, and are informed by a wide-range of pedagogical approaches, both digital and non-digital. The experiences are developed by multidisciplinary teams of educators, learning designers, game designers etc. In terms of degree pathways, some fields preserve the traditional degree path, others follow more dynamic accreditation systems, with the wider implementation of micro-credentials supporting tailored learning. Models of learning assessment change to meet learner needs and abilities.

As AI is widely used by students to access information, universities in 2043 focus on fostering students' ability to critique, synthesise and innovate using the received information. AI tools are also widely used by educators' to create and customise learning content, artifacts and resources, including games. Other technologies widely used include the Metaverse, Augmented and Virtual Reality, and haptics, which support simulated learning environments and immersive collaborative spaces. GL and GBL feature in 2043 higher education, not as part of a mainstream framework, but as part of the wide-range of pedagogical approaches available in the university learning experience. These approaches include a wide-array of interactive learning opportunities and playful approaches, utilised in a variety of ways, e.g. for formative assessment, for application of learning, for promoting social emotional learning, as part of gamified micro-accreditation processes, and as collaborative spaces for problem-solving global challenges.

Alternative Desirable Possibilities for Futures

Some participants articulated futures possibilities that deviate from the patterns identified as part of the Delphi and workshop discourse. For example, a Delphi participant articulated a future scenario where all students can access immersive experiences, with or without the use of technology. They stated that this would be preferred, rather than a scenario where "the potential offered by technology is exploited to the maximum, but only by a few" (D2, P21). This is a vision which shows the respondent's values-thinking. Preferable futures include the notion that some future possibilities are more desirable than others. Bell argues that if any future is as good as another, then there would be no reason to be concerned about the future (Bell, 2003). Others considered a future vision where universities offer highly progressive degree models. Rather than picking a study field, students choose a global challenge they wish to address. With the support of AI

tools, their degree roadmap is generated, and includes the learning pathways necessary to tackle the chosen challenge. Other desirable, progressive visions for higher education included those which saw the role of university moving away from career preparation and meeting market needs, and moving towards the edification of humanity.

Un-desirable Futures

While not explicitly requested as part of the Delphi or the workshop conversations, some participants also articulated undesirable visions for higher education. For example, a) a vision where the higher education sector is solely market driven and focuses on online mini-awards and transferrable skills, neglecting to foster deep learning; b) a vision where universities use AI to track and gather excessive, sensitive learner data (e.g. anxiety levels); c) a vision where learning foreign languages is no longer required, due to the instant translation capabilities of AI, which eventually leads to increasing gaps between countries and societal isolation; and d) a vision where smaller universities consolidate towards larger institutions, resulting in information coming only from one source.

Two participants described undesirable visions that could even be categorised as "preposterous" futures, i.e. futures that we judge as "ridiculous" or impossible to ever happen (Voros, 2017). In the first instance, a participant imagined a vision of universities turning into giant dystopian academies 10-15 years in the future, which ban reading and writing, and involve students in complex gamified activities, such as dancing judged by professors. In the second instance, a participant imagined a future where AI develops unregulated, surpasses human intelligence and takes control. Perhaps the latter is a less "preposterous" possibility than the former one, however one would hope that it is indeed an impossible scenario, given there are already efforts made to regulate AI, e.g. with the European Commission proposing a EU regulatory framework for AI in April 2021[32].

7.3.1.1 How futures-orientated were these visions?

Overall, the visioning exercise within the Delphi survey worked well, with participants articulating a wide-range of possibilities for higher education in 10-15 years in the future. However, it was observed that the majority of the visions were very much grounded on

[32] https://www.europarl.europa.eu/news/en/headlines/society/20230601STO93804/eu-ai-act-first-regulation-on-artificial-intelligence

the present landscape, i.e. they were heavily influenced by present trends, technologies, and practices. As a result, many of the articulated Delphi visions remained within the "probable" and "plausible" space – an observation which also emerged from reviewing the relevant literature of futures studies featuring technologies for higher education (Roberts and Sapio, 1998; The Economist, 2008; Deloitte, 2021). While probable and plausible visioning is not necessarily a negative, as likely this is what participants would naturally find most practical, useful and relatable to their practice, the futures horizon was intentionally extended to 20 years for the workshops visioning activity. According to Chiu (2012) "increasing the temporal distance of future thinking facilitates creative thinking" (page 234), therefore the 20-year horizon would likely enable further observations around participants' level of futures thinking and futures consciousness.

Unsurprisingly, many workshop participants, and some Delphi participants, expressed difficulty projecting into the future, particularly given the rapid technological developments. Even with the extended 20-year horizon of the workshops, many of the visions discussed were rooted in the present and described futures based on technologies and practices that are already used in the present to some extent, e.g. use of micro-credentials, use of AR for learning etc. There were some instances, however, where the visions offered unique perspectives. For example, there were two instances where Delphi visions diverged from the plausible and probable visions, by proposing unique ideas. The first instance is the preposterous vision described earlier in this chapter, which features universities as dystopian academies. The second instance includes a vision where students participate in real-time personalised gaming activities within virtual worlds, in which students' badges, points and feedback can be used in the real world, e.g. to find jobs. The originally of this vision lies in the fact that it is not based on current practices. While virtual gaming worlds exist, gaming metrics do not presently have real-world applicability. An example from the workshops includes a vision which sees drastic changes in western democracy, eventually leading to universal basic income and subsequently a free higher education for all.

In terms of how futures-oriented the visions were in regard to the technology they featured, first, it is worth noting that the vast majority of workshop participants were knowledgeable and articulate around emerging technologies and their potential for higher education in the future. This was not surprising, given the background and expertise of

the majority of the panel was within the spaces of GL, GBL, and technology-enabled learning. Participants' showed good understanding around emerging technologies such as AI, AR, VR, and learning analytics – all of which have indeed been identified and are discussed in relevant literature for their potential in higher education (indicatively: Deloitte, 2021). Very few participants engaged in envisioning new technologies of the future and how these may be used in higher education. One participant, for example, imagined a future where people can virtually meet as holograms, giving a sense of human presence, despite being geographically distributed. Another participant imagined a possibility were AI develops the ability to pick up human thought, and responds to questions without one having to type them in a platform. Beyond these instances, there was hesitation in the workshops to discuss technologies that do not already exist in some shape or form. On that note, one participant commented astutely: "it's hard to predict what technologies will be around, because that's a guarantee for making yourself look foolish, quite honestly" (W2 P1).

It is also worth noting that a few participants highlighted that technology is not always necessary for the success of GL and GBL activities. For example, in the first round of Delphi a participant commented: "I don't think technology adds much - in fact the opposite. LMS dominate higher Ed, they are standardized, and they allow for very little innovation". In workshop two, the conversation led two participants to agree that meaningful game-based activities can be developed without any digital elements or with the use of very affordable technologies, e.g. paper cards and simple Augmented Reality applications. In workshop three, the participants were also clear that the core pedagogy behind GL and GBL is what's truly important, rather than the technology involved. For example, P2 commented: "there's definitely this idea that actually gamification is a piece of software, it's some kit. And if they buy this product and install it, then all of their learning problems will be solved. And of course it's not. […] games for me are just a vehicle, as is gamification, because fundamentally underlying it all is the concept of play". These views bring to mind Facer and Selwyn's (2021) learnings from past educational initiatives that utilise digital technologies, that digital technologies do not necessarily improve learning and that "digital technologies alone do not transform education" (p.16).

Finally, in terms of futures-oriented visions, some of the desirable visions articulated as part of the workshops are good examples of participants ability to futures think beyond what is probable. For example, the vision of universities moving away from the traditional model of choosing a major, and moving towards students choosing a mission, i.e. a global challenge they wish to tackle, shows a significant diversion from current practices.

7.3.2 What aspects of futures consciousness emerge in expert-led futures thinking exercises, and critique thereof?

As an additional layer of analysis, the datasets were examined for the presence of elements of futures consciousness in the participant responses. The data analysis was informed by the conceptual model of Futures Consciousness Dimensions (Ahvenharju, Minkkinen and Lalot, 2018), which was used as a coding frame. In addition, the data was reviewed reflexively, allowing for new coding opportunities where new characteristics or dimensions of Futures Consciousness manifested in the data, to describe participants' cognitive deliberations, perceptions, dispositions, beliefs and values thinking. A summary of what emerged in the data is provided below in figure 7.2, as a Frame of Futures Consciousness.

Figure 7.2 – Frame of Futures Consciousness

Dimension One: Temporal Perceptions

This dimension includes participants' perspective when it comes to the concept and the passing of time. The characteristics within this dimension relate to participants' perception of time, how far an individual sees into the future, and their ability to place probable future events onto a future timeline. As part of this dimension, the participants of all three workshops engaged in long-term futures thinking to some extent. This was prompted by the visioning activity, during which participants were asked to envision higher education 20 years into the future, i.e. 2043. While all participants engaged in futures projections to some extent, some participants challenged the "timing" used for the futures projection exercises, expressing difficulty or hesitation to project futures visions within the context of the study, given the rapid and unpredictable technological developments. This was prominent in the futures workshops, which focused on a 20-year horizon, but was also evident to a smaller extent in the Delphi survey responses, despite the fact that the focus of the survey focused only 10-15 years into the future. Finally, various workshop participants considered probable events and were comfortable to indicate at which point in a future timeline these events may materialise. This characteristic indicates participants' ability to critically consider the timeline of the future, and place future events at specific points in time.

Dimension Two: Critique of the Present

This dimension of Futures Consciousness focuses on participants' considerations of present factors. These include current trends and signals of change, present challenges, and barriers to change, present assumptions and critical questioning thereof, emerging factors or practices, and consideration of their potential for the future. As part of this dimension, a good level of understanding and critical consideration of current technological, socio-political, environmental, and economic trends, challenges and barriers to change was evident throughout the workshops and Delphi survey datasets. In addition, participants were able to identify various signals of change in the present, such as emerging factors and practices, and many actively engaged in highlighting their potential for the future. In addition, the futures workshop dataset provided evidence of critical thinking in the form of questioning assumptions of present views, decisions, and practices.

Dimension Three: Disposition toward Futures Possibilities

This dimension of Futures Consciousness relates to participants' disposition toward the various future possibilities, including their level of optimism or pessimism about the future, and their engagement with envisioning possibilities for higher education. Evidently, the vast majority of Delphi and workshop participants showed an openness to futures exploration, by engaging in some form of envisioning futures, be it probable, possible, preferable or undesirable. Compared to the Delphi survey, the workshops provided a better platform for the participants to provide richer descriptions of their visions, share and/or critique views with others, and inspire new visions as part of the conversation. Both attitudes of optimism and pessimism about the future were evident in the datasets to some extent. Optimism manifested in the form of hopefulness for achieving our preferable futures, confidence that many of the barriers to change will eventually subside, and positive attitude towards certain technologies (such as VR and AI) and how they will improve and positively influence society. On the other hand, much of the pessimism that became evident in the dataset was rooted in systemic barriers of change, such as the institutional resistance to innovation.

Dimension Four: Agency Beliefs

The dimension of agency beliefs relates to participants' trust and confidence (or lack thereof) in their ability to influence the future, be it individually or as a collective. Agency beliefs also influenced participants' dispositions towards the futures exploration process, with some workshop participants acknowledging the importance of futures thinking for shaping desired futures. It is interesting to note that there was no evidence of this dimension in either round of the Delphi survey. As part of this dimension, some workshop participants expressed beliefs that the future can be shaped by social forces. Both in the workshops and to a lesser extent the Delphi responses, some participants expressed the view that learners have the power to drive change for higher education, by demanding better education and/or by showing preference to some institutions than others, driving competitive advantage. Some participants also emphasised the need to empower students and educators to shape their futures, indicating a belief in the ability of these collective

groups in transforming the future, and indicating confidence in the importance of futures thinking.

Dimension Five: Proactive Planning of Futures

This Futures Consciousness dimension relates to participants' strategic thinking about the future, and it includes evidence of proactive planning for the various futures possibilities discussed, by identifying emerging issues and possible surprises, and consideration of factors that can enable preferable futures. Participants' ability to identify emerging issues and anticipate surprises was evident in the futures workshops. In contrast, as the Delphi survey focused on identifying current, established, challenges, there was no evidence of this characteristic in the survey responses. The majority of emerging issues that were highlighted in the workshops revolved around potential risks that could arise from the inappropriate or unregulated use of emerging technologies, such as Artificial Intelligence. In addition to identifying emerging issues, the workshop participants identified and critically examined factors that can enable preferable futures. This type of cognitive deliberation was guided by the backcasting activity, which took place during the second-half of the workshops. Participants demonstrated proactive preparedness and planning, by highlighting various factors necessary to influence the future, including changes in academic and research practices, adjustments in teacher education, and improvements in technology.

Dimension Six: Systems Perception

The sixth dimension of futures consciousness with manifested in the datasets includes evidence of systems thinking, i.e. participants' consideration of the future in a holistic and systematic manner. This includes participants' recognition of the interconnectedness of factors and phenomena, and the complexity of the topic discussed. This dimension was less evident in the datasets, but characteristics of systems thinking did manifest in the workshops, and to a lesser extent in some of the Delphi responses. While discussing futures visions, some participants co-examined various factors (technological, geopolitical, socio-economic), demonstrating holistic thinking. There were also instances where participants discussed the possible long-term implications of factors or practices,

such as the inappropriate use of certain technologies or micro-credentials with no quality control, which demonstrates an awareness that decisions have long-term consequences.

Dimension Seven: Concern beyond the Self

The final dimension relates to participants' values thinking, and it includes evidence of participants' demonstrating concern beyond the self. This includes the sentiment that we should strive for inclusive, better futures for everyone. As part of this dimension, participants moved beyond their personal preferable futures, and envisioned preferable possibilities for the benefit of others, e.g. for the benefit of learners or for the overall wellbeing of humanity, and identified factors that can enable these visions. In some cases, while commenting on various proposed visions, participants showed concern or consideration on the impact of those future possibilities on others, such as the students and academic staff that may be affected. There were also participant comments, which indicated that the future we *should* strive for should be for the wellbeing of others. While this dimension manifested to a small extent in some of the Delphi responses, it was more prominent in the workshop conversations.

7.4 Moving Towards a Frame of Futures Consciousness

While the existing conceptual model of Futures Consciousness by Ahvenharju, Minkkinen and Lalot (2018) was useful in its application as a coding frame (see Appendix F) some discrepancies and limitations became evident while critically examining the study datasets. As the data was reviewed not only by applying the pre-determined coding frame, but also reflexively, new coding opportunities emerged, which led to new Futures Consciousness characteristics and dimensions. There were also instances where characteristics presented within the original model were re-categorised under new dimensions, to best describe participants' cognitive processes, systems thinking, values thinking, strategic thinking and dispositions, based on what emerged in the datasets. A visual representation of the adaptations to the original Futures Consciousness model is presented in Figure 7.3 (and Appendix G) and a discussion on these modifications is presented below.

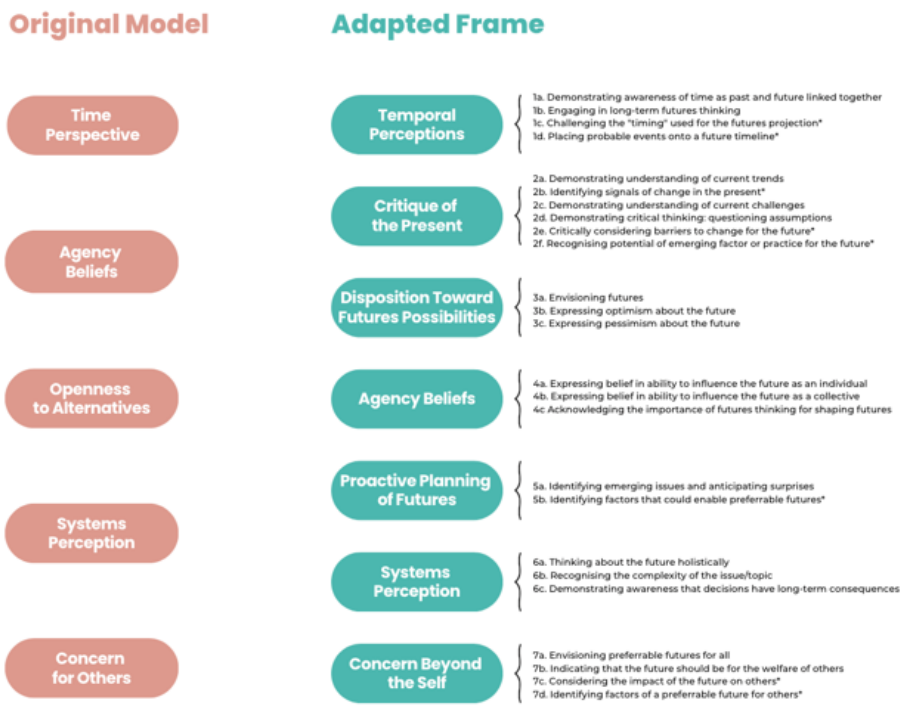


Figure 7.3 – Tracing and Mapping Dimensions of Futures Consciousness

Firstly, various characteristics included in the original model did not manifest in the study data, and are therefore not presented in the adapted frame of Futures Consciousness. Specifically, the concepts of how near or far one perceives the future, which were originally placed within the dimension "Time perspective", while useful for examining futures consciousness, they did not become evident in the study data and were therefore excluded. However, two new characteristics became apparent and were added under this dimension, which was renamed "Temporal perceptions" to encompass a broader spectrum of characteristics relating to how people sense and interpret time. The first characteristic was the action of challenging the "timing" used for the futures projection. Some participants challenged the feasibility of projecting far into the future within this context, due to the rapid technological innovations we are experiencing. Another new characteristic was the action of placing probable events onto a future timeline, showing a capacity to consider the future as a timeline and pinpoint at which point in time certain events may materialise. Other examples where characteristics were excluded from the frame due to not emerging in the dataset, include the level of participants' interest about the future, and whether their interest is on the personal, national or world level –

characteristics that were categorised under the dimension of "System perception" in the original model. In the case of the Delphi and workshops datasets, these characteristics were not deemed relevant and were therefore excluded from the adapted frame.

Many of the concepts within the dimension "Agency Beliefs" also did not become visible in the data, for example, the characteristics of "showing courage to face their fear of the unknown" or "thinking about the future with calmness and self-control". Moreover, it was observed that some of the original characteristics within this dimension were expressions of *dispositions*, rather than beliefs. In the original model (Ahvenharju, Minkkinen and Lalot, 2018) two distinct concepts of futures consciousness articulated by Sande (1972), "optimism" and "influence", were both categorised under the dimension "Agency Beliefs". However, according to the theorist, one can feel powerless but remain optimistic, or feel influential but be pessimistic. Based on this distinction of the two concepts, it is understood that optimism and pessimism about the future reveals more about peoples' *attitude* about the future, rather than their belief system, i.e. their confidence in the ability to influence their future. As a result, the characteristics of "expressing optimism/pessimism about the future" were re-categorised under a new dimension: "Disposition towards futures possibilities".

The latter dimension emerged from the previously known "Openness to alternatives". Firstly, it was felt that the use of the word "alternatives" can be somewhat restricting, as it implies the acceptance of a default or projected future, from which participants are deviating by articulating alternative futures. "Possibilities" was deemed as a more open and flexible term to describe the multitude of futures discussed in the dataset, which included plausible, probable, preferable and even undesirable visions. Moreover, the characteristic of "thinking about the future with creativity, imagination, and curiosity", which was originally presented under "Openness to alternatives" felt highly subjective (how does one define what a creative or imaginative vision look like?) and were therefore excluded from the coding frame. Finally, it was observed that some of the characteristics originally included under this dimension, such as demonstrating understanding of current trends and challenges, and identifying emerging issues, revealed more about participants' cognitive skills rather than their openness, which is a disposition. As a result, the aforementioned cognitive characteristics were re-categorised under a new dimension: "Review of the present".

The new dimension "Review of the present" includes a variety of characteristics that showcase participants' cognitive deliberations in regard to examining the present, prior to projecting into the future. All characteristics, which demonstrate understanding or critical review of present factors, were categorised under this dimension. This includes an understanding of current trends and challenges, a critical questioning of present assumptions, as well as some new characteristics which manifested in the data, i.e. instances where participants critically considered barriers to change, identified signals of change in the present, and recognised the potential of emerging factors or practices for the future.

Another new dimension which became visible in the data was named "Proactive planning of futures". It was felt that this separate dimension was needed to demonstrate participants' strategic thinking when it comes to shaping the future. Two futures consciousness characteristics were included under this dimension. First, the characteristic of identifying emerging issues and anticipating surprises, i.e. one that was previously presented under "Openness to alternatives" in the original model. It was felt that the action of identifying emerging issues and surprises demonstrated more about participants' strategic thinking, proactiveness, and planning, rather than their openness (a positive disposition) to alternatives. Second, a new characteristic was evident in the data and added under this dimension: the action of identifying factors that could enable preferable futures. There were many instances in the datasets where participants demonstrated this futures consciousness characteristic, which showcases strategic thinking.

Finally, the dimension of "Concern for others" from the original model proved to be relevant in the examination of the study dataset, however the term "others" felt highly human-centric. In the interest of inclusivity, the dimension was renamed to "Concern beyond the self", allowing for instances where the concern is for the wellbeing of other elements or beings, e.g. the planet, the flora and fauna etc. Moreover, two new characteristics manifested within this dimension. The first one includes instances where participants showed consideration about the possible impact of a future vision on others, and where they identified factors of a preferable future for others.

7.5 Reflections on the Study

Given the large gap in the literature within this niche space, i.e. studies exploring the future of gamified and game-based learning in higher education, using a futures studies approach to explore this topic was certainly not a smooth and straight-forward journey, but an enjoyable one nonetheless. Essentially, the study focused on researching what is *not* there – but of course one would argue that the whole field of futures studies is researching things that have not happened yet! As Bell puts it, "there are past facts, present options, and present possibilities for the future. There are no past possibilities and there are no future facts" (Bell, 2003, p. 148). The future is unknown and exploring the future does not result in certainties.

Overall, reflecting on the three-phased process followed as part of the study, each of the phases contributed significantly to the exploration of the future. The first phase, which included studying past and present gamified and game-based learning interventions in higher education, reviewing current trends and extrapolating a projected future, was an essential first step to the study. This would be very much in line with the approaches found in the relevant literature (presented in chapter two), whereby the majority of futures studies within a higher education context first embark in an exploration of the history and current state of an issue, prior to developing futures scenarios.

Phase two, which included the two-round Delphi survey with stakeholders, also proved to be a useful approach within this context. Given surveys tend to be online, self-paced, and less time consuming than live focus groups or workshop methods, deploying the Delphi survey resulted in successfully reaching a larger group of stakeholders. A number of other studies in the relevant literature appear to combine the Delphi tool with participatory approaches, such as back-casting (Höjer, 1998; Marchau and Heijden, 2003; Zimmermann, Darkow and von der Gracht, 2012) – and in the case of Zimmermann et al. (2012) Delphi is introduced specifically to increase trustworthiness of the back-casting exercise, given it allows for stakeholder participating in a structured and transparent manner. In this case, overall, the Delphi rounds worked well as a first touchpoint with stakeholders prior to the futures workshops. The findings from the Delphi served as a basis to the workshop conversation, particularly when it came to providing a summary of identified barriers to the widespread adoption of gamified and

game-based learning in higher education. A downside to the Delphi tool was that only a small number of participants provided rich responses to the open-ended questions. The Delphi respondents provided useful insights around present trends, emerging technologies and present barriers to change, but engaged very cautiously with visioning future possibilities. Moreover, However, some of the Delphi participants who also participated in the subsequent workshops did not recall whether they had completed the survey, which raises the question whether the gap between survey(s) and workshops should be shorter, to allow for sense of continuity and momentum.

Unsurprisingly, the futures workshops were a more effective method for capturing robust stakeholder views and futures visions. The workshops, which formed phase three of the study, brought together a subset of the Delphi participants, along with new participants, to further explore the topic, focusing on visioning preferred futures and identifying actions that can shape these futures. In an effort to encourage participants to expand their visions further into the future, the visioning exercise which took place in the first half of the workshop adopted a horizon of 20 years from today, as opposed to the 10-15 years horizon of the Delphi survey.

Overall, the workshop format worked well for capturing a wide array of views on the future. The design of the workshop was intentionally semi-structured, to allow the group to explore the topic in a flexible manner. Based on participant comments, participant interactions, and facilitator reflections, the effectiveness of the workshop was assessed for enjoyability, usefulness to participants own practice, effectiveness of panel selection, effectiveness of workshop structure, effectiveness of activities, and opportunities for improvement.

In terms of enjoyability, overall, participants found the exchanges positive and the experience of meeting like-minded people rewarding. It is worth nothing that at the end of the workshop, some participants expressed interest to be kept updated on the research progress, or even attend future similar workshops organised on this topic. Many of the participants also expressed that they found the workshop conversations useful for expanding their own knowledge on the topic and learning from others.

In regard to the workshop panel selection, this included a mix of industry practitioners and higher education educators, particularly those working within pre-service teacher

education at different levels. As a facilitator reflection, in each workshop there was a good mix of people from various backgrounds and varying levels of familiarity with educational pedagogies, game design and technology, to allow for balance of views.

In terms of the workshop structure, the activities were structured enough to ensure we keep on time, but flexible enough to allow participants to take the conversation to new territories. At the end of the workshops, some participants commented positively around the structure of the workshop and the questions that were posed as part of the conversation. It was also evident throughout all three workshops that participants were comfortably interacting with each other either live or via the chat function, posing follow-up questions to each other, agreeing or disagreeing with each other's views or proposing new ideas, triggered by others' responses. For example:

> *Conversation triggering new thoughts: "a few things I haven't thought about, just listening to your conversations, which is great, but also led to me to the other idea […] how does learning happen?" (P1 W3)*
>
> *Participants pushing the conversation forward by asking direct questions to others: "Just picking up on what P2 said and what you guys said […] is the notion of a degree in a lot of cases going to be an outmoded concept?" (P1 W1)*
>
> *Participants expressing differing views: "P2: Lesson planning is an ideal application for AI, isn't it? […] P1: No, I fundamentally disagree, in the sense that lesson planning is actually thinking about student learning and how students learn". (P2 and P1 W3)*

In terms of opportunities for improvement, it was evident that the ideal number of participants was between 4-5 for the workshop format. Workshop 2 included 7 participants, 6 of which were very engaged and expressed a variety of differing views. This made it difficult for a sole facilitator to moderate the conversation effectively. Participants were also interacting with each other via the chat function throughout the session, which made it challenging, at times, to monitor the various strands of conversations, in order to ask targeted follow-up questions. Moreover, as a personal reflection, listening back to the recorded sessions, some questions could be posed in a more concise way. E.g. instead of "do you see the use of gamification or game based approaches? Is it any different 20 years from now than it is today? Do you want it to be different in some way, and if so, how would you like to see §those approaches being

used?". A number of a questions were posed at the same time, whereas it would perhaps be clearer and more effective if each question was posed separately.

Compared to the Delphi method, the workshops provided a better platform for capturing actions necessary to share preferable futures. This was guided through the back-casting activity, which enabled participants to share views in real-time and provide sufficient detail to what they were proposing as actions. As discussed in the previous chapter, the identified actions included a number of necessary changes in academic practices, research practices, introduction of regulatory frameworks, technological improvements etc.

However, in terms of the effectiveness of the workshop activities, the back-casting activity proved to be challenging. While the main barriers that need to be addressed were clear to participants, identifying specific actions that need to take place in the present was difficult. This raised the question around the suitability of the back-casting activity with the group of study participants. Given the topic discussed was complex, and many of the identified obstacles to the widespread adoption of gamified and game-based learning were larger, institutional and/or systemic barriers, the workshop participants would not necessarily be the main actors that can action these measures in the present. Perhaps the inclusion of institutional leaders and/or policy makers as part of the conversation would have resulted in stronger views around necessary actions in the present.

It also raised the question whether looking for concrete actions and solutions in the present as part of this futures exercise was perhaps out of scope in this case, given the topic was complex and exploratory, and whether the *real* benefit was to share views, open up new futures pathways and inspire possibilities. As a workshop participant put it: "that's one of the nice things about this [futures exercises] is getting this opportunity to share and learn from one another […] Knowing that the goal for today is not to find the solution, right? But it's to start talking about […] and thinking collaboratively about how do we do this. […] so that as we all return back to our work [we look] at what are those incremental little pieces of change or […] those points that can be leveraged or shared, to try to change the discourse, as we want to try to reach that preferred future, as opposed to ones that could be thrust upon us". [Workshop 2 Participant 2]. The participant eloquently highlighted that the participatory process of futures exercises enables those

involved to implement gradual changes in their own present, and perhaps even empower others to become active agents in shaping their preferred futures.

7.6 Contribution to Knowledge and Research

This research study set-out to explore projections for the futures of gamified and game-based learning in higher education, in order to examine the futures orientation of these visions, and implications thereof, and to uncover the dimensions of futures consciousness that emerged within this futures studies exercise. Futures studies approaches were used to hone visions for the integration of gamified and game-based learning in higher education. Within these processes, the participants engaged in critique of the past and present, and examined possibilities for the future integration of game-based learning and gamified learning in higher education. The findings revealed multiple visions for the futures of gamified and game-based learning in higher education, and evidence of elements of futures consciousness that were mapped within the newly formed Futures Consciousness frame.

The study makes significant contributions to the domain of futures studies in its tracing and mapping of dimensions of futures consciousness, which is of critical importance to the development of the anticipatory (futures thinking) competency. The study initially leaned on the existing conceptual model of Futures Consciousness (Ahvenharju, Minkkinen and Lalot, 2018), which was developed based on the definitions of futures consciousness in the literature from various domains. The study utilised the conceptual model of Futures Consciousness (Ahvenharju, Minkkinen and Lalot, 2018) in a coding frame to trace dimensions and characteristics of futures consciousness in the expert-led conversations around futures for GL and GBL in higher education. Through that process, existing dimensions and characteristics of futures consciousness were renamed and/or recategorised, and new dimensions and characteristics of futures consciousness were mapped, to describe stakeholders' cognitive perceptions, dispositions, beliefs and values emergent in processes of futures thinking. The adapted Frame of Futures Consciousness (shown in figure 7.2) would be of interest to futurists, particularly those exploring education futures and the emergence of futures consciousness in relevant stakeholder's engagement with futures exercises.

The study further contributes to the body of knowledge around futures for gamified and game-based learning in higher education, through its mapping and critique of a wide-range of future visions that emerged from the three phases of the study, specifically in terms of the integration of GL and GBL in the near future (10-20 years), which was shown in the literature review to be an under researched area. The study findings related to research question one, i.e. the vignette of the present, the projected future and further stakeholder futures scenarios, such as probable, plausible and preferable futures of GL and GBL in higher education, would be of interest to educators and researchers engaging in education research within higher education, particularly those researching or integrating the GL and/or GBL approaches in their practice, and futures of higher education in this domain.

In addition, the study contributes to the body of knowledge around using futures exercises and futures thinking tools in education research. In this regard, the hybrid Delphi method and follow-up futures workshops were evidently beneficial as both pedagogical tools and research tools in the enactment of this futures research study.

More broadly, the study contributes to the literature around gamified learning and game based learning, specifically in terms of the past and present use of these approaches in higher education, as articulated within the systematic trend review. The outcome of this review is relevant to those engaged in research around integrating GL and GBL in higher education.

7.7 Concluding Recommendations

The key recommendation is for the dissemination of the findings of this study in a number of ways: firstly, two academic papers will be published, the first of which will present the Frame of Futures Consciousness, and the second will present the futures visions for gamified and game-based learning in higher education, and critique of the orientations thereof. Furthermore, the findings will be presented at the education research conferences, such as the European Conference on Educational Research. The research will also be presented within the doctoral programme at DCU, in areas of professional focus such as Education for Sustainable Futures.

Further recommendations include to engage in further *futures studies* research to deepen understandings of the impact of other futures thinking processes on the development of futures consciousness, and to engage in studies with more diverse stakeholders in higher education, and other education levels. In particular, it would be beneficial to explore the contribution of futures studies methods and tools, such as the Futures Wheel (Glenn and Glenn 2009) and the Causal Layered Analysis (Inayatullah 2004) in the deepening of futures consciousness, and futures actions. Furthermore, given the emergence of generative forms of artificial intelligence, it would be interesting to explore potential contributions from this field to the visioning of futures, and the field of futures studies and futures research.

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Appendix A:

Ethical Approval

DCU | APPS

Katerina Economides <katerina.economides2@mail.dcu.ie>

Amendment to DCUREC/2020/025

rec dcu <rec@dcu.ie> 12 November 2020 at 12:18
To: Katerina Economides <katerina.economides2@mail.dcu.ie>

Dear Katerina,

Thank you for submitting the amendment for your research project DCUREC/2020/025. I can confirm that the REC Chair has completed their review and issued approval for the amendment and all associated documentation. Please accept this email as formal approval.

Wishing you the very best for your research.

Best wishes,
Adam Platt

[Quoted text hidden]

> [Quoted text hidden]
>
> **Séanadh Ríomhphoist/Email Disclaimer**
>
> *Tá an ríomhphost seo agus aon chomhad a sheoltar leis faoi rún agus is lena úsáid ag an seolaí agus sin amháin é. Is féidir tuilleadh a léamh anseo.*
>
> *This e-mail and any files transmitted with it are confidential and are intended solely for use by the addressee. Read more here.*

--
Kind regards
Adam (On behalf of REC)

Research Ethics Committee
Dublin City University
Tel: 01 700 5612

[Quoted text hidden]

Appendix B:

Protocol for Informed Consent Online & Zoom Protocol

Protocol - Informed Consent Online

1. Participants will be provided with an online version of the Plain Language Statement (PLS) followed by an online consent form (both the PLS and consent form will be embedded within an online survey tool).
2. A separate tick box will be provided for each statement/clause as outlined within the Informed Consent form, which must be completed by participant to indicate consent.
3. Each statement/clause will be set as mandatory to complete to ensure that full informed consent has been obtained.

Protocol for Conducting Focus Group Workshops and Interviews Online Via ZOOM

1. Pre-ZOOM meeting Advice and Guidance:

   Before the ZOOM meeting, participants will be sent by email an online etiquette (netiquette) guidance sheet, which will outline good practice behaviours for online meetings.

2. Preventing access to the online meeting room before the researcher arrives:

   Participants will be placed in a waiting room until the researcher is ready to start the interview and focus group workshop.

3. Preventing unintended access to the online meeting room:

   The researcher will share a dedicated ZOOM meeting weblink with participants. The security icon will be used to prevent unauthorised access (lock) the ZOOM room.

4. Sharing screens:

   The researcher and participants will use the ZOOM facility to share screen during the focus group workshop. The researcher has within ZOOM the facility to stop participant screen sharing in the event of a security or a netiquette breach.

5. Participant Camera:

   The researcher will advise participants that the camera can be switched ON or OFF during ZOOM meetings.

6. “Muting” Participants:

   The researcher has the facility within ZOOM to mute participants in the event of audio or feedback issues, or a netiquette breach.

7. Removing Participants:

   The researcher has the facility within ZOOM to remove participants in the event of netiquette or security breaches.

8. Keeping the ZOOM software up to date:

   The researcher commits to using the most up-to-date version of the ZOOM app.

Appendix C:

Table presenting the identified futures studies by main method used

Main Method Used	Studies Identified	Topic	Details / Other methods used
Delphi	(Schüll, 2019)	Current trends and future challenges of the Austrian Universities of Applied Sciences.	Literature based trend analysis and explorative scenarios.
	(De Wit and Hunter, 2015)	The Future of Internationalization of Higher Education in Europe.	N/A
	(Noh *et al.*, 2013)	Usage of Facebook: The Future Impact of Curriculum Implementation on Students in Malaysia.	The authors use "Fuzzy Delphi method", a different version of Delphi, which is deemed by the authors are more cost-effective and less time-consuming (De Wit & Hunter 2015 p 1264)
	(Huisman, de Boer and Bótas, 2012)	The future of English Higher Education.	Scenarios: Following the Delphi questionnaire, the authors present two scenarios on the future of English Higher Education. The first scenario is based on the consensus elements of the expert responses, and the second one is developed as a counter-scenario. (Huisman et al. 2012 p 344)
	(Rieckmann, 2012)	Identifying key competencies crucial for sustainable development.	N/A
	(Hayes, 2007)	The future of marketing of higher education.	N/A
Trend Analysis	(Beynaghi *et al.*, 2014)	Future orientation of Higher Education post Rio+20.	Panel Discussion: The analysis was followed by an expert panel discussion, where experts presented their views on the topic.

	(Inayatullah, 2012)	University futures through analysis of current drivers and trends, as well as past trends.	Scenarios: Following the trend analysis, the author articulates scenarios on university futures.
	(Hashimshony and Haina, 2006)	The future of the university through analysis of societal trends and assessment of impact of those trends on the future of universities.	Scenarios: Following the trend analysis, the author proceeds with articulating three scenarios on the future of universities.
	(Vincent-Lancrin, 2006)	Changes in and future scenarios for academic research.	Scenarios: Following an analysis of characteristics, trends and drivers of academic research, the author articulates scenarios for the future of academic research in a 20-year period time.
	(Boer *et al.*, 2002)	The future of academia based on extensive review trends, developments and stakeholders' views within the reviewed literature.	N/A
Scenario building	(Hammershøj, 2018)	Identifying trends which may lead to a disruptive scenario for higher education.	"Diagnosis of the times […] identifying signs of change, interpreting patterns and directions, and drawing on historical analysis." (p 161) While not identified as trend analysis, the process of diagnosis of times appears to be similar to the former process.
	(Barnatt, Starkey and Tempest, 2016)	Risks that threaten the future of business schools.	The scenarios are based on the authors' own research into business schools, work experience within business schools, as well as previous work in the futures field.
	(Beynaghi *et al.*, 2016)	Implications of sustainable development trends and university future directions post the United Nations Decade (2005-2014) of Education for Sustainable Development.	Trend analysis. The authors generate trend-based scenarios by combining a variety of futures studies methods.
	(Blass and Hayward, 2014)	Innovation in Higher Education.	Literature review – To develop the scenarios, the authors draw on previous work and drivers identified in previous studies.
	(Faasse, Meulen and Heerekop, 2014)	Future of Dutch universities.	Literature review, interview with stakeholders, cross-examining scenarios with experts.
	(SARUA, 2012)	Strategic planning for Southern African	Scenario building workshops, literature review, review of past and current trends, International Futures Model.

		Universities (medium and long-term).	
	(Blass, Jasman and Shelley, 2010)	Future of higher education sector in UK.	Literature review – The authors based their scenarios on an extensive literature review covering among others education, business and socio-political studies.
	(Azman, Sirat and Karim, 2010)	Future of Malaysian universities.	Review of current state of Malaysian university and future trends.
	(Munck and McConnell, 2009)	Strategic planning for an Irish university.	Two scenarios are developed – short term horizon (5 years)
	(OECD, 2008)	Future of higher education.	List of drivers for each scenario
	(Snyder, 2006)	The future evolution of university.	The author examined trends and forecast to develop the scenario presented in the paper
Causal Layered Analysis	(Baradaran Ghahfarokhi, Mohaghar and Saghafi, 2018)	Futures of the University of Tehran (UT).	Interviews, content analysis, mapping, literature review, reverse CLA and backcasting with expert panel. The researchers used CLA as framework, and collected data from sources such as literature reviews, and interviews with university stakeholders. They also conducted content analysis of university regulations, they mapped the current state of the University of Tehran and used reverse CLA with an expert panel to establish new metaphors for the university, and backcast in order to envisage a new future for the UT.
	(Conway, 2012)	Exploring the relationship between academics and administrators in universities.	The author conducted workshops, focus groups, interviews with volunteers using CLA. For each level of CLA she used probing questions. Using a series of questions, the author guided the discussion in order to reframe the relationship between academics and administrators.
Six Pillars approach	(Inayatullah, 2012)	Develop scenarios and strategies for the future of higher education in Malaysia.	The six pillars approach is used as part of a future-oriented event, with academic leaders. In the paper, particular emphasis is given on the following methods, as part of the six pillars approach: futures triangle, causal layered analysis and scenario planning.
	(Inayatullah and Milojevic, 2016)	Leadership and governance in higher education for Malaysian universities.	The six pillars approach is used as part of a five-day course, where higher education educators presented their futures scenarios to the deans. Following this phase, the deans framed their desired futures for Malaysian universities. In the paper, particular emphasis is given to the following methods: futures triangle, causal layered analysis and scenario planning.
	(Inayatullah and Milojević, 2014)	The future of higher education in Malaysia.	The paper reports on the same event as Inayatullah and Milojevic (2016). The six pillars approach framed an action-learning course with purpose of framing futures for Malaysian universities. Emphasis is given on the following methods: futures triangle, causal layered analysis and scenario planning.
	(Ithnin, Mohd Nor and Yusoff, 2017)	Future scenarios for Universiti Teknikal Malaysia Melaka.	Foresight workshop with university stakeholders, facilitated by Sohail Inayatullah. Mutliple methods used, as part of the six pillars approach, including futures triangle, futures wheel,

			emerging issues analysis, Sarkar game[33], Causal Layered Analysis, scenarios, visioning, backcasting.
Visioning and/or Backcasting in workshop setting	(Géring *et al.*, 2018)	Future of Higher Education.	The authors conducted a two-day workshop using a custom methodology, which included: • Framing phase – Using "participatory systems mapping"[34] method. • Visioning phase – Using the "world café"[35] method. • Backcasting phase – Using a modified version of the futures wheel method.
	(Blass and Hayward, 2015)	The role of business schools in the future in developing globally responsible leaders.	The researchers help collaborative workshops with academics and business leaders to explore the topic. The workshops were inspired by transformative scenario planning (Kahane 2012) and Scharmer's Theory U (Scharmer 2009) on transformational change. The workshops included group discussion and brainstorming ideas on how to move from the current state to the desired future state.
	(Havas, 2008)	Futures for universities.	The author articulates futures using a three-level structure, with the term "cascading visions" (Havas 2008 p558).
	(Hicks, 1998)	Educators (higher education) articulate their desirable futures and sources of hope.	While the paper is not focused on the future of higher education per, the researcher works with educators in participatory futures workshops. Moreover, the study is focusing on long-term horizon, i.e. more than 25 years into the future. Elements of these interventions may be useful when designing workshops or focus groups as part of my study. The intervention included: • each participant recording initial thoughts prior to the workshop • bringing in the workshop a personal object that is a symbol of hope • writing up list of changes they wish to see in the future • illustrating preferred futures in poster format • examining the posters to find common elements in their visions of the future Following the workshops, the researcher compared the workshop findings with previous research on the topic.
	(Hicks, 1996)	Students envisage their desirable futures.	The workshop aims to capture higher education student's view of the future and their desired world in 2020. While the study is not concerned with the future of higher education, I include this study in this literature review as it appears as a good example of workshop focusing on

[33] A type or role-playing game where participants assume archetype roles and discuss with each other to see whether they can step out their archetype in certain situations, and discover solutions to world problems (Inayatullah 2017)

[34] Participatory systems mapping is an analytic process where "participants focus on finding the most important variable of a given problem or situation, and attempt to establish a web of interconnections among them" (Géring et al. 2018 p66)

[35] The world café method is a "deliberative and creative process in which participants are encouraged to think in an associative way in relation to the focus of the world café […] and look for connections between their ideas and the ideas of others (Géring et al. 2018 p69). In this case, participants were split into three groups,, with each participant rotating tables in order to discuss all questions posed by the researchers.

			long-term future (25 years into the future). As part of the intervention, the facilitator used guided visualisation to help students articulate their preferred future worlds.
Framework Foresight	(Hines, 2017b, 2017a; Hines and Whittington, 2017)	Emerging student needs (higher education).	All three papers discuss a project undertaken to explore six aspects of student life in the future. To explore the topic, the project team used a custom methodology: a modified version of "Framework Foresight", which was developed by the university of Houston Graduate Program in Foresight. The methodology included the following steps: • Current assessment: As this stage, the team assessed and defined the scope of the project, including time horizon and area of forecast. • Scanning: During this phase, the team found, collected and analysed materials that signify how the topic may change in the future (50 years horizon). • Forecasting: During this phase, the team constructed a probable future (if all continues the same way) and alternative futures. • Analysis: In this last phase of the project, the team analysed the alternative futures for patterns.
Conceptual Papers	(Abeles, 2006) (Melville-Ross, 2010)	Future of the university. Challenges for the future of higher education in the context of leadership, governance and management.	The two papers identified are exploring futures without utilising a particular methodology.
Case Study	(Tynan and Lee, 2009)	Academic staff envision the future of higher education	The paper follows a case study approach, where the researcher analyses the stories of the participants (academics at an Australian university) relating to learning technologies, and identifies patterns, barriers and potential solutions.

Appendix D:

Studies Deploying and/or Evaluating Gamification

Author & Year	Title	Description	Sample	Platform	Game Elements	Main Findings
(Brom *et al.*, 2019)	Gamifying a Simulation: Do a Game Goal, Choice, Points, and Praise Enhance Learning?	The study examined the effectiveness of gamification when used within a simulation for teaching a complex process (how to brew beer).	98 students	Computer	goals, increased freedom of choice, points, virtual currency, praise	Neutral: ● Positive student attitudes towards gamification ● No significant improvement of learning outcomes or intrinsic motivation levels ● Points, virtual money and having a "game-like" goal were received positively
(Carlos Cuevas-Martinez *et al.*, 2019)	Jump to the Next Level: A Four-Year Gamification Experiment in Information Technology Engineering	The study explored the impact of gamification in the assessment process of a Telematics Engineering degree.	Unclear	LMS	Intrinsic and extrinsic rewards, competition, coins, levelling up	Positive: ● Increased performance ● Positive experience ● Did not interfere with the evaluation
(Cerqueiro and Harrison, 2019)	Socrative in higher education: Game vs. other uses	The study compared the use of gamified and non-gamified version of the Socrative mobile app.	68 students	Socrative, Mobile App	Points, leaderboard, time limit	Positive: ● Both gamified and non-gamified versions were well-received ● Gamified version was more enjoyable

						• Socrative supports collaboration • Good tool for feedback and formative assessment
(Christopoulos, Conrad and Shukla, 2018)	Interaction with Educational Games in Hybrid Virtual Worlds	The study explored the inclusion of educational and leisure mini-games in a virtual world to increase student motivation and engagement	51 students	Computer Open Simulator world	Amusement park, lego maze, row boats, quizzes	Neutral: • Positive impact of mini-games on student engagement • Non-significant impact on learning process • Not all students equally attracted to mini-games
(Felszeghy *et al.*, 2019)	Using online game-based platforms to improve student performance and engagement in histology teaching	The paper explores the effectiveness of a gamified competition, using Kahoot, on students' performance, learning and enjoyment.	215 students	Kahoot Mobile App	Quiz, time limit	Positive: • Increased student satisfaction, motivation, and participation • Students felt that they learned the material more comprehensively • Kahoot was deemed to be a risk-free, judgment-free environment to practice • Students felt more relaxed in group games than individual • Immediate feedback was viewed positively
(Glowacki, Kriukova and Avshenyuk, 2018)	Gamification in Higher Education: Experience of Poland and Ukraine	The study explored the use of Kahoot to gamify an "English for Specific Purposes" course.	43 students	Kahoot Mobile App	Quiz, Kahoot audio features	Positive: • Increased student engagement, enjoyment and sense of achievement

						• Competition and music/audio features contributed to enjoyment • Some students felt worried of losing
(Grivokostopoulou, Kovas and Perikos, 2019)	Examining the Impact of a Gamified Entrepreneurship Education Framework in Higher Education	The study examined the impact of including Non-Playing-Characters and gamified activities, in a 3D world.	86 students	Computer	Pedagogical agents, quizzes, real-world training scenarios, hints	Positive: • Deeper understanding of entrepreneurship concepts • Increased engagement with learning activities • Improved self-efficacy • Increased student intentions to open their own business
(Hensen, Koren and Klamma, 2019)	Gamification support for learning in spatial computing environments	The study evaluated a gamified mixed reality experience on 3D structures, to enhance motivation and long-term memory.	14 students 4 lecturers	HoloLens, HTC Vive, Computer	Quests/quizzes, badges	Positive: • Positive student experience • Badges contributed to motivation • HoloLens not suitable for private use (expensive and heavy), but can serve as shared equipment
(Jurgelaitis *et al.*, 2019)	Implementing gamification in a university-level UML modeling course: A case study	The study explored the effectiveness of gamification in enhancing learning and motivation in a computer science course.	137 students	LMS (Moodle, with added plugins)	Levels, unlocking content, quizzes, points, badges, leaderboard, trading coins for rewards	Positive: • Increased performance • Increased student motivation • Basic Moodle functionality not sufficient to deploy gamification

(Jurgelaitis, Drungilas and Ceponiene, 2018)	Gamified Moodle Course for Teaching UML	The study explored the use of gamification in an Information System Design course.	22 students	LMS (Moodle, with added plugins)	levels, challenges, points, virtual currency, and rewards	Positive: ● Students found the gamified course enjoyable and useful ● Not all students progressed through levels, as participation was voluntary ● Basic Moodle functionality not sufficient to deploy gamification
(le Maire *et al.*, 2018)	Clash of Chemists: A Gamified Blog To Master the Concept of Limiting Reagent Stoichiometry.	The study used a gamified blog to support undergraduate Chemistry students in their assignment.	53 students	LMS (Blackboard Learn)	Challenge, points, video rewards, leaderboard/ranking	Positive: ● Positive student experience ● Significant increase in performance ● Enhanced understanding of the topic ● Leaderboard was seen as negative aspect of the experience ● Time investment by teacher is necessary, but worthwhile
(Mader and Bry, 2019)	Fun and engagement in lecture halls through social gamification	The study explores compares the use of social (team-based) gamification in a small course and a large lecture hall.	600 students	Backstage, audience response system (run on students' laptops)	Quiz questions, team leaderboard, real-time score, feedback	Mixed: ● Approach fostered participation and engagement in small class ● Approach not successful in large audience, where teams were randomly assigned and not sat together ● Overall, students are positive about social gamification

						• Need to adapt the approach based on audience
(Ortiz-Rojas, Chiluiza and Valcke, 2019)	Gamification through leaderboards: An empirical study in engineering education.	The study explores the impact of leaderboards in an engineering course to increase performance.	89 students	LMS	Weekly activities (e.g. quizzes), leaderboards (absolute and relative)	Positive: • Significant increase in performance • No impact on intrinsic motivation, self-efficacy, or engagement
(Tsay, Kofinas and Luo, 2018)	Enhancing student learning experience with technology-mediated gamification: An empirical study.	The study explores the use of gamification in a Professional Development course.	136 students	LMS (Moodle)	Essential and optional activities (quizzes, videos etc.), badges, leaderboards	Positive: • Significant increase in performance • Gamification can satisfy students with diverse / differing abilities • Gamification beneficial to certain lifestyles (e.g. part-time workers) as it allows autonomy and flexibility • Moodle appropriate for gamification due to student familiarity with the platform
(van Roy and Zaman, 2019)	Unravelling the ambivalent motivational power of gamification: A basic psychological needs perspective.	The study use Self-Determination theory to explore whether gamification satisfies students' sense of autonomy, competence and relatedness.	40 students	Google+	Challenges, points leaderboard, badges	Mixed: • Situational factors are important for the success of gamification • Students valued competence more than the other needs • Students cautious about their self-image when posting online • Low rankings diminished sense of competence

						• Design implication: A game element that satisfies one phycological need, can thwart another • Google+ more flexible that university LMS (Blackboard)
(van Roy and Zaman, 2018)	Need-supporting gamification in education: An assessment of motivational effects over time.	The study examines how students motivational levels change over time, during a gamified online experience designed to satisfy students' autonomy, competence and relatedness.	40 students	Google+	Challenges, points, badges, group competition, opportunity for online discussion	Various: • Need to adapt gamification to target audience's needs • Need for longer implementation of gamified systems (potential benefits could manifest long-term) • University LMS (Blackboard) did not support gamification
(Welbers *et al.*, 2019)	Gamification as a Tool for Engaging Student Learning: A Field Experiment with a Gamified App	The study compares types of feedback provided in a gamified quiz, to support students in learning about university life.	101 students	Mobile App	Quiz, session/time limit, points, levels, virtual rewards, daily quests, feedback	Positive: • No differences in feedback or no feedback versions • Generic feedback more effective than personalised • Including daily session limit in gamified apps recommended, to promote distributed learning and prevent binge playing • Students may lose motivation when they perform above average • Participation relates to relevance

Appendix E:

Studies Deploying and/or Evaluating Game-Based Learning

Author & Year	Title	Description	Sample	Platform	Game & Gameplay	Main Findings
(Ameerbakhsh *et al.*, 2019)	A comparison of two methods of using a serious game for teaching marine ecology in a university setting.	The study compares two approaches of using an online game to teach marine ecology: A student-centred and a teacher-led approach.	36 students	Online	**Good Time Fishing.** Players take on the role of a fishery manager who must estimate the optimal annual catch quota.	Positive: ● Significant increase in performance in teacher-led group ● Students would prefer a combined approach ● Teaching method should be chosen after consideration of the specific learning context
(Barr, 2018)	Student attitudes to games-based skills development: Learning from video games in higher education.	The study explores students attitudes about commercial games' efficacy for development of skills, such as communication and adaptability.	20 students	Computer	Variety of single-player and cooperative commercial games: Portal 2; Team Fortress 2 Gone Home; Minecraft Papers, Please; Borderlands 2; Lara Croft and the Guardian of Light; Warcraft III	Positive: ● Broadly positive perception of the games' efficacy for skills development ● Students' perception was that multiplayer/ cooperative games can likely have a positive impact on communication skills

						● Students felt that the games they played required some player adaptability ● Less clear connection between playing games and perceived resourcefulness
(Beatriz Hernandez-Lara and Serradell-Lopez, 2018)	Student interactions in online discussion forums: their perception on learning with business simulation games	The study analyses students' online interactions on discussion forums while playing a business simulation game, to explore the impact of the game in learning outcomes, specifically generic and managerial skills development.	182 students	Online	**Cesim Global Challenge**. Simulation of an international mobile telecommunications company.	Positive: ● Students perceived generic skills as most relevant in affecting their learning outcomes ● Higher level of reflection is needed about what type of knowledge students are applying ● Instructor's role is key in providing support with the game software ● Instructor's role is key in ensuring good teamwork by detecting problems proactively ● Teams should be assigned after careful consideration
(Buil, Catalán and Martínez, 2019)	Encouraging intrinsic motivation in management training: The use of business simulation games	The study investigates which factors of business simulation games promote intrinsic motivation, and the impact of intrinsic	360 students	Software	**Strategy Management.** Students play in competing teams of 4-6. Each team manages a company by making ten	Positive: ● Intrinsic motivation enhances engagement, which in turn supports generic skills

		motivation on engagement, generic skills development and students' perceived learning.			rounds of decision-making.	development and perceived learning ● Satisfaction of autonomy and competence promotes intrinsic motivation ● Satisfaction of relatedness not impactful on intrinsic motivation
(Buil, Catalán and Martínez, 2018)	Exploring Students' Flow Experiences in Business Simulation Games	The study explores which factors support flow during business simulation gameplay, and the impact of flow on generic skills development, perceived learning and satisfaction.	167 students	Online	**N.A.** Students play in teams of 4-6. The game includes ten rounds of decision making in relation to manufacturing and selling air conditioning products.	Positive: ● Flow positively impacts generic skills development, perceived learning, and satisfaction ● Elements of challenge, and instant feedback positively impacts flow, but balance of skills and challenge is needed ● Goal clarity does not significantly impact flow ● Perceived usefulness of game positively impacts perceived learning and satisfaction

(Buzady and Almeida, 2019)	FLIGBY-A serious game tool to enhance motivation and competencies in entrepreneurship	The study investigates how an online serious game can enhance student motivation and development of entrepreneurship competencies.	Unclear	Online	**FLIGBY.** Played individually. The story unfolds in movie format. Students play the CEO of a family business, and must make approx. 150 strategic decisions (choosing from 2-5 options) to enhance cooperation and teamwork.	Positive: ● Students received the game positively ● Students felt the game supported development of entrepreneurship competencies ● Interactivity was highly valued ● Non-intrusive formative assessment elements within game are crucial ● Previous training is needed prior to playing ● Teacher needs to support with technical issues
(Calabor, Mora and Moya, 2019)	The future of 'serious games' in accounting education: A Delphi study	The study examines accounting academic' perceptions on the use of accounting serious games in the classroom, focusing on perceived usefulness and barriers.	12 accounting lecturers	Online	**Platform Wars Simulation** Business game developed by MIT. Players play the role of video game producers that make business decisions and compete against competitors.	Perceived barriers: ● Lack of info on appropriate games ● Lack of resources for purchasing games ● Lack of knowledge on serious games Perceived benefits: ● SGs give an image of modernity to the university ● SGs benefit the faculty by increasing student motivation and

						engagement, allowing for practical application of concepts, and helping to make teaching easier and more dynamic ● SGs benefit students by making the learning experiential and enjoyable, and by relating concepts with real world
(Chon *et al.*, 2019)	Serious games in surgical medical education: a virtual emergency department as a tool for teaching clinical reasoning to medical students	The game explores the effectiveness of a serious game in enhancing motivation, motivation, and knowledge gain (declarative and procedural knowledge) in medical studies.	140 students	Computer	**EMERGE.** Virtual emergency department. Students navigate freely in the game environment and treat incoming patients with the help of a digital mentor.	Positive: ● Game was highly enjoyable ● Significant increase in declarative knowledge ● Significant increase in procedural knowledge in some cases only ● Unclear if knowledge game is solely due to game
(Corda *et al.*, 2019)	BashDungeon: Learning UNIX with a video-game	The study investigates the effectiveness of a Computer Science game in achieving the learning outcomes and being perceived as entertaining.	14 students	Computer	**BashDungeon.** "Above view" adventure game, where students navigate inside a dungeon and complete quests with increasing difficulty, using Unix commands.	Positive: ● Game achieved learning outcomes ● Game is useful in reducing the learning time of difficult subjects ● Students found the game enjoyable

						• Complex representation of commands caused feeling of lack of ownership (design lesson)
(Hernández-Lara, Serradell-Lopez and Fitó-Bertran, 2018)	Do business games foster skills? A cross-cultural study from learners' views	The study analyses students' views on which generic and managerial skills they value most when they determine the effectiveness of a business game. The study also looks at differences in student views depending on their cultural contexts.	120 students	Online	**Global Challenge.** Played face-to-face in groups. Players devise a strategy for an international mobile telecommunications company in the USA, Asia and Europe, with the instructor present during the decision-making process.	Positive: • Students find business games appropriate for development of generic and managerial skills • Most valued generic skills: information processing and decision-making, and leadership • Most valued managerial skills: company management • Students' cultural context affects how they perceive the effectiveness of business games in promoting managerial skills, but it does not affect perception of generic skills development • Some parts of Europe may need to adapt to experiential learning

						models to take full advantage of its benefits
(Martínez-Cerdá, Torrent-Sellens and González-González, 2018)	Promoting collaborative skills in online university: comparing effects of games, mixed reality, social media, and other tools for ICT-supported pedagogical practices.	The study compares nine ICT-supported pedagogical practices (including games) used in online universities for collaborative skills development.	930 students	N/A	N/A The ICT-supported practices included: multimedia content, wikis, open educational resources, games, mixed reality, own personal webpages, social media, personal files on the cloud, and sharing files with others on the cloud	Positive (results specific to games): ● Several of the approaches compared, including games/gamification can support development of collaborative skills ● Digital games in STEM studies are useful for collaborative skills ● From the nine practices compared, gamification was the only significant tool in non- STEM studies
(Martí-Parreño, Galbis-Córdova and Miquel-Romero, 2018)	Students' attitude towards the use of educational video games to develop competencies	The study explores how perceived relevance, perceived confidence, media affinity, and perceived self-efficacy affect student's attitudes towards the use of educational video games for competency development.	128 students	N/A	N/A	● Perceived relevance is key for student's positive attitude towards use of EVGs for competency development ● Students' lack of confidence in using EVGs influences negative attitude

(Matute-Vallejo and Melero-Polo, 2019)	Understanding Online Business Simulation Games: The Role of Flow Experience, Perceived Enjoyment and Personal Innovativeness	The study examines the link between perceived usefulness and ease of use, and students' acceptance of an online business simulation game.	266 students	Online	**N/A.** Students play in competing teams. Students manage a business (climate control products) and must make strategic and operational decisions.	Positive: ● Perceived ease of use and usefulness are critical in acceptance ● The enjoyment element is important for flow ● Perceived ease of use does not predict flow states ● Instructors should consider students' diversity/innovativeness, as experiences and perceptions vary
(Middeke *et al.*, 2018)	Training of clinical reasoning with a Serious Game versus small-group problem-based learning: A prospective study.	The study compares a Serious Game to small-group problem-based learning (PBL), in terms of achieving learning outcome of clinical reasoning (CR).	112 students	Computer	**EMERGE.** Students take the role of physicians, who must to take medical histories, test, diagnose and treat patients. An experienced clinician was present and clarified questions.	Positive: ● Serious Game at least as effective as PBL in CR training ● Compared to PBL, the serious game exposes students to a higher number of clinical cases in short time, without hindering learning outcome
(Mullor *et al.*, 2019)	Effect of a Serious Game (Stigma-Stop) on Reducing Stigma among Psychology	The study compared the effectiveness of a serious game with other traditional in reducing	81 students	Computer (projected on classroom	**Stigma-Stop.** Played in classroom as a group. Players interact with characters with	Positive: ● The game was as effective as other tools (e.g. talk by

	Students: A Controlled Study	stigma toward mental health illness.		multimedia screen)	mental health illnesses. Each interaction is followed by a mini game (e.g. memory, shooter etc.) within the topic of mental health.	professionals, meeting with patients). ● Easy and economical to apply, even on large sample and young audience ● The game is compatible with other intervention methods
(Palomo-Duarte *et al.*, 2019)	Clustering analysis of game-based learning: Worth it for all students?	The study explores the effectiveness of a 3D virtual world video game in supporting foreign language learning (German)	102 students	Computer	**The Hidden Room.** Implemented in OpenSim platform. Students complete individual and cooperative learning tasks (e.g. match an object with the right word). Students cooperate in German, using the chat function.	Positive/Mixed: ● Evidence of improved writing and grammatical competence in some students ● Students with good initial language level improve faster ● Not all students benefit from GBL in the same way
(**Perini *et al.*, 2018)**	Learning and motivational effects of digital game-based learning (DGBL) for manufacturing education - The Life Cycle Assessment (LCA) game	The study explores the potential of GBL in teaching sustainable manufacturing, and increasing motivation.	62 students	Computer	**Life Cycle Assessment (LCA) Game.** Students take on the role of a sustainability manager, who must perform the LCA of a coffee maker. The game environment takes place in the company offices. Players can interact with	Positive: ● The game was effective in improving students' procedural knowledge and skills ● High enjoyment but motivation was not impacted ● The game can support a more proactive learning, once theory is covered

					other characters to get information.	
(Sánchez-Mena, Martí-Parreño and Miquel-Romero, 2019)	Higher Education Instructors' Intention to Use Educational Video Games: An fsQCA Approach	The paper investigates educator's intentions to use educational video games (EVGs), by analysing perceived ease of use, perceived usefulness, ability to draw students' attention, and relevance.	170 educators	N/A	N/A	Instructors can be clustered in four groups: ● Instructors who find EVGs can draw students' attention, but are not relevant/value-adding in the learning process. ● Instructors who show intention to use EVGs simply based on ease of use ● Instructors who find EVGs relevant, but that they will not draw students' attention ● Instructors who find EVGs useful for students' learning process and would use them even if it means higher effort for them
(Sánchez-Mena, Martí-Parreño and Aldás-	Teachers' intention to use educational video games: The moderating role of gender and age.	The study uses a Technology Acceptance Model approach to predict higher education teachers' intention to use	312 educators	N/A	N/A	● Perceived usefulness influences attitude. The higher educators' perception of games being useful, the better

Manzano, 2019)		educational video games for teaching.				their attitude and intention to use ● Perceived ease of use does not directly affect attitude ● Gender and age do not influence their attitude and intention to use games
(Siala, Kutsch and Jagger, 2019)	Cultural influences moderating learners' adoption of serious 3D games for managerial learning	The study investigates the role of culture in students' adoption of a serious game on business ethics.	319 students	Computer	**N/A.** Students play a manager in a marketing company, who faces ethical dilemmas. Other gamified elements include points, leaderboard, autonomous play and levels.	Positive: ● Students received the game positively ● Extrinsic motivation drove adoption more than intrinsic ● Culture plays significant role in students' adoption of serious games (e.g. some cultures can find the game learning curve steep) ● Educators using games in culturally diverse contexts should include various assessments and point collections mechanisms, to increase extrinsic motivation
(Silva, Rodrigues and Leal, 2019)	Play it again: how game-based learning improves flow in	The study used Flow Theory to explore the effectiveness of two	816 students	Online	**Accountingame & Marketingame.**	Positive:

	Accounting and Marketing education	online games in increasing performance in Accounting and Marketing.			Played individually or in groups. Digital board divided into squares containing quiz questions in the disciplinary topics. First player to get to the centre of the board wins. Other elements included: badges, countdown time, leaderboard.	• The games were effective in creating conditions for flow • Increased student motivation and interest • Feedback and clarity (goals of game) dimensions did not influence flow in this case • Necessary to find the best way to merge games and traditional teaching, as the latter is still important
(Taillandier and Adam, 2018)	Games Ready to Use: A Serious Game for Teaching Natural Risk Management	The study examines the use of a simulation-based serious game in teaching territorial risk management.	15 students	Computer	**SPRITE.** Played in pairs, on an agent-based digital board game made up of grids. Students take on the role of a local councillor of the Oleron Island, and must ensure the safety of the locals. Other elements include score, immediate feedback, sense of control, and leaderboard.	Positive: • Increased performance • Increased enjoyment • Game not sufficient on its own. Students feel it should be accompanied by a traditional course • Debriefing with educator after the game is very important

(van Goor, Luursema and IJgosse, 2018)	Saving robots improves laparoscopic performance: transfer of skills from a serious game to a virtual reality simulator.	The paper examines the potential of serious gaming for laparoscopic skills development.	85 students	Computer and hardware interface	**Underground.** Action-adventure game, where students use two robotic arms to nudge robots back to the surface from an underground system of mine shafts.	Positive: ● Evidence of skills transfer between the game and validated laparoscopic simulator technology
(Whitton and Langan, 2019)	Fun and games in higher education: an analysis of UK student perspectives	The paper examines students attitudes on the element of fun, specifically whether they believe it to be a crucial part of the experience in higher education, and what they perceive to contribute to it.	37 students	N/A	N/A	● Majority of students feel that university should be a fun experience ● No evidence that fun is linked to games specifically ● Students link active teaching approaches with a sense of fun ● Students find social aspects of learning, such as collaboration, fun ● A safe and stress-free learning space, and the lecturer's enthusiasm for their topic is important for students

Appendix F:

Summary of Futures Consciousness Dimensions by Ahvenharju, Minkkinen, and Lalot (2018)

A summary of the five dimensions of Futures Consciousness by Ahvenharju, Minkkinen, and Lalot (2018), along with the relevant concepts within each dimension, the researcher's interpretation of each, and the Initial code for analysis for this study.

DIMENSION	**Characteristic /Concept**	**Interpretation of Characteristic /Concept**	**Initial Code for Analysis** (developed as a coding frame for this PhD study)
Time Perspective	Length (Sande, 1972)	How an individual perceives time (e.g. 30 years into the future may be considered distant or close to them, depending on the person); how far they see into the future.	1a. Perceiving time as distant 1b. Perceiving time as near
	Sense of time (Lombardo & Cornish, 2010)	"an expansive sense of time, of past and future linked together**"** (Lombardo & Cornish, 2010 p35).	1c. Demonstrating awareness of time as past and future linked together
	The meaning of time (Bell, 2003)	"Time is continuous, linear, unidirectional and irreversible. Events occur in time before or after other events and the continuum of time defines the past, present and future" (Bell, 2003b, pp. 140–141)iousn	
	Connectivity (Mische, 2009)	"the imagined logic of connection between temporal elements" (Mische, 2009, p. 701), the link between actions and events, which in futures projections can be e.g. very detailed step-by-step guides of how to reach a goal, or more vague.	
	Extension (Beal, 2011; Trommsdorff, 1983)	Extension of future time perspective; how far an individual sees into the future.	1d. Engaging in short-term futures thinking 1e. Engaging in middle-term futures thinking

	Reach (Mische, 2009)	"the degree of extension that imagined futures have into the short, middle, and long term, along with the future scenarios imagined at each stage" (Mische, 2009, p. 699)	1f. Engaging in long-term futures thinking
	Forward thinking is preferable to crisis management (Slaughter, 1996a)	Forward thinking means "to take a strategic view, to explore options and alternatives, to anticipate eventualities, and to prepare for contingencies" (Slaughter, 1993, p. 293). This can minimise undesirable consequences and is preferable to crisis management, which can be expensive.	
	Look far away (Berger in Godet & Roubelat, 1996)	Engaging in long-term thinking.	1f. Engaging in long-term foresight
	Long timeframe (Heinonen & Raleigh, 2015; Heinonen, 2013)	Long-term thinking, e.g. 30+ years into the future	
	Temporal and situational awareness (Miller, 2007)	The first level of Miller's hybrid strategic scenario method for developing Futures Literacy. At this level, people discuss about their common goals and shared values, which builds their capacity to make decisions about their future. This level aims to develop people's awareness that "change happens over time and that particular constituencies, products or organisations can be situated in time according to their values and expectations" (Miller, 2007 p349).	1g. Demonstrating awareness that change happens over time, and in context with one's values at the time
Agency Beliefs	Optimism (Sande, 1972)	In terms of futures consciousness, optimism is expecting that something good will happen in the future, whereas pessimism is expecting that something bad is going to happen.	2a. Expressing optimism about the future 2b. Expressing pessimism about the future
	Optimism about the future (Lombardo & Cornish, 2010)	Feeling optimistic about the future. As Lombardo and Cornish point out: "If we wish to realize a positive future, we need to be hopeful and optimistic. Likewise, to enhance future consciousness in others, we need to help them develop hope". (Lombardo and Cornish, 2010, p. 38)	

	Affect (Beal, 2011; Trommsdorff, 1983)	(Psychology) Within the field of psychology, future orientation refers to a complex system of cognitive, motivation, affective aspects (Trommsdorff, 1983). Affect refers to the emotion (positive or negative) tied to the future anticipations.	
	Influence (Sande, 1972)	"how people think they are able to influence future events, whether in their own lives or in a larger context" (Sande, 1972, p. 274) This is subjective and can vary, e.g. one can feel confident in their influential ability, while another can feel powerless. In relation to Optimism, one can feel powerless but remain optimistic, or feel influential but be pessimistic.	2c. Expressing belief in ability to influence the future as an individual 2d. Expressing belief in ability to influence the future as a collective 2e. Taking a passive stance towards the future
	Sense of personal growth and purpose (Lombardo & Cornish, 2010)	"a strong sense of ongoing personal growth and purpose involving long-term, goal-directed thinking and behavior and a future-oriented self-narrative" (Lombardo and Cornish, 2010, p. 35)	
	Self-efficacy and self-responsibility (Lombardo & Cornish, 2010)	"Self-responsibility means that we feel responsible (at least to a significant degree) for our own future and we also feel that we have the required self-efficacy—the ability to realize our goals" (Lombardo and Cornish, 2010, p. 38)	
	Control (Beal, 2011;Trommsdor ff, 1983)	(Psychology) "the amount of control an individual believes he or she holds over goal attainment" (Beal, 2011, p. 5)	
	Future alternatives imply present choices (Slaughter, 1996a)	Taking action in the present to shape a desirable future alternative or avoid an undesirable one.	
	An open future (Bell, 2003)	The future is not fixed and predetermined, but rather open and uncertain. This gives humans hope, freedom and power to become active agents in shaping futures.	
	Humans make themselves (Bell, 2003)	"To a greater or lesser degree future outcomes can be influenced by individual and collective action" (Bell, 2003 p. 154). This includes the view that there are parts of the future	

		that can be controlled by the individual's actions themselves, and other parts that subject to a more powerful agent's actions.	
	Proactivity and action (Heinonen & Balcom Raleigh, 2015; Heinonen, 2013)	"Affecting and creating the future through policies and implementation" (Heinonen and Raleigh, 2015, p. 14)	
	Volition (Mische, 2009)	"the relation of motion or influence that the actor holds in regard to the impending future" (Mische, 2009, p. 701), taking a passive or an active stance towards the approaching future	
	Courage (Lombardo & Cornish, 2010)	"Courage is needed to face one's fears, including fear of the future, about which we can know so little" (Lombardo and Cornish, 2010, p. 38).	2f. Showing courage to face their fear of the unknown
	Enthusiasm (Lombardo & Cornish, 2010)	"Enthusiasm for the adventures and surprises that lie ahead" (Lombardo and Cornish, p. 36)	2g. Demonstrating enthusiasm about the adventures and surprises of the future
	Enthusiasm (Berger, in Durance, 2010)	One of the six basic virtues of a prospective attitude, according to the philosopher Gaston Berger. "[E]nthusiasm […] propels that same action and makes people capable of creating" (Durance, 2010, p. 1470)	
	Motivation (Beal, 2011; Trommsdorff, 1983)	(Psychology) Motivation to achieve the future anticipations.	2h. Expressing motivation to achieve future vision
	Team spirit (Berger, in Durance, 2010)	One of the six basic virtues of a prospective attitude, according to the philosopher Gaston Berger. "Team spirit is indispensable if action is to be efficient" (Durance, 2010, p. 1470)	2i. Expressing view that team spirit is essential for action to be efficient

	Being calm, self-control (Gaston Berger, quoted in Durance, 2010)	One of the six basic virtues of a prospective attitude, according to the philosopher Gaston Berger, the ability to take a step back and maintain self-control.	2j. Thinking about the future with calmness and self-control
	Futures thinking and action (Bell, 2003)	In order to make conscious decisions for action, futures thinking is essential (including considering the potential future consequences of each action).	2k. Acknowledging the importance of futures thinking for shaping futures
	Capacity for commitment, resoluteness toward action, clarity of follow-through (Ogilvy, 2011)	Through a good scenario "you gain a capacity for commitment, a resoluteness toward action, and once having acted, a clarity of follow-through" (Ogilvy, 2011 p.14)	
Openness to alternatives	Sense of trends and challenges (Lombardo & Cornish, 2010)	"heightened future consciousness requires a comprehensive understanding of contemporary trends and challenges facing humanity—seeing the big picture of ongoing developments in the world and the problems facing us" (Lombardo & Cornish, 2010 p. 35)	3a. Demonstrating understanding of current trends 3b. Demonstrating understanding of current challenges
	Look in depth (Berger in Godet & Roubelat, 1996)	"to find the factors and trends that are really important" (Godet & Roubelat, 1996 p. 164)	
	Creativity, imagination, and curiosity (Lombardo & Cornish, 2010)	The ability to think about future possibilities with novelty and creativity, curiosity and wonder.	3c. Thinking about the future with creativity, imagination, and curiosity
	Imagination and innovation (Berger, in Durance, 2010)	Imagination is one of the six basic virtues of a prospective attitude, according to the philosopher Gaston Berger. It refers to imaginative, innovative and original ways of thinking about the future.	
	Taking radical and unorthodox views seriously (Heinonen & Balcom	"Taking radical, unorthodox, unconventional and outliers' views seriously (out-of-the-box)" Heinonen & Balcom Raleigh, 2015 p. 14)	

	Raleigh, 2015;Heinonen, 2013)		
	Enthusiasm (Lombardo & Cornish, 2010)	"Enthusiasm for the adventures and surprises that lie ahead" (Lombardo and Cornish, p. 36)	3d. Demonstrating enthusiasm about the adventures and surprises of the future
	Courage and enthusiasm (Lombardo & Cornish, 2010)	"Courage is needed to face one's fears, including fear of the future, about which we can know so little" (Lombardo and Cornish, 2010, p. 38).	3e. Demonstrating courage to take risks to change the future
	Courage (Berger, in Durance, 2010)	Courage is one of the six basic virtues of a prospective attitude, according to the philosopher Gaston Berger. It refers to having the courage for innovation, entrepreneurship and accepting the risks.	
	Take risks (Berger in Godet & Roubelat, 1996)	To take risks to change long-term plans.	
	Questioning the assumptions of present decisions (Miller, 2007)	"questioning the assumptions used to make decisions in the present, not as targets to plan-by but to provide new insights into the potential of the current world as a way to embrace complexity, heterogeneity and the pertinence of spontaneous actions that put values into practice" (Miller, 2007 p. 348)	3f. Demonstrating critical thinking: questioning assumptions (e.g. assumptions of present decisions to open new possibilities)
	Scepticism regarding simple solutions and criticism that aims to open pluralistic potentials (Sardar, 2010)	The study of the future should be sceptical of one-dimensional solutions to complex problems and dominant projections, as the aim is not to foreclose the future, but to open pluralistic potentials.	
	Critical thinking and constant questioning (Heinonen & Balcom Raleigh, 2015;Heinonen, 2013)	Critical thinking, rethinking, constant questioning (e.g. of assumptions about the future).	
	Future transformations are certain to occur (Slaughter, 1996a)	Change is certain, so studying the future should involve considering how to (and whether we should) adapt to the	3g. Showing openness to adapt to future change

		changes, and how to regulate these changes for the greater good.	
	The possible singularity of the future (Bell, 2003)	"Not everything that will exist has existed or does exist" (Bell, 2003 p. 162). In fact, the future may contain unprecedented things, especially in times of rapid social change.	
	Identifying emerging issues and anticipating surprises (Heinonen & Balcom Raleigh, 2015;Heinonen, 2013)	"Identifying emerging issues, discontinuities, disruptions, tipping points & anticipating surprises (contrafactuality: impossibilities, what ifs?)" (Heinonen & Balcom Raleigh, 2015 p. 14)	3h. Identifying emerging issues and anticipating surprises
	Alternative thinking (Heinonen & Balcom Raleigh, 2015;Heinonen, 2013)	Thinking of alternatives, scenario thinking.	3i. Envisioning possible futures
	Breadth, contingency, expandability (Mische, 2009)	Breadth: "the range of possibilities considered at different points in time" (Mische, 2009 p. 699), with some seeing one single trajectory and others seeing a range of possibilities. Contingency: "the degree to which future trajectories are imagined as fixed and predetermined versus flexible, uncertain, and dependent on local circumstances" (ibid p. 700) Expandability: "the degree to which future possibilities are seen as expanding or contracting" (ibid p. 700). Some possibilities are perceived as increasing (e.g. economic boom) or declining (e.g. economic decline).	

	Future alternatives imply present choices (Slaughter, 1996a)	Different future alternatives mean we have new choices in the present. If we want to avoid a future, or we want to create a future, we can take action accordingly.	
	Curiosity, willingness to learn, eagerness to experience new frames of reference (Ogilvy, 2011)	Curiosity and eagerness to find new ways of looking at the world.	3j. Showing eagerness to find new ways of looking at the world
Systems Perception	Level of interest (Sande, 1972)	Whether one's concern about the future is on the personal level, the national level or the world level.	4a. Showing interest about the future on the personal level 4b. Showing interest about the future on the national level 4c. Showing interest about the future on the world level
	Look breadthwise (interactions) (Berger in Godet & Roubelat, 1996)	To consider the complexity of phenomena and interactions (Godet and Roubelat, 1996)	4d. Thinking about the future holistically
	Multidisciplinarity and multisectorality (Heinonen & Balcom Raleigh, 2015;Heinonen, 2013)	**"**breaking boundaries between different fields of study, industries, and actors" (Heinonen & Balcom Raleigh, 2015 p.14)	
	Complexity, systems thinking, and holistic thinking (Heinonen & Balcom Raleigh, 2015; Heinonen, 2013)	"focus on connections between different fields and spheres (Heinonen & Balcom Raleigh, 2015 p.14)	
	Interdependence and holism (Bell, 2003)	The interrelatedness/interdependence of the world requires decision-making and action to be holistic and transdisciplinary.	

	Sociality (Mische, 2009)	"the degree to which future projections are ''peopled'' with others whose actions and reactions are seen as intertwined with our own" (Mische, 2009 p. 701).	
	Rigorous imagining (Miller, 2007)	Pushing boundaries through imagination when considering possible futures, but with scientific rigour, i.e. the imaginations are intelligible.	
	Decisions have long-term consequences (Slaughter, 1996)	Having an "active view of decision-making" (Slaughter, 1996 p.4). Being aware that some decisions can have long-term consequences.	4e. Demonstrating awareness that decisions have long-term consequences
	Futures studies deals with complex wicked problems (Sardar, 2010)	The study of the future brings us face to face with complex, interconnected problems, and is open-ended, i.e. it offers possibilities rather than e.g. a single solution.	4f. Recognising the complexity of the issue/topic
Concern for others	Values (Sande, 1972)	What people want to happen in the future, regardless of whether it is likely or not.	5a. Envisioning preferable futures for all
	Better futures (Bell, 2003)	Some futures are more preferable than others.	
	Take care of humanity (Berger in Godet & Roubelat, 1996)	According to philosopher Gaston Berger, one of the elements of a prospective attitude is to take care of humanity.	5b. Indicating that the future should be for the wellbeing of others
	Assuring cultural diversity (Sardar, 2010)	"Given the diversity of cultures on this planet […] Futures studies need to take account of this diversity in their frameworks of concepts, theories and methods" (Sardar, 2010 p.183)	
	Participatory approaches (inclusive interaction) (Heinonen & Balcom	Including multiple stakeholders in the study of the future; being inclusive.	

	Raleigh, 2015; Heinonen, 2013)		
	Value rationality (Heinonen & Balcom Raleigh, 2015)	Making decisions based on one's values, regardless of the outcome. Taking a certain action because it's the right thing to do.	5c. Basing decisions on values

Appendix G:

Tracing and Mapping Dimensions of Futures Consciousness