Gamification Design in Self-Paced Online Courses for Adult Learners: A Mixed Methods Study

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Declaration of Authorship

I, Lin Zhang, hereby declare that this thesis titled "Gamification Design in Self-Paced Online Courses for Adult Learners: A Mixed Methods Study", and the work presented in it is my own work. The work is done wholly for the purpose of the PhD degree at Lancaster University.

Any contribution made to the research project by others has been explicitly acknowledged. I declare that there is no material in this thesis that has been accepted for the award of any other degrees at Lancaster University or any other educational institution, except for those been clearly acknowledged in the thesis. When citing the work of others, references have always been given.

Abstract

This convergent mixed methods study examines the gamification implementation of seven self-paced online professional development courses focusing on adult learners. The quantitative and qualitative data used in this work was derived from three sources: a survey of 741 participants in gamified online courses, course records exported from the Learning Management System (LMS), and follow-up interviews conducted with 36 participants.

The results from the integrated data analysis reveal an overall positive attitude among the participants toward the gamification implementation. However, there was a mixed view on various game elements. For example, game elements belonging to the aesthetics category in the Mechanics-Dynamics-Aesthetics (MDA) framework received the highest ratings, followed by those in the dynamics category, while the ones in the mechanics category received the lowest ratings. Through the quantitative comparison of various demographic clusters using the nonparametric Kruskal-Wallis H test, also called the one-way ANOVA (Analysis of Variance) on ranks, this study revealed that learners' perspectives on gamification are similar overall across demographic groups, with a few exceptions. Course-related factors, such as the length, type, and cost of the course, highlighted more significant differences than learner-related factors, such as gender, age, job profile, and nationality. The quantitative analysis records also indicated that participants' perception of game elements did not correlate with their course engagement and performance data, with a few exceptions. Analysis of the qualitative data gathered from the interview and survey comments yielded six categories pertaining to participants' perceptions of gamification: psychological, andragogical, technical, instructional design, user experience and game design.

Based on the study results, I developed a gamification strategy framework demonstrating the multilayer interconnected relationship among the various disciplines associated with gamification design. This gamification strategy framework can offer instructional designers and developers with some insights and considerations while designing and implementing gamification in self-paced online courses for adult learners.

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1 Introduction

1.1 Overview

This study seeks to examine the implementation of gamification strategies in self-paced online courses for adult learners. Gamification is defined as to "use game elements and game design techniques in non-game contexts" (Deterding, Khaled et al., 2011) with the goal of engaging people in a variety of tasks. It has gained growing popularity in online education in recent years and is considered an effective tool to engage online participants, motivate action, and improve educational outcomes. In recent years, many gamification-related studies have been conducted in educational settings. However, there is a lack of research on gamification implementation outside of the formal education system focusing on adult learners, especially in the self-paced online courses, where the tutor role is often absent.

As an instructional designer and developer, I work in a not-for-profit organisation developing autism awareness courses for various adult audiences. Through my personal experiences of developing online courses, I recognised the potential benefits of including game elements and game strategies in the course design. Aiming to fill the above research gap about gamification, I conducted this convergent mixed methods study. The goal of this research is to better understand the results of the gamification implementation and to provide some insights for instructional designers and developers about gamification design considerations when developing self-paced online courses.

1.2 Statement of the Problem

Gamification is believed to be an effective solution in improving engagement and increasing motivation. As gamification gains acceptance and popularity, there are a growing number of educators and researchers who are introducing gamification in educational settings (Hamari et al., 2014; Looyestyn et al., 2017; Nah et al., 2014; Subhash & Cudney, 2018). There have also been an increasing number of studies in recent years, focusing on the effectiveness of gamification in education. Findings of these gamification studies have been in favour of gamification.

However, the majority of the gamification implementation in education focuses on the reward system and social collaboration and competition (Looyestyn et al., 2017) which are beneficial in instructor-led classes. There are very few studies that focus specifically on the gamification implementation on self-paced online courses where learners are often not connected with instructors or other learners.

Also, the existing literature and empirical research on gamification have mostly been centred on formal education, with the focus on children, adolescents and young adults. There is a lack of research on the use of gamification in professional development courses for adult learners outside of the traditional educational system. It is proven that adults learn differently from children and adolescents. Their learning preferences are also different from those in a formal educational system. Hence, results and recommendations made by the existing research on gamification may not apply to the informal self-improving adult learning context.

Furthermore, existing studies are mostly from the viewpoint of educators evaluating the results of the gamification applications in their schools or institutions. In reality, gamification design is not only related to education-related theories and practises but is also associated with many other disciplines including technology, design, development, project management and user experiences. There is a lack of a multidisciplinary framework from the instructional designers' perspective that supports their gamification design and implementation in adult-focused online courses.

More research is needed to substantively explore the gamification strategies within the adult-focused self-paced online courses context. Not only will this research look at the

effectiveness of gamification implementation, but it will also examine the perspectives of the online participants through which insight of the learner experiences is obtained.

1.3 Research Questions

Given the positive impact of gamification proved by existing studies, between 2014 and 2017, I implemented various gamification elements and strategies in several online courses. The purpose of this mixed methods study is to examine the gamification implementation results in the self-paced professional development online training context, to understand the participants' perspective about gamification and to develop a practical strategy framework for instructional designers and developers.

Gamification design in the researched courses is mostly based on the Mechanics-Dynamics-Aesthetics (MDA) framework (Hunicke et al., 2004). The MDA framework places emphasis on the connection of mechanics, dynamics and aesthetics of the game design. It looks at the relationship of different gamification aspects and explains how a gamification design can be created by the designers and developers, carried out by the gamification elements, and experienced by the participants.

My first three research questions answer a rather straightforward question: "Does gamification work?" As an empirical study, I want to know if the gamification design, through the lens of the MDA framework, enhanced the participants' course experiences; whether the participants' gamification experiences are similar across different demographic groups; and do the participants' gamification experiences correlate with their course completion and engagement records.

My fourth research question focuses on the "what" aspect of the gamification design. I would like to know what factors impact the results of the gamification implementation; what are the participants' perspectives of the gamification course design; which gamification strategies enhanced the learners' course experiences; which ones have little impact; and in particular, which ones yielded negative results.

My final research question looks into the links between the above four research questions and further asks the "how" question. How do the various factors and considerations impact the design and implementation process of a gamification project? As an instructional designer and developer, I want to understand the complex

relationships among various factors during the design, development, and implementation phases, and how these relationships ultimately affect the learner experiences.

For the reasons listed above, I identified five research questions in this study:

RQ1: To what extent do participants perceive gamification and game elements implemented in their researched online courses positively?

RQ2: Are there any demographic differences in participants' perceptions of gamification elements?

RQ3: To what extent do the participants' survey responses correlate with their course engagement and performance record?

RQ4: What are participants' perceptions of including gamification in their online courses?

RQ5: What are the considerations when designing and implementing gamification in self-paced online courses for adult audiences?

1.4 Methodology

Convergent mixed methods are the primary research method utilised in this research. Mixed methods research involves the combination or integration of quantitative and qualitative research and data in a research study (Creswell et al., 2005). In this research, I collected both quantitative and qualitative data, and combined and compared them during the data analysis process. I selected the mixed methods because I believe the combination of the two data types can provide me with a deeper understanding of my research topic. I consider this research as convergent because the quantitative survey responses, the qualitative survey comments, the quantitative course data, and the qualitative interview data was collected during the same time. I believe the integration of both quantitative and qualitative data can provide me with a broader and deeper understanding about the gamification implementation results, as well as the reasons behind these results.

This research was conducted through a pragmatic lens. Pragmatism emphasises the research problems rather than the use of approaches to understand the problems (Hanson et al., 2005). A detailed discussion about the research methodology will be carried out in Chapter 3.

1.5 Organisation of the Study

This thesis consists of five chapters. The first chapter is the overview of the research project, including the background and rationale of the study, and the list of research questions that guide the reader through the thesis.

Chapter 2 is the literature review pertinent to this study. This chapter provides an overview of gamification, the definition, the common elements, and other related concepts. In this chapter, I also examined how gamification is used in education, especially in online education for adult learners. I also reviewed the psychological, pedagogical, and andragogical theories behind gamification in education, which constructed the theoretical foundation of this study, as well as the gamification strategy frameworks that guided this research project.

Chapter 3 introduces the research methodology. In this chapter, I explain the considerations that led me to use the mixed methods as the methodology for my study and the reasons for adopting a pragmatic world view as the underpinning philosophy of the research project. This chapter also details the implementation process of the research project, including the participant selection, the survey questionnaire design, the survey administration, the courses' data collection and the interview process. Ethical considerations, including permission, privacy, informed consent and confidentiality are also addressed in this chapter.

Chapter 4 presents the findings from both quantitative and qualitative data analysis, aiming to answer the first four research questions. The quantitative survey results were analysed through IBM SPSS software and presented in various tables, charts and graphics. Consenting participants' course data was extracted from the Moodle Learning Management System (LMS) database and mapped with each survey and interview participant. Qualitative open ended survey questions and interview transcriptions were coded, categorised into themes using ATLAS.ti then further analysed and discussed. In this chapter, I also brought the quantitative and qualitative

results together, comparing their similarity, differences and contradictions using tables and diagrams.

Chapter 5 answers my last research question. I examined the results from the previous chapters, connected them with my personal course design experience, and introduced the Gamification Strategy Framework. This framework could be a useful tool for designing, developing, and implementing gamified online courses. In this chapter, I further address the limitations of the study, identified the original contribution to knowledge, and provided recommendations and directions for future research.

1.6 Research Background

I work at the Geneva Centre for Autism, a not-for-profit organisation located in Toronto, Canada. The Geneva Centre for Autism provides autism-related services and training to individuals with autism, professionals, and caregivers. I have been working in the eLearning department at the Geneva Centre for more than 14 years, first as the system administrator, then as an instructional designer and developer, and now as the eLearning manager. I work in a small team and am fortunate to be involved in all phases of the course development cycle, including planning, design, development, implementation and evaluation.

The majority of the courses I developed are self-paced online courses. This is mostly due to cost, resource, scalability and capacity considerations. One of the challenges of the self-paced online course is the absence of social interaction. Learners are learning from a series of preprogrammed modules with little interaction with tutors or peers. Self-paced online courses are often viewed as boring and robotic, which resulted in low course engagement and high drop out rates.

Over the years, I have been exploring various strategies to improve the engagement of online courses. Given the favourable results of gamification in existing literature, between 2014 and 2017 I introduced various gamification elements and strategies in the online course design. This empirical study is the post-implementation study of the gamification approach. Through this study, I wish to offer my contribution to the existing literature about gamification implementation, particularly in the self-paced adult-focused online training context.

As I write this paper in 2020, utilising suitable game elements and finding the proper gamification design strategies has become an intriguing part of my course design.

1.7 The Researched Online Courses

The subjects of all of the researched courses are related to autism. Autism Spectrum Disorder (ASD), often referred to as autism, is a lifelong neurodevelopmental disorder. Individuals with autism often experience challenges with language, communication and social interactions, as well as restricted and repetitive behaviours, interests or activities (American Psychiatric Association, 2013). According to the 2018 National Autism Spectrum Disorder Surveillance System (NASS) Report, one out of every 66 children and young people aged 5-17 years old in Canada has autism (Ofner et al., 2018). My workplace, the Geneva Centre for Autism, has been partnering with the Government of Ontario to provide online training about autism. The researched courses cover a wide range of autism-related topics, including autism awareness, employment support, clinical techniques, and classroom practises.

The targeted audiences include educators who are seeking knowledge regarding autism to support students in their classrooms, parents of children with autism, professionals who work in the social services field and the general public. It is worth noting that the researched courses are not aimed directly at individuals with autism, but at those who support them. Content of the researched online courses mostly focuses on service delivery and treatment procedures for professionals or parents of autistic individuals. Individuals with autism may self-enrol in the courses, as enrolments are open to the public. But in this research, participants were, presumably, neurotypical learners. Research participants' demographic profiles are presented in section 3.8.

There are two types of courses included in this research: certificate courses and free modules. Certificate courses are longer courses with an average duration of more than ten hours. They generally have multiple sections with a certificate issued upon completion. The free modules are shorter in length, with an average completion time of 2-3 hours. They often cover narrower topics with no certificate issued. As listed in Table 1-1, seven online courses are included in this study. Four of the courses are online certificate courses, and three are free online modules. All seven courses

included in the research are self-paced online courses with enrolment open all year round. Once participants enrol in the courses they can access the content for 120 days. After that time their enrolment expires and their access to the courses is closed. If the participants complete the course within the timeframe, those who took the free modules receive a letter of attendance, and those who took the certificated course receive a certificate. In this study, for easy referencing, a one-letter code was assigned to each course. These codes will be used throughout the study in the place of the course names.

Table 1-1 *List of the Researched Online Courses*

Course Title	Short Name	Type	Targeted Audience
ABA for Educators Level I	Course A	Certificate course	K-12 educators
ABA for Educators Level II	Course B	Certificate course	K-12 educators and autism professionals
Charting a Path to Success	Course C	Certificate course	K-12 educators
Coordination and Collaboration	Course O	Free module	Parents, professionals, and educators
RWA Works	Course R	Free module	Businesses owners and hiring managers
Supporting Children with ASD	Course S	Certificate course	Kindergarten teachers
Who Says ABA is Just for Autism?	Course W	Free module	Universal audience

The ABA for Educator Level 1 (Course A) course focusses on how to apply the ABA (Applied Behaviour Analysis) principles and strategies in classrooms when working with students with autism. Gamification implementation strategies of this course are focussed on using interactive game activities in the content layer to demonstrate the ABA principles and techniques. Also, badges, checklists, progress bars, and conditional content unlocking are implemented at the LMS layer. Figure 2-3 illustrated in Chapter 2.3.2 is an example of the badges used in Course A.

The ABA for Educators Level II course (Course B) is an advanced course targeting the learners who have completed the Level 1 course and wish to learn advanced ABA techniques and behavioural analytic strategies. The gamification implementation strategies in this course are similar to such strategies implemented in other online certificates with game-style activities, checklists, badges, progress bar, and content

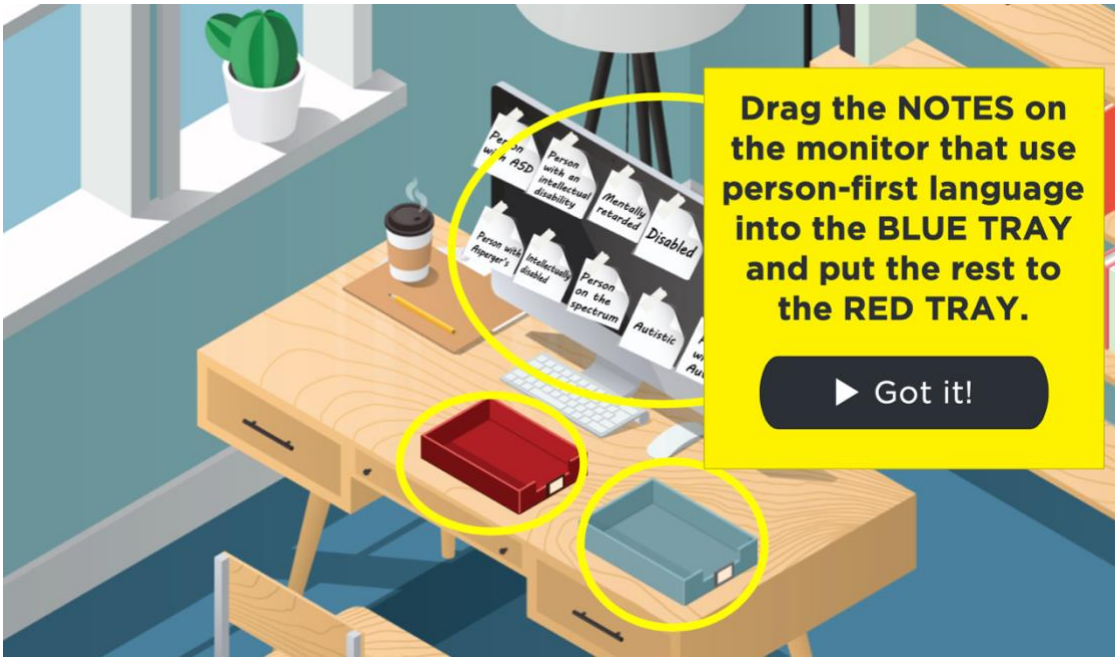
unlocking. Since this is an advanced course with detailed clinical data analysis techniques, gamification strategies, its focus is on interactive game-style practice activities.

The Charting a Path to Success course (Course C) is a self-paced online course tailored to the needs of Ontario educators. Gamification of this course is implemented in two layers. At the LMS layer, badges are awarded for various achievements. Leaners can track their progress through the visual checklist and progress bar. Milestones and achievements are celebrated by on-screen messages and emails. At the course content level, various game activities throughout the course offer leaner a fun and engaging opportunity to practice the knowledge and skills.

The Supporting Children with ASD course (Course S) is developed to help kindergarten teachers to support pupils with ASD in a play-based learning environment. This Gamification implementation strategies used in this course also are similar to those in the other courses, namely, online certificates, with game activities, checklists, badges, progress bar, and content unlocking. Figure 2-4 in section 2.3 is an example of the progress bar, indicating the student's progress towards each learning objective in the course.

The Who Says ABA is Just for Autism course (Course W) is a free, self-paced online training module. It gives learners a broader perspective of the various applications of ABA beyond supporting individuals with ASD. Gamification of this course is highly interactive at the course content design level. Throughout the course, learners are presented with various game-style activities. Virtual rewards and badges are issued when participants reach the milestones or pass the checkpoints. Figure 1-1 is a screenshot of a game-style activity about using person-first language.

Figure 1-1 *Example of a game-style activity in Course W*



The Coordination and Collaboration course (Course O) is a short free online module designed to demonstrate how families, schools, and ABA service providers can coordinate and collaborate to support children with ASD in the ABA-based programs. Gamification of this course is achieved through role selection, personalised storytelling, and scenario-based decision-making. This course is story-based and allows the learners to progress through the module from three different perspectives: a parent's, a teacher's, and an ABA service provider's. With the computer-generated animation, the storyline of the course adjusts based on the learner's selected role. Figure 2-8 and Figure 2-9 in section 2.3 are examples of the role play and storytelling implemented in course O.

The RWA Works course (Course R) is a free, self-paced online training series developed for the Ready, Willing and Able initiative to provide employers with the know-how and resources for hiring employees with an intellectual disability or ASD. The researched RWA Works course is the first of the five-course series. Gamification of this course is a combination of various game elements, including game-style activities, challenges, quests, achievement, rewards, avatar, content unlocking, checklist, and progress bar. At the end of the course, completion is celebrated by awarding an achievement badge. The course lasts about one hour. Figure 2-6 in section 2.3 is a screenshot of a quest game included in this course.

1.8 Concluding Remarks

In this chapter, I provide the rationale for my mixed methods research focusing on gamification implementation in a self-paced adult-focused online training context. I identify the five research questions and briefly introduce the methodology used in this study. Furthermore, to support the rationale for this research, background information about the researched online courses is also included in this chapter. In the next chapter, I will discuss the literature that is related to my research topic and research questions.

2 Review of Literature

This literature review focuses on the literature currently available on the utilisation of gamification for adult online training. This chapter will initially define "gamification", its relationship with other similar concepts, and some commonly used game elements in gamification design. This chapter also presents a synthesis of research related to gamification in online education, the underlying theories that laid the research foundation, and some criticisms commonly raised in gamification studies. It further discusses the practical aspects of gamification, including various design and implementation frameworks and their use in online learning. The research gaps that inspired this research project are also identified at the end of this chapter.

2.1 Literature Selection Strategy

In the search for gamification literature in education, I adopted the literature review model developed by Machi and McEvoy (2012). I systematically searched multiple online bibliographic databases, including EBSCO Host, Academic Search Ultimate, ERIC (Education Resources Information Center), Lancaster University's OneSearch, ScienceDirect, Web of Science, the Association for Computing Machinery Digital Library (ACM), the Institute of Electrical and Electronics Engineers (IEEE) Xplore Digital Library and Google Scholar.

The literature search was undertaken with a broad-to-narrow approach, starting with several general keyword searches. The search results were refined toward the education domain and further narrowed to self-paced adult-focused online education.

Appendix A demonstrates the keyword refining process of this search. There were several key considerations when selecting papers for the literature review. The primary concern was their relevance to the research topics. The included literature had to be related to gamification, especially in the education context. Another consideration was the importance of the study, which can be gauged by the publication source and the frequency with which an article is cited by other works. When selecting the paper, I focused primarily on peer-reviewed articles. Additional resources such as books, book chapters, industry reports and conference proceedings were also included. The included literature covers both empirical studies and systematic reviews.

The literature review was conducted under a pragmatic lens. From this perspective, I focused on problem/solution-related studies, as well as on articles providing practical guidance on gamification design and development.

A total of 459 articles were selected through the keyword search process. I skimmed through these and further narrowed my selection to 210 papers based on the articles' subject, keywords, abstract, subject headings and conclusion. Subsequently, a further content analysis was carried out based on these articles. Among these 210 articles, 127 of them are empirical studies, 50 of them theoretical papers and 33 of them literature reviews.

2.2 Gamification, Games and Gameful Design

2.2.1 Gamification

Although gamification is the central topic of this research, it is a relatively new term that was only added to the Oxford English Dictionary in June 2019 (Oxford University Press, 2019). Over the years, many researchers and scholars have defined gamification from various perspectives. Deterding, Sicart et al. (2011) described gamification as "the use of game design elements in non-game contexts." In their definition, they emphasised the application aspect of gamification: applying game playing in a non-game context. Zichermann and Cunningham (2011) looked at the purpose of gamification and defined gamification as "the process of game-thinking and game mechanics to engage users and solve problems". Kapp (2012) focused on the design perspective of gamification and defined the term as "using game-based

mechanics, aesthetics and game thinking to engage people, motivate action, promote learning and solve problems".

Since its emergence around 2008 gamification has experienced fast-growing awareness (Boulet, 2012). Nowadays gamification has been widely adopted in marketing, employee performance, healthcare, politics and education (Deterding, Sicart et al., 2011). It is also applied in various forms, such as software, mobile apps, interactive online applications, wearables, and offline activities and services (Gartner, 2011, 2012, 2013, 2014; Wu, 2017). According to MarketsandMarkets Research Private Ltd. (2020), the growth of the gamification market had been and was expected to continue to be exponential. In 2015, the gamification market was USD 1.65 billion. This number grew to USD 9.1 billion in 2020 and is expected to reach USD 30.7 billion by 2025, with a compound annual growth rate of 27.4% (MarketsandMarkets Research Private Ltd., 2020). Currently, gamification has moved away from its novelty stage, gained awareness and acceptance, and gradually involved mature design practises in many industries.

2.2.2 Game

Since gamification is about turning something into or like a game by applying elements of game playing to other activities (Oxford University Press, 2020), it is important to take a closer look at some of the associated concepts, such as a game, play, serious game, gameful design, and game elements.

Unlike gamification, the game is an ancient concept that has been an essential part of human history since its early years. Game is a form of play and "a voluntary attempt to overcome unnecessary obstacles" (Suits & Hurka, 2005). When playing a game, people "engage in an abstract challenge, defined by rules, interactivity and feedback that results in a quantifiable outcome often eliciting an emotional reaction" (Kapp, 2012). Games can be in a wide range of forms such as field games, board games, computer games and smartphone games. They can be played by a single person, between multiple people, or among a massive population over the Internet.

Games of various forms share some key characteristics such as goals, rules, feedback systems and voluntary participation (McGonigal, 2011). The goals are the purpose of the game. Games can have a single goal or multiple goals, which are usually well

defined and are known to all players. Games need rules to set up the boundary on how players can achieve their goals. These rules define the scope of actions allowed in the games, challenging the players' creativity and pushing them to be strategic during the game. Games also need a feedback system to inform the players about the consequences of their actions. Immediate feedback interacts with the player's action and serves as indicators to help them achieve their goals. Voluntary participation is another important aspect of a game. It ensures that all players accept the goals, rules and feedback and offers a safe and pleasurable environment. The game is fun to play because players are challenged by the game rules, working hard towards the game goals, receiving immediate feedback about their actions, and knowing that they are safe to fail. McGonial (2011) explains, "When we do hard work that we care about, we are priming our minds for happiness".

2.2.3 Serious Game, Simulation, Playful Learning and Gamification

There has been some unclarity regarding gamification, playful learning, simulation and serious game. Some scholars believe simulation and the serious game should be considered a subset of gamification (Koivisto & Hamari, 2019). Others believe these concepts are so interchangeably used in educational contexts that they should be grouped together when conducting studies (Landers, 2014). Since this research is on gamification, it is beneficial to explore the differences between similar terminologies, which will help clarify the scope of this project.

Games are called serious games when they have a pedagogical purpose (Gorbanev et al., 2018). Bergeron (2006, p.398) defined a serious game as "an interactive computer application, with or without a significant hardware component, that has a challenging goal, is fun to play with, incorporates some concept of scoring, and imparts in the user a skill, knowledge or attitude which can be applied in the real world". Serious games hold an important role in education. They confront students with challenging problems and offer them opportunities to explore and develop solutions through first hand problem-solving experiences (Gorbanev et al., 2018).

Simulation is considered a narrow focus of serious gaming (Ahmed & Sutton, 2017). It is defined as "a sequential decision-making exercise, with the basic function of providing an artificial but realistic environment that enables players to experience the

consequences of their decisions through immediate response" (Siemer & Angelides, 1995). The key element of the simulation is interactivity. Through simulation, users can interact with the system and create their own sequence of events rather than passively observe a pre-recorded process.

Playful learning focuses on the playfulness of the learning activity. It is not limited to playing games but is a state of mind that a person can apply to any activity (Whitton & Moseley, 2019). In the education context, playful learning is to learn through play (Resnick, 2004). It is a learning experience where play and learning are integrated, using gameplay to promote problem-solving and risk-taking without real world consequences.

Gamification is constructed with elements that can be identified in games. It does not replicate the game as a whole but offers flexible game-like user experiences in non-game contexts. Gamification is not about building fully-fledged games. It is about using game elements and game design techniques in non-game contexts while aiming to engage people and solve real world problems (Deterding, Dixon et al., 2011; Werbach & Hunter, 2012; Zichermann & Cunningham, 2011). Figure 2-1 demonstrates the relationship between games, serious games, playful interaction and gamification. This research primarily focuses on the narrow definition of gamification while acknowledging many overlaps in these terminologies. Studies and examples of serious games, simulations and playful learning can also be valuable for gamification studies.

Figure 2-1 *Difference Between Gamification, Serious Games, and Playful Interactions*

Source: Deterding, Dixon et al. (2011)

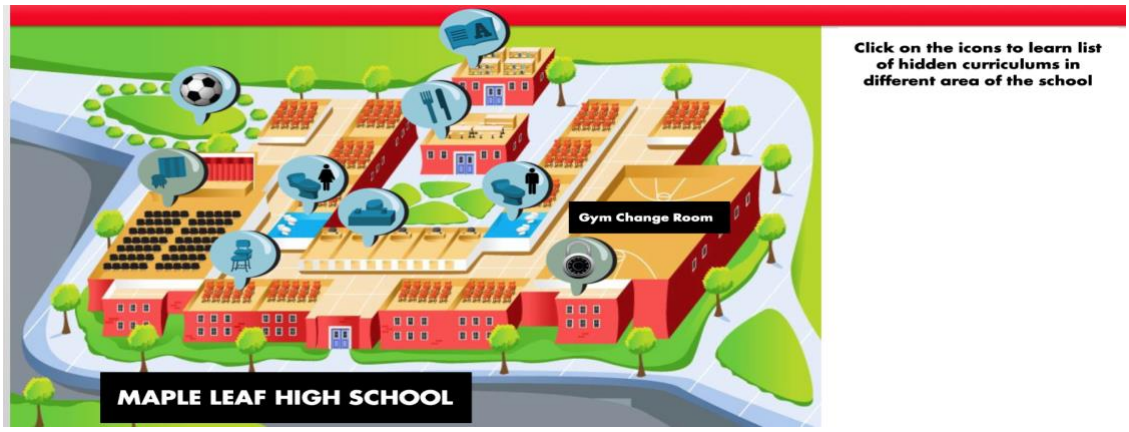
2.2.4 Gameful Design

Gameful design is closely related to gamification but is not the same. Gameful design refers to the gameful experiences, while gamification refers to the strategy of using game design elements. The goal of the gameful design is to offer a holistic gameful course experience (Deterding, Dixon et al., 2011). In the early stages of gamification, designers often focused on adding game elements to applications, which resulted in some criticism of misuse or overuse of game tactics. Later, designers attempted to correct the negative connotations associated with gamification and refer to their theory-driven intricate-motivation-focused design as gameful design (Dichev et al., 2014). Nowadays, as gamification has become more mature, the gameful design is considered an essential element of gamification, bringing the playful state of mind or attitude to gamification.

Figure 2-2 is an example of gameful design in one of the researched courses. The map below is interactive within the game. When clicking on each icon, learners can learn

about the hidden curricula, unspoken rules or implicated social expectations in the school setting.

Figure 2-2 *Example of the Playful Design in Course C*



2.3 The Commonly Used Game Elements

Game elements, which are the common patterns and building blocks of a game, are at the core of gamification. In a game, these various elements dynamically interact with each other, making a game fun and sometimes addictive to play. As Deterding, Sicart et al. (2011) suggested, since video games can engage players with unparalleled intensity and duration, game elements borrowed from video games should also help make other non-game solutions engaging and enjoyable.

It is worth pointing out that a single or a few game elements alone cannot make a game engaging. Rather, several game mechanics and elements combine to make a game exciting and engaging. Gamification designers can strategically select various game elements in their gamification design to achieve their course design goals.

So, what are these game elements and how can they be used in non-game contexts? In this section, I will explore some of the common game elements.

2.3.1 Points

Points are rewards users receive for their participation, progression, and achievements. Gaining points offers learners a sense of progression and mastery. Points can be used

as scorekeeping and determine the win state and can also be used as a reward when players complete tasks or gain experience of certain skills. The point system can be designed in the form of coins or virtual cash as the foundation of the award system. In the gamification of learning, points are often linked with badges, levels, leaderboards or status and are one of the most used elements in gamification design.

2.3.2 Badges

Badges are usually presented in the shape of a shield or button and attached to the player's profile as a visual representation of the player's achievement. Badges can be a powerful tool that motivates people to achieve goals, seek mastery and engage with social competition (Hakulinen et al., 2013). Badges are also associated with people's incentive to collecting things. When a list of collectable badges is displayed to players, it motivates people to collect them.

In the gamification of learning, badges are often issued when a milestone is reached, or an outstanding performance is observed, or they may be used as a surprise gift to engage users along the process (Glover, 2013). They signal to the students what behaviours are preferred and what elements of the course are significant. Figure 2-3 are examples of the badges used in one of the researched courses.

Figure 2-3 *Example of the Badges Used in Course A*

2.3.3 Leaderboards

Leaderboards display a list of players who have high scores in a game or a game-like activity (Kapp, 2013). They create competition between players and give bragging rights and social capital to the individuals who achieve high scores (Kapp, 2012). In

the gamification of learning, a leaderboard could be a powerful motivator for both individual and team participants and can improve course performance.

A leaderboard is one of the most used but often criticised game elements in the education context. Some scholars argue that the competitiveness of the leaderboard could harm the motivation of the less competitive, status-seeking learners (Glover, 2014). There are some strategies the teachers and instructional designers can adopt to reduce the negativity of the leaderboards. For example, Glover (2013) suggested making competition internal rather than external by having players competing against their own personal best and reward learners for their improvement. Similarly, Landers and Landers (2014) suggested giving all learners roughly equal chances of being placed on the leaderboards, given equal amounts of effort.

In this study, all the researched online courses do not include the leaderboards for the above-discussed reasons.

2.3.4 Rewards

The reward system gives the player something symbolic or material in recognition of their effort or achievement. They are the way the game tells the players, "You have done well". In the gamification of online learning, rewards can be issued in various forms. For example, playing a sound effect when the learner correctly answers a question, giving points after the students take some desired actions, granting access to the locked resources, or issuing a certificate recognisable by potential employers.

2.3.5 Goals

The goal is the fundamental characteristic of a game and is the main difference between casual play and a game. A goal adds purpose, focus and measurable outcome to a game (Kapp, 2012). A clearly defined goal provides a visual cue about how each player is performing. It shows the players how far they are from the winning state and guides them to put their efforts into the goal's actions.

A well-designed goal should be specific, measurable, achievable, realistic, and time-bound (Landers & Landers, 2014). A common goal-setting strategy is to design a course with some smaller goals leading towards a final goal. These smaller goals are

meaningfully structured and interconnected, allowing the learners to move from one accomplishment to the next.

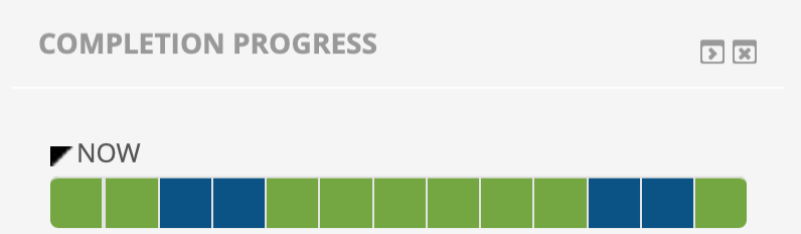
2.3.6 Levels

Levels in a game indicate progress. They serve as markers while players progress and move towards the end of the game. Levels can be used to indicate a degree of difficulty players choose to play and can also be treated as an indicator of experiences and skills a player has achieved. Levels are usually associated with a point system. Zichermann and Cunningham (2011) suggested that participants progress through the levels seamlessly in a well-designed system, gaining confidence and experience.

2.3.7 Progress

Progress in a game refers to moving up levels, checking off checklists or improving the avatar's power. In the gamification of learning, the learners' progress is often visualised as a progress bar or checklist. Progress provides the learner with positive feedback that they are heading in the right direction and gives the learner a sense of accomplishment when ticking something off the list. They motivate learners to take a few more actions to achieve the win state. Figure 2-4 is an example of the progress bar in one of the researched courses, indicating the student's progress towards each learning objective.

Figure 2-4 *Example of the Progress in Course S*



2.3.8 Feedback

In games, feedback returns information to players and informs them about their performance against a continuum of progress (Zichermann & Cunningham, 2011). It is a tool to evaluate the players' performance, recover from errors, and change actions

subsequently. While playing a game, the immediate increase of the points offers the players a positive hint that they took the correct action.

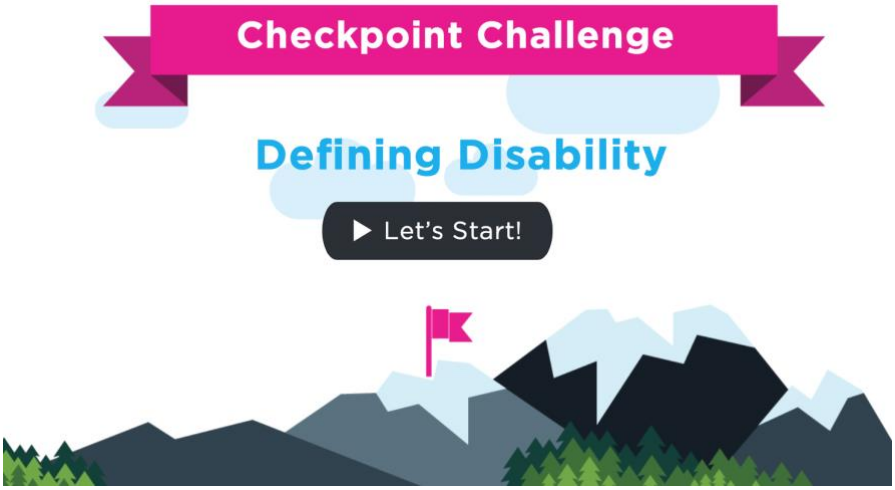
Feedback is widely used in the gamification of learning. Timely feedback can motivate the participants to take further action. For example, a detailed textual explanation about the incorrect answers provides learners with an immediate opportunity to review the relevant content in a quiz. A buzzing sound indicates a forbidden attempt in a simulation, while a flashing status bar shows the urgency of the situation.

2.3.9 Challenges and Quests

Challenges and quests provide players with directions for what to do within the game. They create some problems that the players have to work to resolve. Challenges and quests evoke the players' emotional responses to the issues and add some tensions to their experience.

The effectiveness of challenges and quests can be explained by Csikszentmihalyi's Flow Theory (2009). The challenge level should dynamically match with the level of ability to keep the player engaged. When the player's ability is low, the challenge should also be low to avoid frustration. When the player's ability rises, the challenge level should also increase to avoid boredom. Players might find one task challenging when they are at the beginning of a game. They might find the task not as challenging once they gain experience in the game. Therefore, the sense of accomplishment drops, and the engagement level reduces. Figure 2-5 is a screenshot of a checkpoint challenge included in one of the researched online courses.

Figure 2-5 *Example of a Challenge in Course W*



2.3.10 Content Unlocking

Content or milestone unlocking is another element used widely in games, where status or levels are locked unless the players have achieved the unlocking condition.

Content unlocking is often used in the gamification of learning. By keeping the content locked, it raises curiosity and motivates the learners to unveil the information. The content unlocking can also function as an interim milestone and can be a motivator to keep the learner in the course until the milestone is reached. Figure 2-6 is an example of a content unlocking in one of the researched courses. Participants need to collect enough points to pass the challenge and move on to the next section of the course.

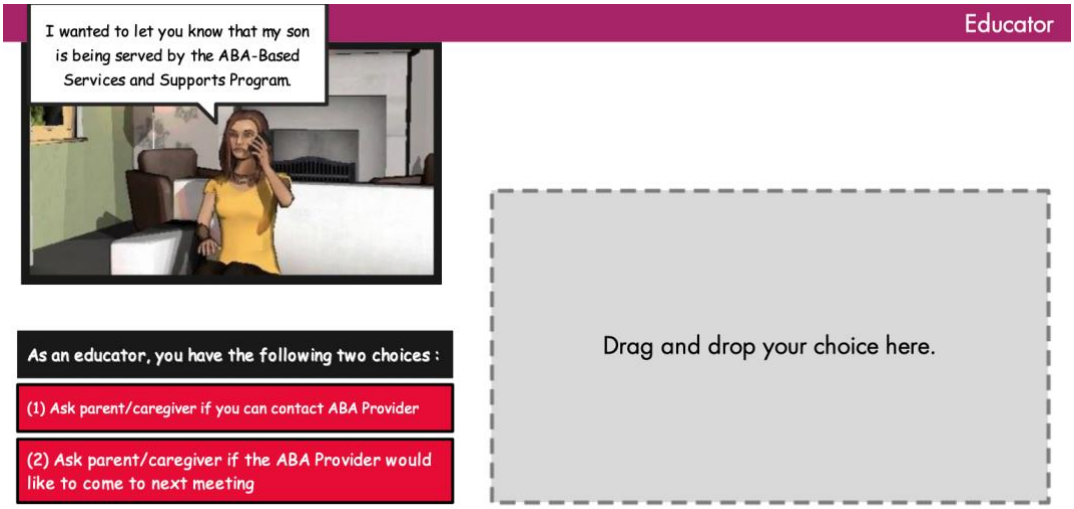
Figure 2-6 *Example of a Quest in Course R*

2.3.11 Choices

During gameplay, players are constantly making choices. These choices change the game outcome and make the gameplay a unique non-linear experience.

In the gamification of learning, meaningful choices give the learner autonomy, allowing them to control their learning experiences. Meaningful choice means the learners' decisions will impact the output and lead to different consequences following their action. If the choices are an illusion, which means all choices lead to the same outcome regardless of the selection, it will leave learners feeling disappointed. Also, the gamification of learning should offer learners the right amount of choices (Schell, 2014). If a course offers no choice, learners may feel disempowered and bored, while too many choices may lead to the feeling of being overwhelmed. Figure 2-7 below is a screenshot of choice-making implemented in one of the researched courses.

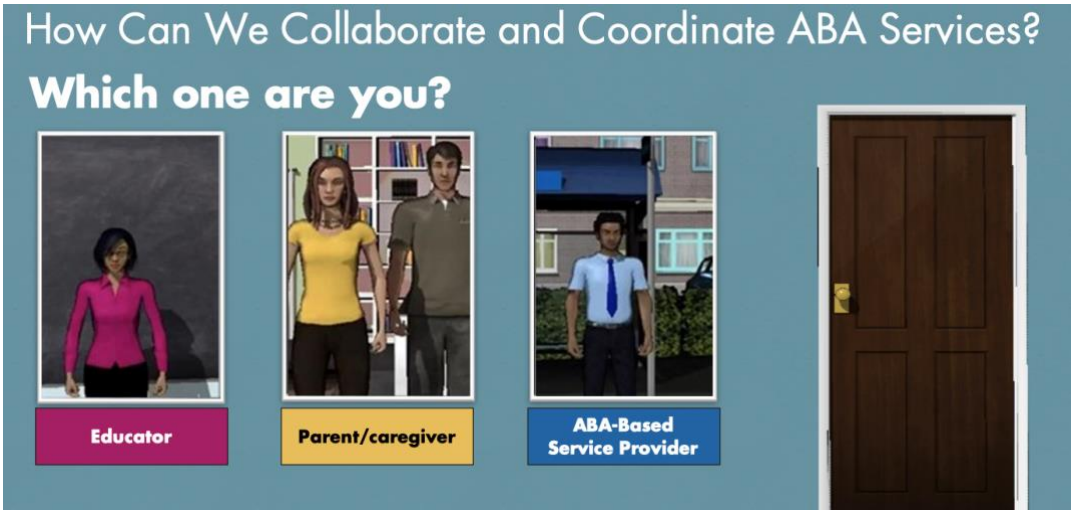
Figure 2-7 *Example of a Choice Making in Course O*



2.3.12 Role-play

Role-play in a gamified system allows the participants to choose their preferred perspective within a course. Based on the role selection, they will be led to different learning paths with varying learning experiences. In role-play, the participants' learning experience is loosely structured. Learners determine their learning process. Role-play offers an immersive and transformative experience to the learners that is not the same as when learners are merely being themselves (Day, 2019). It is worth noting that the objective of the role-play in a gamified online course is not to win or to reach the end of the training but to explore alternative aspects of the topic. Role-play is often closely related to the avatar. The difference between role-playing and an avatar is that role-play refers to the process in which the learner interacts with the courses, while an avatar is the character used during the role-play. Figure 2-8 is an example of the role-play implemented in one of the online courses.

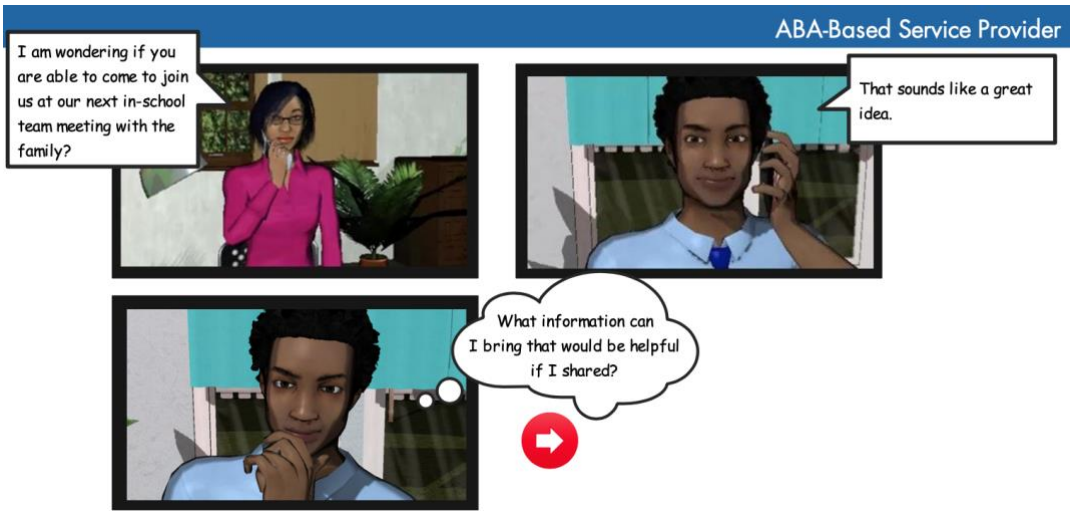
Figure 2-8 *Example of a Role-Play in Course O*



2.3.13 Storytelling

Storytelling integrates the narrative and stories into the course. Rather than passively watching or reading the content, the learners can actively interact with the system and continually make decisions through storytelling (Fullerton & Swain, 2008). Storytelling brings fun to the course, engaging learners' emotions and offering them a feeling of empathy. Figure 2-9 is a screenshot of storytelling implemented in one of the researched courses.

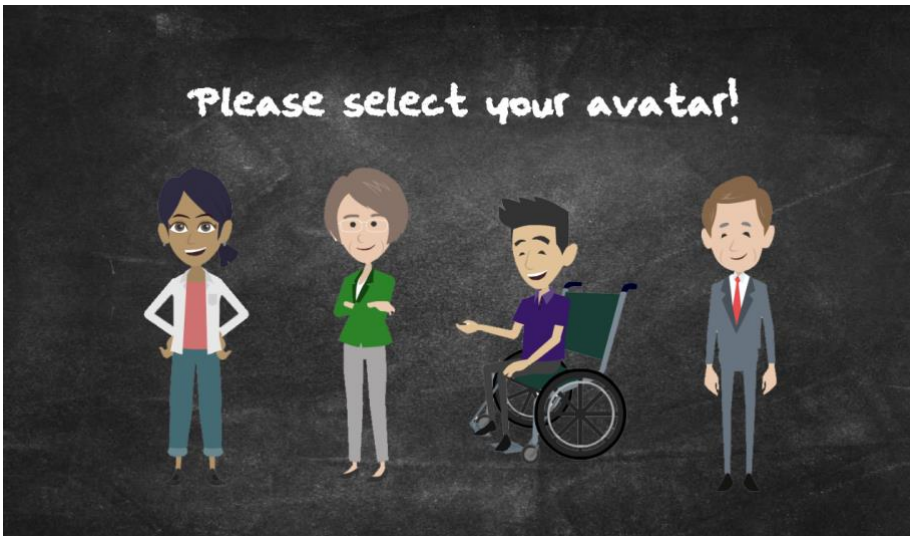
Figure 2-9 *Example of Storytelling in Course O*



2.3.14 Avatar

Avatars are virtual characters representing the learner in the course (Werbach & Hunter, 2012). It is often used in combination with other game elements, such as storytelling and role-plays. Adding avatars to the online course helps the learners associate themselves with the character, develop an emotional attachment to the character, and have a sense of control over their learning experience (Fullerton & Swain, 2008). Figure 2-10 is an example of using avatars. After selecting an avatar, the participant can interact with the training through the perspective of the selected avatar.

Figure 2-10 *Example of Avatar in Course R*



2.4 The Game Element Relationships

Similar to the human body, games come to life only when their elements function dynamically, collaboratively and effectively. Simply juxtaposing these elements will not make a game fun to play; similarly, introducing only certain game elements into eLearning courses will probably not result in an engaging learning experience.

Understanding the interrelationships between the elements can help course designers systematically select those elements that work cohesively with each other in the gamification design. Over the years, scholars and designers have attempted to identify the various game elements, classify them and discover the relationship between them.

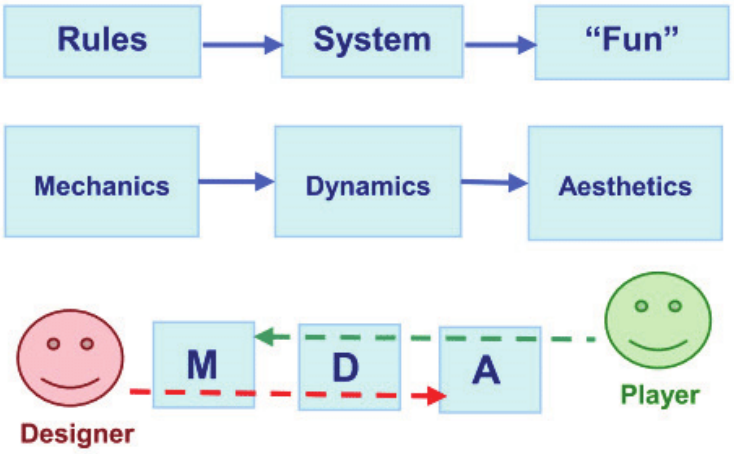
Many gamification frameworks were developed, through which these elements were identified, and their relationship explained. Four of the frameworks with different perspectives and foci are discussed in this chapter. In my gamification design practises and this research, I adopted the concepts and applied design suggestions from all four frameworks, especially the MDA framework.

2.4.1 The MDA Framework

MDA stands for mechanics, dynamics and aesthetics (Hunicke et al., 2004). In game play, game designers and players serve different but dynamically interactive roles. Games are created by designers, but the outcome of the gameplay is closely tied to the player's interaction with the game and is rather unpredictable to the designers. The game designers control the function of the games through game mechanics, the particular components of the game. The game players interact with the game environment and other players and produce the run-time individualised gameplay outputs: the dynamics. When the players interact with the game system, their perceptions of the game are influenced by the outcome of the gameplay. These emotional responses to the game dynamic are referred to as game aesthetics. In the MDA framework, the three categories interact and create a unique and holistic gameplay experience.

As illustrated in Figure 2-11, both the game designers and players employ a unique lens when designing and playing the games. Designers design games through rules and by adjusting the implementation of the game mechanics, while game players interact with the system through game dynamics. The players' gameplay experiences evoke their emotions and make games "fun". The MDA framework is a practical game design framework, helping game designers identify the game's aesthetic goals, create the game dynamics, and subsequently choose the mechanics to support the game dynamics and achieve the aesthetic goals.

Figure 2-11 *The MDA Framework*



Source: Hunicke et al. (2004)

The MDA framework is the conceptual foundation of my research. It helped me to understand the gamification design from both the designers' and the players' perspectives. As a gamification course designer, I used the framework to understand the effectiveness of various game mechanics and dynamics. I also used the MDA framework to examine the participants' gameplay (course study) experiences by reviewing their feedback and course records.

2.4.2 The Pyramid of Elements

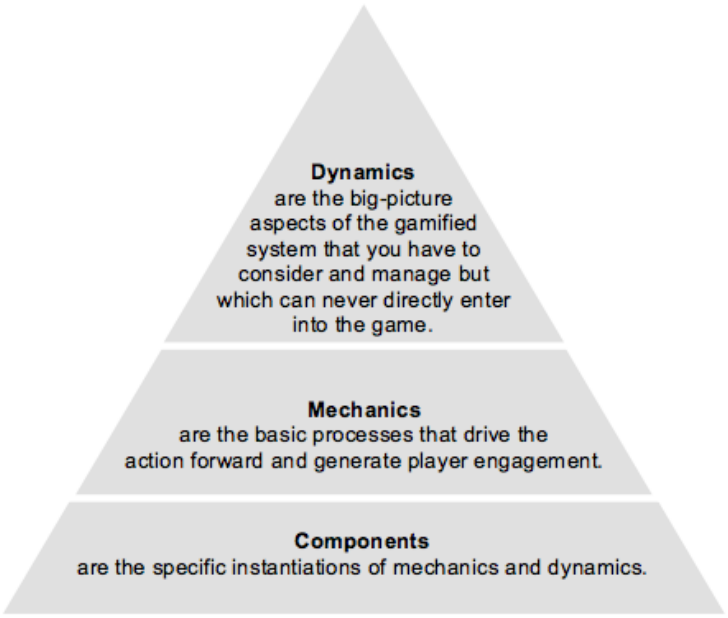
Werbach and Hunter (2012) examined the patterns in games and categorised the common game elements, structures, and their relationships into three levels of a pyramidal hierarchy. The order of the levels is based on the abstraction level of the game elements, with dynamics on top, mechanics in the middle, and components at the bottom. Figure 2-12 illustrates the relationships between dynamics, mechanics and components.

Game dynamics are the highest abstraction level. They constitute "the big-picture aspects of the gamified system that you have to consider and manage but which can never directly enter into the game" (Werbach & Hunter, 2012). Game mechanics are "the basic processes that drive the action forward and generate player engagement",

and game components are "the specific instantiations of the mechanics and dynamics" (Werbach & Hunter, 2012).

The pyramid shape also reflects the number of items each level contains, with the least number at the top and the most at the bottom. Furthermore, it also indicates the relationships between the levels, with the lower-level elements being the instances or examples of the higher level.

Figure 2-12 *The Pyramid of Elements*



Source: Werbach and Hunter (2012)

Unlike the MDA framework, which focuses on the designer-player interaction, the Pyramid of Elements focuses on the hierarchical relationships among the game elements. In this study, I used the pyramid of elements framework to identify and categorise the various game elements in the online courses.

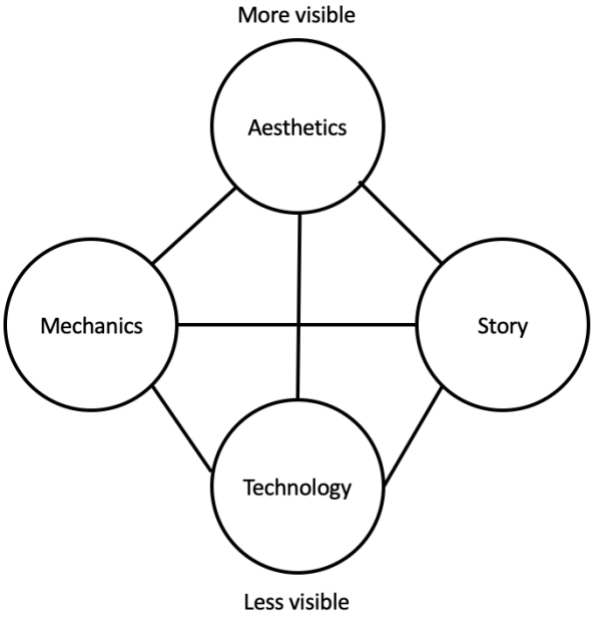
2.4.3 The Elemental Tetrad

Schell's (2014) elemental tetrad framework also focuses on the relationship between the game elements. Different from Werbach and Hunter's pyramid of elements framework, the elemental tetrad categorises the game elements into four classes: mechanics, story, aesthetics and technology. According to Schell, the mechanics in the

tetrad are the rules, goals, space, time, states, attributes or chance. "It is mechanics that make a game a game" (Schell, 2014). A story is the sequence of events unfolding in the game, supported by mechanics and technology and experienced by players non-linearly. Aesthetics is the sensational input of a game, such as the visuals, sounds, colours, animation and music used. It is the world outside of the real world the player interacts with and is their most direct game experience. Technology is the medium used in the game, which makes it possible or better. High-tech equipment and programmes are unnecessary, and a game can be as low-tech as dice and token.

As illustrated in Figure 2-13, the four categories are interconnected and equally important, working together to create a holistic gameplay experience. The tetrad shape of the diagram demonstrates the visibility of these elements, with aesthetics being the most visible to the players and technology the least visible.

Figure 2-13 *The Elemental Tetrad*



Source: Schell (2014, page 71)

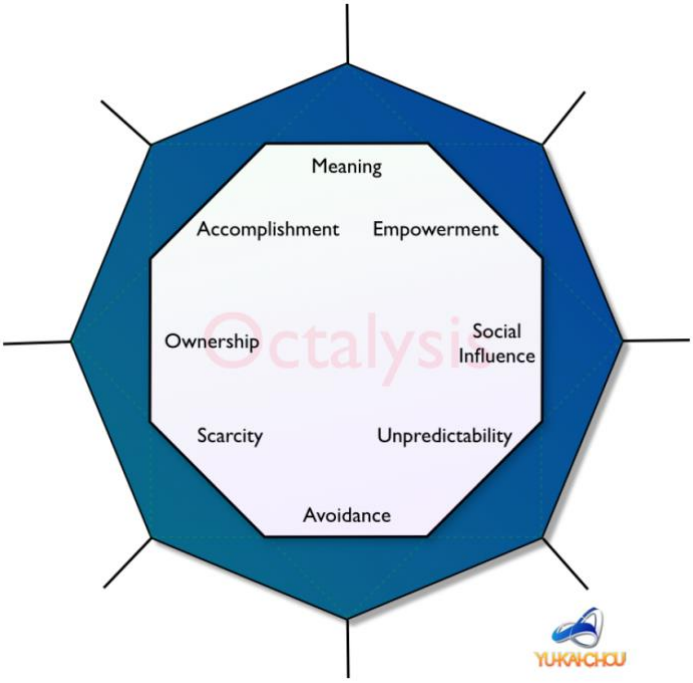
Schell includes a broader range of considerations in the game design process. She emphasised the importance of technology, story and aesthetics and placed them at a level of importance equal to the game mechanics.

2.4.4 The Octalysis Framework

Chou's Octalysis Framework identifies the eight core drives that motivate people to act in a game or gamified system. It is a motivation-centred framework and focuses on improving user engagement, promoting desired behaviour and achieving the designers' gamification objectives. Chou argued that these motivation factors are more important in a gamified system than the features and functionalities of the game elements (Chou, 2019). As illustrated in Figure 2-14, the eight core drives in the Octalysis Framework are placed in an octagon. Each side of the octagon represents a motivation factor of gamification (Kahneman & Egan, 2011).

What is unique about Chou's Octalysis Framework is the placement of these core drives. Drives from the left side of the octagon tend to promote intrinsic motivators, while drives from the right are extrinsic motivators. Furthermore, the vertical location of the core drives indicates the different effects on people. Core drives at the top half of the octagon, labelled as "White Hat" drives, motivate people through positive feelings, and the ones located at the lower half, labelled as "Black Hat" drives, stimulate and push people into actions by imposing some negative emotions. Chou stressed that although the "Black Hat" drives are powerful motivational tools, they trigger uncontrollable feelings and dissatisfaction and may not have a long-term motivation effect. Gamification design that relies heavily on the "Black Hat" core drives may have limited long-term success after implementation. This concern has also been echoed by multiple researchers (Barata et al., 2017; Hanus & Fox, 2015; Roy & Zaman, 2018). In this study, I used the Octalysis Framework as a supportive theoretical framework when evaluating the participants' feedback on motivation.

Figure 2-14 *The Octalysis Framework*



Source: Chou (2019)

2.5 Theories That Support Gamification

The gamification of learning is supported by a range of psychological and learning theories. These theories provide some theoretical foundations for educators and instructional designers with underlying factors that motivate users and explain why gamification could make non-game solutions engaging and enjoyable (Deterding, Khaled et al., 2011).

2.5.1 Reward and the Behavioural Theories

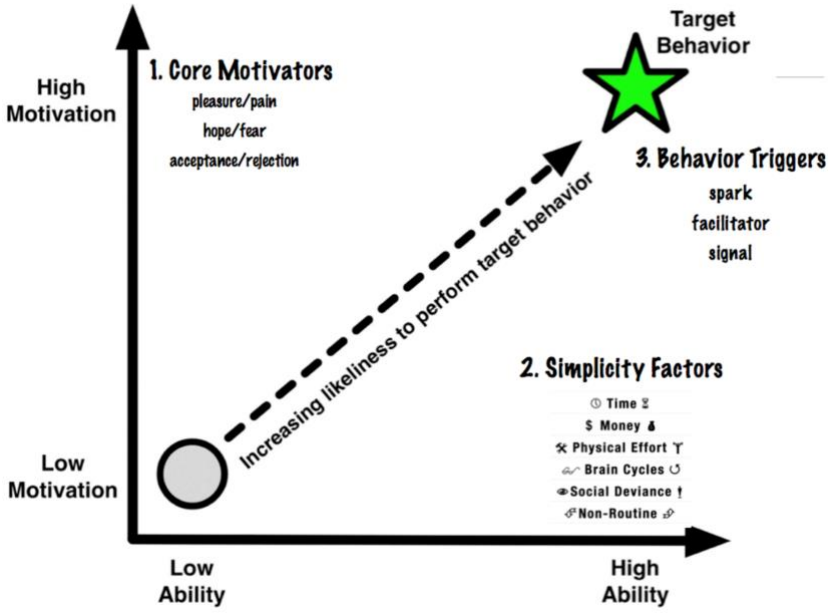
Behaviourism forms the theoretical foundation of the reward system in gamification. The game elements such as points, badges, leaderboards and tokens are rooted in operant conditioning and behavioural reinforcement theories.

Thorndike and Skinner's operant conditioning theory states that learners can learn from the consequences of their actions, and "the consequences of behaviour determine the probability that the behaviour will occur again" (Stangor, 2012). Skinner found it possible to shape behaviour by providing rewards for the desired behaviour (Kassin,

2003). These behavioural reinforcement theories formed the early theory of the foundation of student motivation, which "depicted humans as responsive to basic drives or needs, but otherwise relatively passive" (Brophy, 2013).

A more recent behavioural theory related to gamification is Fogg's Behaviour Model (FBM) (Fogg, 2009). As illustrated in Figure 2-15, Fogg identified three factors shaping human behaviour: motivation, ability and triggers. According to FBM, to persuade a person to perform a target behaviour, three conditions must be met: 1) the person must be sufficiently motivated, 2) the person must be able to perform the behaviour, and 3) the person needs to be triggered to perform the behaviour. To be successful in online courses, a student needs to be motivated to learn, capable of using online learning tools, and able to perform certain actions when triggered. FBM can be used to identify the motivational factors of learners so that they can cross the behaviour activation threshold and trigger the desired behaviour.

Figure 2-15 *The Fogg Behaviour Model*



Source: Fogg (2009, p.2)

Behaviourism-based gamification design focuses closely on learners' actions. It increases or maintains the frequency of the desired behaviour by applying the reinforcers or reducing the frequency of undesired behaviour with the deployment of

punishment or the removal of the reinforcers. It also uses immediate and frequent feedback to obtain an immediate reaction from the learners. The behaviourism-based design could be very powerful when used in online education. Many gamification designs such as the Point-Badge-Leaderboards (PBL) system, the reward system and the level-up system are all rooted in behavioural theories.

However, the use of behavioural theories in gamification design has also garnered some criticism. Hunter (2012) pointed out that behaviourism relies heavily on rewards. The notion of modifying players' behaviour through reward or punishment raises concerns regarding manipulation. People are pushed to take action for the rewards rather than their personal needs, goals and intentions. Also, behaviourism focuses on the scientific and systematic measurement of players' actions, rather than the players' reports of their feelings. What is on people's minds and what empowers them are left out in the behaviourism-based gamification design. Although powerful, rewards-based strategies should not be the only approach adopted in the gamification design.

2.5.2 Motivation and the Self-Determination Theory (SDT)

The alternative to a behaviourism-focused gamification is the cognitivism approach. While behaviourism sees players' minds as 'black boxes', cognitivism focuses on opening up the black box and trying to understand learners' minds and figure out why learners are motivated to behave in certain ways (Gorbanev et al., 2018). To be motivated means to be inspired to do something (Ryan & Deci, 2000a). Maehr and Meyer (1997) define motivation as a theoretical construct used to explain the initiation, direction, intensity, persistence and quality of behaviour. In education, it is considered one of the essential factors in learning (Eales et al., 2002) and is believed to be tied directly to the attention and effort students dedicate to their training objectives (Brophy, 2013). Students' increased motivation levels are believed to translate into increased effort, persistence, and enhanced performance (Buckley & Doyle, 2016; Lei, 2010). The ways in which gamification can motivate students to start, complete and perform well in online courses have been the focal point of many gamification-related theories and studies.

Maslow's hierarchy of needs (Maslow, 1943) is one of the earliest but still popular theories of motivation. He categorised people's physical and psychological needs into a five-level pyramid. From the bottom to the top they are physiology, safety, love, esteem and self-actualisation. The lower-level needs such as food, water, shelter and safety must be satisfied before higher-level needs such as self-expression and curiosity can operate (Brophy, 2013). Such hierarchical ranking of needs in various circumstances received some criticism from scholars (Break et al., 2014). However, its emphasis on lower-order needs serving as the foundation of the higher-order needs (self-esteem and self-actualisation) is still a valuable insight into motivation in gamification. Anxiety about failure can act as a demotivation factor when attempting activities; similarly, participants who feel rejected by their peers are less likely to be motivated to participate in learning activities.

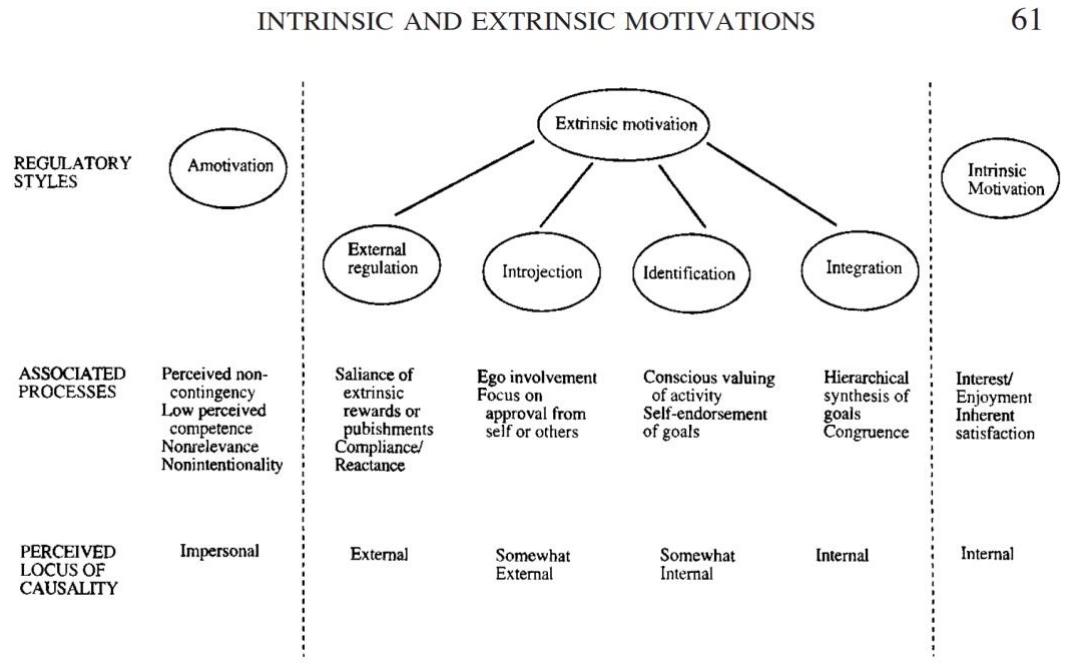
Another widely used theoretical foundation for gamification is the self-determination theory (SDT) developed by Deci and Ryan (Deci & Ryan, 1985; Deci et al., 2001; Ryan & Deci, 2000a; Ryan & Deci, 2000b). The theory is comprehensive and consists of multiple sub-theories. SDT identifies what motivates people to perform an activity and believes that they are not always motivated by rewards. Their inherent growth tendencies and innate psychological needs (Ryan & Deci, 2000b) are more powerful drives than those external motivators.

SDT proposes that people's motivation should not be simply divided into two distinct types, intrinsic and extrinsic (Ryan & Deci, 2000a). There is a spectrum of motivation types, ranging from amotivation or unwillingness to passive compliance to active personal commitment. As indicated in Figure 2-16, at the far left is amotivation, which means the participant is disengaged from the activity and lacks the intention to act.

At the far right of the spectrum is intrinsic motivation. Intrinsic motivations come from within the individual. They refer to the learner's inner drive to undertake an activity for the enjoyment of the learning itself or the feeling of accomplishment it evokes. As Ryan and Deci (2000a) examined, "Humans, in their healthiest states, are active, inquisitive, curious and playful creatures, displaying a ubiquitous readiness to learn and explore, and they do not require extraneous incentives to do so". This natural curiosity towards knowledge is the root of intrinsic motivation. When people are intrinsically motivated, the activity itself becomes the reward. They tend to pay

more attention to the complexity of the activities and are more accepting of unexpected possibilities (Kapp, 2012). Intrinsic motivation is often observed in well-designed games. People play the games not for external rewards but for the enjoyment of the games themselves. In education, when students are intrinsically motivated, they are more likely to explore further information, try out different approaches, and appreciate more with their learning output, which is believed to lead to a deeper level of learning and yield a better learning outcome (Hanus & Fox, 2015).

Figure 2-16 *A Taxonomy of Human Motivation*



Source: Ryan and Deci (2000a, p.61).

In between amotivation and intrinsic motivation are the extrinsic motivation factors. Extrinsic motivation is primarily driven from something else other than the content and subject of learning itself. Extrinsic motivation can vary greatly in the degree of autonomy. Learners are driven to complete a task because they want to avoid being criticised by the teacher, look good among peers, pass the exam or genuinely believe that the subject is valuable for their life.

When exploring the factors associated with a person's motivation, SDT identifies three essential psychological needs: autonomy, competence and relatedness. Autonomy

refers to a person's internal need to be responsible for their own meaningful choices. It is the feeling of being in control of one's actions and determining the outcome of one's activities. Competence refers to the person's need for challenges and a sense of mastery. According to the Cognitive Evaluation Theory (CET), a sub-theory of self-determination theory, interpersonal events and structures, such as the opportunity to acquire a new skill or be appropriately challenged, offer the satisfaction of the basic psychological need for competence and, hence, enhance the person's intrinsic motivation (Ryan & Deci, 2000a). Relatedness within the SDT theory concerns the psychological need of being socially involved and valued by significant others (Deci & Ryan, 1991). In education, it can be interpreted as the feeling of being respected and cared for by teachers and accepted by classmates.

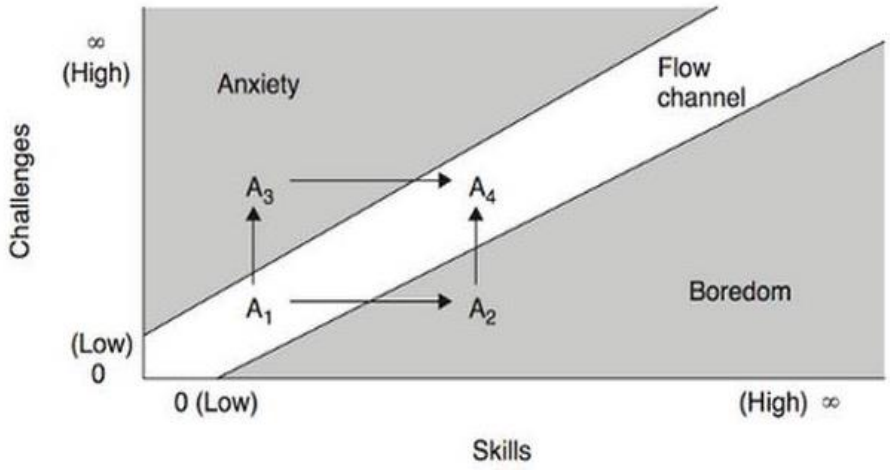
Research on gaming motivation has supported that the psychological "pull" of games can mostly be attributed to their capacity to engender a feeling of autonomy, competence and relatedness (Ryan et al., 2006). Game players feel they control their gameplay experience, gain competence when achieving a goal or winning the game, and experience relatedness during game collaboration. The view of motivation through the SDT lens is essential for gamification design. We have to agree that many of the subjects taught through eLearning may not be designed to be intrinsically interesting. This is particularly true in professional compliance training for adult learners. Online games are naturally fun and are intrinsically motivating to the players. By adding some fun game elements to the training, designers hope to increase learners' sense of personal commitment, gain positive self-perceptions and improve course engagement quality.

2.5.3 Engagement and Flow Theory

Another theory often used to guide gamification design is the flow theory introduced by Mihaly Csikszentmihalyi (2009). While SDT mostly pertains to players' motivation, flow theory focuses on learning engagement in gamification design. Flow is "the satisfying, exhilarating feeling of creative accomplishment and heightened functioning" (Csikszentmihalyi, 2009). According to Csikszentmihalyi, people enjoy the activity the most when they are in the "flow channel" or "the zone". The experience of flow is often described as an optimal state of being intensely focused and at the peak of creativity and performance. As indicated in Figure 2-17, the state of

flow is dynamic, achievable by striking the right balance between the two dimensions, challenges and skills. People may experience boredom if they do the same thing for too long; they may feel anxious or frustrated if the difficulty level increases too much. Neither boredom nor anxiety would be a positive experience for the players. By increasing the challenge by the right amount, players are pushed to stretch their skills to a higher level and open up to new opportunities.

Figure 2-17 *Flow As a "Channel" Between Boredom and Anxiety*



Source: Csikszentmihalyi (1990, p.74)

In the educational context, Whitton (2011) summarised eight considerations that can be used to balance between boredom and anxiety. These factors include 1) a challenge that requires skill to achieve with an attainable goal and known rules; 2) complete absorption in the activity; 3) clear goals; 4) immediate feedback; 5) concentration on the task in hand; 6) a sense of control, lacking anxiety about losing control; 7) loss of self-consciousness; and 8) transformation of time. In gamification of education, flow theory is often associated with goals, challenges, quests, levels and immediate feedback. According to flow theory, learners experience a high engagement level when they receive clearly defined goals, face just-manageable challenges, and continuously process feedback about progress (Bozkurt & Durak, 2018).

2.5.4 Bartle's Player Types

Another theory often mentioned in gamification literature is the player-type theory. People interact differently within a game or gamification environment. Bartle (1996)

classified players into four categories: killer, achiever, explorer, and socialiser. According to Bartle, explorers enjoy the gameplay by discovering new territories and gaining new knowledge about the environment; achievers gain a great sense of achievement by progressing to the top of the ranking system; socialisers often attain their highest satisfaction by interacting with other people; and killers try to dominate others in the game environment by conquering, destroying and killing.

Understanding the various player types is believed to benefit effective gamification design. Researchers and designers have recommended considering the different preferences from different player types in gamification design (Ferro et al., 2013; Werbach & Hunter, 2012). By understanding the characteristics, perspectives, and behaviours of the learners, designers can incorporate gamification elements and strategies so that each player type can encounter game elements attractive to them.

One of the foci in gamification design is the emphasis on competition, rewards, and winning. However, several empirical studies on player types have demonstrated that most gamification participants are not competition-driven (Gachkova et al., 2018; Kocadere & Çağlar, 2018; Staubitz et al., 2017). In a study, Zichermann and Cunningham (2011) discovered that most participants are not achievers but socialisers and explorers who are more attracted by a less competitive game environment. These researchers suggested that a balanced design with more consideration for socialisers and explorers may yield a better result in a gamification system.

2.6 The Effectiveness of Gamification

A good game makes us work hard and provokes a positive emotion towards the experiences of hard work (McGonial, 2011). Observed from the success of the video game industry, there has been a common belief that gamification can enhance students' motivation to learn, improve course engagement and yield better performance. However, the empirical study on gamification does not indicate such consistent results.

The pioneering research on the use of games in education can be traced back to the early nineties. Randel et al. (1992) reviewed 67 empirical studies published between 1984 and 1991 about the effectiveness of using games in conventional classroom instruction. Their study revealed that more than half (56%) of the studies show no

difference between games and conventional instructions, while about one-third favour games. Reviews by Randel et al. (1992) also discovered that the benefit of games varies among subject matter areas, with maths being the subject reporting the best results. Although this review focuses on the use of games in conventional classrooms, the insights about game-based learning can also be applied, with some adjustment, in online education.

Hays (2005) analysed 48 empirical studies on the instructional effectiveness of games with a wide range of age groups, from elementary school children to working adults. He summarised his findings as "The empirical research does not make a compelling case for games as the preferred instructional method", and "There is no evidence to indicate that games are the preferred instructional method in all situations". A valuable point he made through his research is that instructional games are only effective if they are designed to support instructional objectives.

Hamari et al., (2014) conducted a literature review focusing on the effectiveness of gamification. They analysed 24 empirical studies and concluded that gamification results varied between studies, as did the measurement of effectiveness. Gamification does produce certain positive effects and benefits, but very few found it universally applicable in all scenarios. The effectiveness of gamification depends on many factors, such as the motivation of users, the nature of the gamified system, and the gamification implementation strategies. The review also showed that the results of gamification might not be long-term but instead could be caused by the novelty effect.

Dicheva et al. (2015) examined 34 empirical studies published between 2011 and June 2014 and confirmed that gamification has the potential to improve learning if designed and implemented properly. They also identified the challenges of developing a gamification system using existing course management systems and called for new ways of gamification other than heavily focusing on extrinsic rewards.

Subhash and Cudney (2018) reviewed 41 papers focusing on gamification in higher education. They noticed that the benefit of gamification has become more established and recognised. Overall positive results in improving student attitude, engagement and performance were observed, and points, badges, leaderboards, levels, feedback and graphics are the most frequently used elements. Echoing other reviews in the past,

they also emphasised the importance of selecting different gamification approaches based on the subject area.

While the literature review provides us with an overall understanding of the effectiveness of gamification in education, the individual empirical studies offer a more contextual understanding of the topic. A large number of gamification studies have confirmed the positive results of gamification implementation with a wide range of foci.

Chapman and Rich (2018) focused their research on the motivation factor of gamification when surveying 124 students in a university-level organisational behaviour course. About 68% of participants reported that the gamified course was more or much more motivating than a traditional course. Smith (2017) undertook a quasi-experimental study and examined the impact of gamification on students' attitudes towards statistics. Through a comparison of attitude differences and course performance with those of the previous non-gamified semester, Smith concluded that there was a positive impact on students' attitudes towards statistics and learning and, subsequently, an improvement in students' course performance. Cheong et al., (2013) examined the gamification effect on students' performance. They evaluated a gamified multiple choice quiz software tool called Quick Quiz and measured the effectiveness of gamification along three dimensions: learning, engagement and motivation, discovering that the effects on the learning outcomes were most significant, but the effects on engagement and motivation were considered moderate.

Gamification in education can also positively influence the participants' emotions. Mese and Dursun (2018) conducted a mixed methods research on the effectiveness of elements of gamification in blended-learning environments. They discovered that the gamification elements allowed the participants to develop positive emotions on the one hand and caused them to have negative emotions on the other. Some elements, such as reward, competition, badge and level were influential in developing positive emotions in some participants. In contrast, different gamification strategies, such as content locking and over-competition, could negatively impact emotions.

Gamification in education studies does not always yield positive results. There is an ongoing discussion regarding the suitability of gamification as a solution for

education, the conditions under which gamification in education yields positive results, and the gamification strategies that offer positive cognitive gain for the learners. Dichev and Dicheva (2017) examined 41 behavioural studies and found that only 26% of the outcomes are considered "positive", which means that valid evidence confirms the effectiveness of gamification. A majority of the studies were marked as "inconclusive", which means the presented evidence was insufficient to conclude on the effectiveness of gamification. It is worth noting that 10% of the studies were marked as "negative".

Domínguez et al. (2013) conducted mixed methods research on the gamification plugin used on an eLearning platform, revealing that despite the common beliefs about the benefits of gamification in education, written assignment scores from the gamified experience group were lower than that of the non-gamified group. However, students with the gamified experience group received better scores in practical assignments. These mixed results imply that gamification is not a one-size-fits-all solution and that the results of the implementation are related to a wide range of factors and considerations, such as the subjects, application context, player types, combination of the gamification elements selected, and overall attitude of the students towards the games.

Further examination of the small number of studies that reported entirely negative results provided me with some insights into the criticism of gamification. For example, Berkling and Thomas (2013) gamified a software engineering course aiming to improve student engagement and motivation. The student survey conducted after the course indicated that the students did not positively receive the gamification solution. They were more motivated to study the material required in the exam and viewed the gamification solution as a non-efficient way of learning. The extra points and public recognition for helping others were not incentive enough if they were not tied to the final score. To the students, gamification was an "unnecessary hindrance towards studying for the exam". The authors concluded that changes to the traditional style classroom are needed before creating an autonomous, mastery-focused gamification-infused course.

It is worth noting that, in recent years, many theory-driven gamification studies have aimed to test gamification design against existing knowledge, explain how specific

gamification design elements work, and predict whether a particular model will be useful. Bozkurt and Durak (2018) systematically reviewed gamification research, revealing that research on engagement, motivation, behaviour change and gamified design is among the most studied topics. The self-determination theory (Ryan & Deci, 2000b) is among the most frequently used psychological theories in gamification.

To summarise, gamification could be an effective education method to increase learners' motivation, enhance engagement, improve assessment results, and promote learners' attitude and emotions towards learning. However, gamification is not a one-size-fits-all solution. The effectiveness of gamification depends on many factors. Gamification design needs support from behavioural, psychological and learning theories. Traditional non-gamified education methods still hold sway in many scenarios.

2.7 Gamification in Self-Paced Online Training for Adults

2.7.1 Gamification in Online Education

Research on gamification in the online education context, whether blended learning, eLearning or mobile learning remains popular among researchers. In a literature review, Bozkurt and Durak (2018) summarised the gamification related research between 2008 and 2016 and discovered that 45.19% of the studies are education-related. Dicheva et al. (2015) further calculated that 79% of the examined education-related gamification research is associated with online education.

Approaches to gamify online education can be broadly categorised into two types: structural gamification and content gamification (Kapp, 2016). "Structural gamification is the application of game-elements to propel a learner through content with no alteration or changes to the content" (Kapp 2013, p. 224). The content of the training is not gamified. Gamification is applied only to the structure around the content. Content gamification, on the other hand, uses the application of game elements, game mechanics, and game thinking to alter the contents of the course and make it more gamelike (Kapp, 2016).

Cavalcanti et al. (2018) examined the possibilities and limitations of both the structural and content gamification approaches in an online course. They discovered

that the combination of the two types of gamification, based on different theoretical foundations, can contribute to increased student engagement and improve the training outcome. In a quasi-experimental study, Fotaris et al. (2016) utilised a variety of structural gamification strategies in their blended entry-level Python programming course. Without altering the course content, the off-the-shelf interactive gamification systems made the learning fun and exciting for the learning experience. The results of this experiment were very positive, with several key performance metrics significantly better than the control group.

Looking more closely at the gamification element selection, according to Nah et al. (2014), the most commonly used game elements in the education contexts are points, levels/stages, badges, leaderboards, prizes and rewards, progress bars, storyline and feedback. This finding is echoed by Seaborn and Fels (2015), who surveyed 31 studies and observed that the most commonly used game elements are points, badges, rewards, leaderboards and challenges. Morales et al. (2016) examined the use of points, badges and leaderboards in massive online open courses (MOOCs) and discovered that gamification strategies provided motivation to complete the course and reduced the drop-off rate.

2.7.2 Gamification for Adult Learners

There were extensive debates among educators and scholars over the differences between how children and adults learn. Some scholars viewed education as a single fundamental human process and believed that adults' and children's education was essentially the same (Houle, 1972; London, 1973; Elisa, 1979), while others believed that they were basically different and the existential differences between the two required a strategic differentiation of educational practice (Knowles & Carlson, 1979; McKenzie, 1977, 1979).

Knowles' andragogy theory about adult learners, established in 1968, is based on the assumptions that adults learn differently from children and exhibit distinct characteristics when cultivating knowledge (Knowles, 1980). As such, he identified six principles of adult learning, stating that adults – 1) are internally motivated and self-directed; 2) bring life experiences and knowledge to learning experiences; 3) are

goal-oriented; 4) are relevancy-oriented; 5) are practical; and 6) like to be respected (Knowles et al., 2014).

In Knowles' early publications, he shared a dichotomous perspective on education, stating that pedagogy was for children and andragogy was for adults (Knowles, 1970). Later, he updated his statement and expressed a more continuum view on the topic. He indicated that there were occasions when andragogy could be used with children and pedagogy with adults, even though andragogy was the most appropriate approach for most adults in a majority of the learning situations while pedagogy was generally better for children (Knowles & Carlson, 1979). As individuals mature, their need and capacity to "be self-directing, to use their experience in learning, to identify their own readiness to learn, and to organise their learning around life problems" increases steadily from infancy to preadolescence and then improves rapidly during adolescence to fully exhibiting adult learning characteristics in their adulthood (Knowles et al., 2014).

Despite the critics, Knowles' andragogy theory about adult learners is still sound and valid and often closely referenced. During my interaction with adult learners through day-to-day work and this study, I also noticed their unique characteristics from the formal educational settings that are different from children and youth. I agree with Knowles' view on adult learning principles and believe they should be the core considerations when designing a gamified online course with the targeted audience, primarily adult learners.

People's attitude towards game and playfulness is also drastically different between children and adult education. While play in childhood is generally accepted as natural and inevitable, game in adulthood is commonly derided (Whitton & Moseley, 2019). Playing games, especially during professional training, is often stigmatised and misunderstood by trainers, employers, and learners.

Whilst there are many comprehensive studies on gamification in education, a vast majority of them focus on children, adolescents, and young adults in schools, colleges and universities. There are very few studies specifically focusing on adult learners outside of formal education settings. In a qualitative meta-analysis study, Ke (2011) indicated that the empirical research on instructional gaming tends to focus on

traditional learner groups such as school children and college students while ignoring adult learners. In a literature review, Caponetto et al. (2014) counted that more than 43% of the 120 gamification papers published between 2011 and 2014 are focused on university students and that another 9% focused on primary and secondary students. In a more recent literature review, Dichev and Dicheva (2017) discovered that among the 49 empirical gamification studies they selected, only one research paper was adult-learner-focused.

Gamification research focusing on adult learners remains under-researched and what gamification design strategies are more likely to be considered appropriate by adult learners remain unclear.

2.7.3 Gamification in Self-Paced Online Training

The delivery of online education can be mainly categorised into teacher-led, self-paced and blended learning. In instructor-led and blended learning the students learning experience is often facilitated by tutors or teachers who also control the pace of the progress and evaluate the learning outcome. In self-paced learning the role of the tutor is often absent. The course content is delivered through preprogrammed training modules.

Delivering training through self-paced eLearning has some apparent benefits. The training content can be distributed to a large audience quickly. The online courses do not require additional tutor resources once the training modules are developed. The modules can be repeatedly re-deployed to new students or cohorts at a low cost. Some self-paced training modules can also be translated into multiple languages quickly, making global mass distribution efficient. However, these benefits of self-paced eLearning could also pose challenges for instructional designers when designing effective and engaging gamification solutions. Research findings and suggestions for instructor-led and blended learning may not apply to self-paced online course design.

One of the challenges of the self-paced online course is the absence of human interaction in it. In such a course, the teacher's role is usually absent and replaced by a series of computer-programmed instructions. Learners often progress through the course alone without any engagement with the teacher or other participants, making timely and personalised feedback to the learner challenging. The absence of a learning

community also challenges gamification designers. Game elements and strategies promoting social relatedness, such as competition and cooperation, thus become irrelevant.

Although other research has been carried out on the use of gamification to improve students' engagement in online education (Alsawaie, 2018; Bozkurt & Durak, 2018; Dichev & Dicheva, 2017; Looyestyn et al., 2017; Martí-Parreño et al., 2016), the vast majority of the research is focused on instructor-led online training. Very few studies focus on gamification design for the self-paced online course. Dicheva et al. (2015) surveyed 34 empirical studies of gamification in education and found only two studies related to online courses; however, neither of them was about self-paced online courses outside of the classroom setting. Through my literature search in this study, I identified only two empirical studies related to gamification design or implementation for self-paced online courses (McGrath & Bayerlein, 2013; Schoenenberger et al., 2016).

With the limited existing research on this topic, gamification strategies optimised for self-paced online courses are not fully understood. This study, therefore, is an effort to explore the gamification strategies focusing on self-paced online courses.

2.8 Designing Gamified Online Courses

Reviews about the game, game elements and their relationships in this chapter provide us with the building blocks for gamification design. The behavioural, psychological and educational theories discussed herein explain how games and gamification could affect people's psychological needs, promote extrinsic and intrinsic motivation and improve learning engagement. Applying the game elements and theories to online courses requires an additional understanding of gamification design at the operational level.

Gamification design is a multidisciplinary approach requiring a broad set of considerations from various fields. Although gamification design and instructional design tend to be separated in the academy, they require close collaboration and integration when creating a gamified course experience. When designing gamified courses, traditional instructional design models and frameworks can also be applied to gamification development projects. In this section I include three of the operational

level frameworks and discuss how they can support a gamification development project's success.

2.8.1 The 6D Gamification Framework

Werbach and Hunter's (2012) 6D gamification framework is a practical design guideline for gamification implementation, extending their pyramid of gamification elements framework introduced in section 2.4.2. The 6D refers to the six-step development process involved in gamification design: define business objectives, delineate target behaviours, describe the players, devise activity loops, don't forget the fun and deploy appropriate tools.

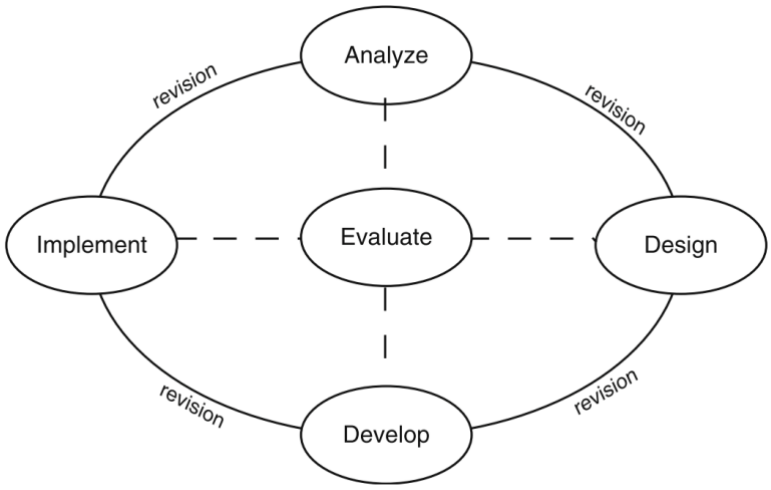
This gamification framework is practical because it incorporates the various considerations in a gamification project, including the business objective, behavioural and psychological foundation, user-centric design, fun elements and technical feasibility.

2.8.2 The ADDIE Model

The ADDIE model is an instructional system design framework and can be applied to "practically any development context" (Branch, 2010). The acronym ADDIE stands for the five sequential phases of the instructional design process: analysis, design, development, implementation and evaluation. It is considered the most well-known approach for designing eLearning courses. As illustrated in Figure 2-18, the ending of a course development phase is the starting of the next step. These phases can overlap or be interrelated, in which case the evaluation may lead the design process back to any of the previous stages.

The gamified online course development shares a similar development process to that of non-gamified courses, with additional gamification considerations. Although ADDIE is not a gamification-specific design model, it can be used as an underlying framework for course development.

Figure 2-18 *The ADDIE Workflow*

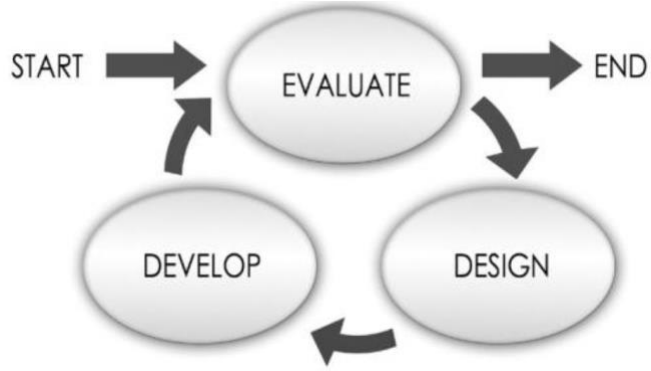


Source: Branch (2010)

2.8.3 The SAM Model

The Successive Approximation Model (SAM) is an instructional design approach created by Allen Interactions as an "Alternative to ADDIE that also emphasises collaboration, efficiency and repetition" (Allen & Sites, 2012; Allen Interactions Inc., n.d.). Different from the ADDIE's ordered steps approach, the SAM development approach is a more cyclical process consisting of multiple repeated small steps or iterations. The SAM development approach is often considered agile because it often continually evaluates and corrects the product at times when correction costs the least. As illustrated in Figure 2-19, SAM is divided into three phases: reparation, iterative design, and iterative development. Within the design and development phases there are iteration cycles bringing feedback and corrections quickly to the project. This cyclical process can foster close collaboration between all parties, including instructional designers, project managers, content experts and learners.

Figure 2-19 *The SAM Approach*



Source: Allen and Sites (2012)

None of the above-discussed frameworks is explicitly for the gamification projects in the education discipline, with the 6D Gamification Framework focusing on the general gamification design and the ADDIE and SAM frameworks focusing on eLearning project management. However, when designing and implementing eLearning gamification projects, the combination of these design frameworks could provide a valuable guideline for gamification designers. The researched online courses were developed under the influences of all three frameworks.

2.9 Criticisms of Gamification

Despite the popularity of gamification in education in recent years, it has received a noticeable amount of criticism from educators and researchers. People have started realise that mechanically added gamification may not live up to their promise. Blindly applying gamification elements without a proper understanding of the psychological and educational foundations may not guarantee an increase in engagement or performance. Below are some of the issues and concerns raised in the literature.

2.9.1 Undermining Intrinsic Motivation

The gamified reward systems such as points, badges, levels and leaderboards primarily promote extrinsic motivation, the rewards, rather than intrinsic motivation, the pleasure of learning itself. Zichermann and Cunningham (2011) warned of the danger of extrinsic reward dependency as extrinsic motivation tends to require a continuous supply of rewards. If the reward stops, the target behaviour will stop with

it. Also, not all people are motivated by the same incentive. Some are motivated by money or power; others by challenges or social recognition. According to the Self Determination Theory (Ryan & Deci, 2000a), people tend to seek activities that can satisfy their autonomy, competence and relatedness needs. The participants' performance will diminish over time if the reward-based gamification system cannot provide the player with self-fulfilling and creative engagement. This lack of intrinsic motivation can demotivate learners who already have high intrinsic motivation (Glover, 2013). In an empirical study conducted by Thom et al. (2012), the overall participation of the studied behaviour was reduced when the extrinsic reward, the points and badges, were removed.

As for gamification design, a substantial body of research suggests that some gamification elements, such as points and badges, may cause the learner to shift from intrinsic to extrinsic motivation and may demotivate the learner over time (Lamprinou & Paraskeva, 2015). Other gamification elements such as goals, progress, levels and feedback are believed to be intrinsically motivating and are generally viewed as preferable in gamification solutions.

2.9.2 The PBL Fallacy

Not all game elements are adopted equally in gamification applications. Badges, points and leaderboards, often referred to as "the PBL Triad" (Werbach & Hunter, 2012), are the most commonly utilised. Many gamification designers add PBL to existing online courses, hoping it will effectively improve learners' engagement and motivation. Dichev and Dicheva (2017) explained that the possible reason for the overuse of the PBL system is that it is somewhat parallel to the traditional classroom assessment module and is the easiest to implement.

PBL is often criticised for being heavily focused on the reward systems and promoting competition rather than collaboration, thus "making the learning scenarios more stressful instead of more enjoyable" (Challco, 2016). Researchers noticed that with the heavy use of badges and points, also known as "pontification" and "badgification" (Chee et al., 2017), some learners will focus more on the available rewards rather than the content (Hagedorn et al., 2017). Some may be pushed to repetitively work on some activities that they have already mastered to earn points to level up.

2.9.3 The Oversimplification of Gamification

With the help of new technology, teachers can use gamification plugins to quickly add a gamified layer over the existing course design without changing the core of the system (Hamari et al., 2014). Deterding (2012) commented that "Gamification has drawn the ire of game designers", and the current stock implementation of gamification adding points, badges and leaderboards to mundane user activities is "Taking the thing that is the least essential to games and representing it as the core of the experience". Simply adding PBL to existing courses should not be the one-size-fits-all gamification solution.

Bogost et al. (2015) viewed it from the development perspective and argued that gamification is not a style of game design or a manner of putting games to use. It is "The simplest, fastest route to getting customer sign-off and billing for services". They claimed that gamification not only misinterpreted games and failed in its purpose but also provided irrelevant, temporary solutions with the only purpose being to "advance the current". They also indicated that gamification is a beautified and falsified solution and "-ification" has made the process easy, achievable and recyclable for any situation.

2.9.4 Lack of Hedonic Aspect

From the user experience perspective, successful video games bring players "An intense temptation, hedonic thrills, instant gratification and states of compulsion and obsession" (Chee & Wong, 2017). However, most gamification applications fail to bring a great feeling of fun to their users due to the lack of a hedonic nature. Educational gamification is essentially centred around learning. The hedonic elements, such as immediate feedback, achievable goals, progress and encouragement, are often insufficient. When a gamification system is introduced to students who have high expectations of their game experiences through exposure to commercial video games, they will be disappointed if their hedonic experiences are not similar to the video games' levels.

2.9.5 Decrease the Seriousness of Education

From the educator's perspective, gamification is criticised by some teachers for decreasing the seriousness of education. This view may be a result of some historical misconceptions about fun. Fun is traditionally viewed as applying only to young children and irrelevant or inconsequential to formal or informal learning (Rieber, 1996). In adult learning, fun can be seen as "too easy", "frivolous", or "inappropriate" (Whitton, 2011). In an empirical study conducted by Alabbasi (2018), some teachers in the research expressed concerns about gamified learning's competitive nature. They were concerned that gamifying learning may be distractive to the students and lead to poor learning behaviour.

Although gamification generated some criticism and concerns, the adoption of gamification has become increasingly popular in online education. Findings from existing literature suggest that imitating game design and replicating game elements may not transfer well into the educational context. Gamification design in education should focus on identifying gamification solutions that bring fun and playfulness to online courses, promote learners' autonomy, foster their competence and enhance their learning relatedness.

2.10 Research Gaps

Through the literature reviewed in this chapter, gamification applications clearly have some favourable implications on motivation and engagement when applied in educational settings. However, gamification studies were often focused on teacher-led classes where social collaboration, competition and communication can be utilised. Little research exists regarding the use of gamification strategies in self-paced online courses, where students are typically pacing through the course without interaction with teachers or classmates.

The majority of the existing literature focuses on children, adolescents and young adults in a formal education system. There is a lack of research examining the gamification for informal online education for adult learners. Further investigation is needed to understand how adult learners perceive the gamification applied in their online courses, that is, what gamification strategies may or may not work for adult learners. By understanding the adult learners' perspectives, gamification designers and

developers can understand how to create gamified online courses that yield better learner experiences and learning outcomes.

Furthermore, the existing gamification frameworks focus either on general gamification implementation or on the traditional instructional design process. There is a missing link that bridges the two processes together. A gamification strategy framework tailored for online adult education could help the leadership team, the project managers, instructional designers and developers cultivate a multidisciplinary understanding of the gamification design, its underlying theories, the available technologies and their interlinked relationships.

2.11 Concluding Remarks

The literature reviewed in this chapter provides the background within which this study is situated. In this chapter I explored the definition of game, gamification, its history and its relationship with other related concepts. I also examined the gamification construct and detailed the different game elements and their interconnecting relationships. Many of these game elements were implemented in the researched courses and will be further discussed in later chapters.

The review of existing literature, both systematic reviews and empirical studies, provided me with an overview of the current gamification research and helped me to identify gaps that could be further explored in this study. The reviewed behavioural and motivational theories formed the foundation of my research and will be used to explain my research findings; the empirical studies provide me with rich contextual details of the topic; the gamification design frameworks were used as the development models when creating the researched courses; and the criticism on gamification provides me with an alternative viewpoint on my studied topic and helps me to be aware of the challenges that could potentially impact my research results.

3 Methodology

3.1 Introduction

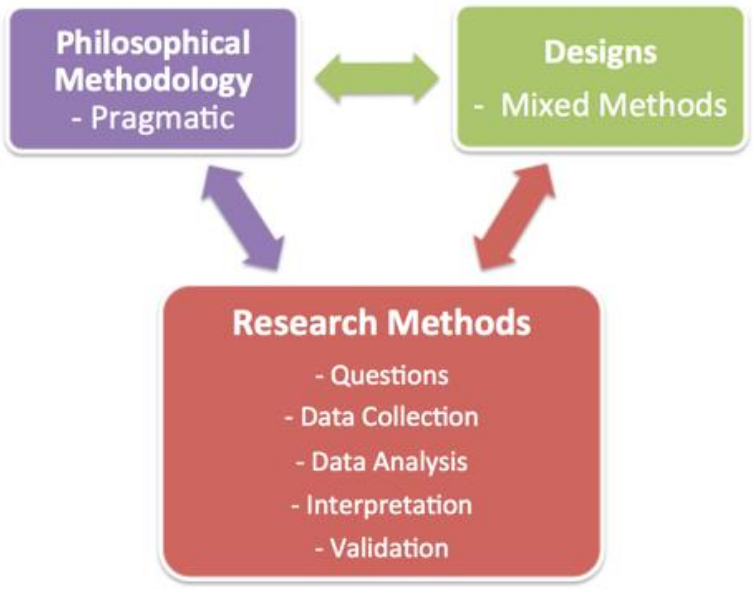
A suitable research design is the foundation of a successful study. It ensures the reliability, validity and credibility of the research findings. For a study to be considered adequate, Creswell suggested three components in the research design: the philosophical worldview assumptions that inform the research design, the methodology that guides the overall execution of the research plan and the specific methods that are selected to collect and analyse the data (Creswell, 2014). Figure 3-1 is the research framework used in this study. It illustrates the connective relationship among the philosophical methodology, research design and the selected research methods.

This research is guided with a pragmatic lens. From a pragmatic perspective the focus of this study is on developing practical solutions for gamification design and implementation rather than to test or develop gamification-related theories.

This study aims to understand the results of implementing gamification in self-paced online courses and to testify whether gamification is a method that is theoretically driven and proven by empirical evidence. Furthermore, this study aims to discover the various considerations that need to be taken into account during the design and implementation of an online gamified course. A convergent mixed methods approach that involves collecting and bringing together qualitative and quantitative data is considered best suited for this study.

Data for this research were collected from three sources: the quantitative participant feedback survey, the quantitative course records and the qualitative interview. Qualitative survey comments were also incorporated with the interview transcript during the process of analysis. Through the analysis of both quantitative and qualitative data, results of the gamification implementation were understood and factors that impact the participants' experiences were merged.

Figure 3-1 *Framework of the Research*



Adopted from Creswell (2014, p.5)

3.2 Research Philosophy

Philosophical methodologies are essential components of this research. Though mostly hidden, they provide the foundation for this research and influence the practise of the research designs throughout the project (Creswell, 2014).

The research was conducted using a pragmatic lens. Pragmatism is a worldview or philosophy that arises from actions, situations and consequences rather than antecedent conditions (as in post-positivism) (Creswell, 2014). It is "Primarily a method of settling metaphysical disputes that otherwise might be interminable" (James, 1959). Pragmatism is concerned with applications that work and solutions to problems (Creswell, 2014) and emphasises the research problems rather than the

methods and uses various available approaches to understand the problems (Hanson et al., 2005).

There were extensive debates among social and behavioural science researchers over choosing between qualitative and quantitative research in the 1970s to 1980s of the last century. The discussion was fundamentally rooted in the vast differences among the paradigms that researchers operated within.

In general, quantitatively oriented researchers primarily work within the postpositivist/positivist paradigm. They are mostly working with numerical data and view the world from the perception given by authoritative knowledge. Quantitative studies usually are theory driven. These studies are conducted to test propositions or hypotheses that are based on specific conceptual frameworks. Typical quantitative analysis is generally deductive, which means the intent of the research is to test theories deductively using evidence to either support or reject the hypothesis (Azungah, 2018; Teddlie, 2009).

In comparison, the qualitatively oriented researchers belong among the users of the constructivist paradigm and are mostly interested in narrative data and analyses (Mills et al., 2006). They view the world from the perspective of the research participants. Typically, qualitative research is often exploratory (Creswell, 2014) and involves discovering patterns, themes and categories from the research data (Lincoln & Guba, 2005). Qualitative research is often inductive as theories and findings are generalised from the unknown phenomena. It was believed that researchers could not overcome the radical differences between the two paradigms, and they could not co-exist in the same field of research. Researchers had to align their research with one of the approaches (Burell & Morgan, 1979).

Kuhn (1970), however, called for a third paradigm or a "paradigm shift". He argued that members of a scientific community share a common understanding of best practises for conducting research. These standard practises are well accepted and carried on by the community of practitioners until the defined paradigm is no longer able to answer the research questions. As a result, some innovative practitioners will step out of the existing paradigm and, eventually, establish a new paradigm. Kuhn (1970) referred to this as the "paradigm shift". He further argued that competing

paradigms may exist simultaneously, especially within the emerging research fields. This "competing paradigms" view was later to become the foundation of mixed methods research.

Many researchers associate mixed methods research with the pragmatists' worldview (Branne, 2005; Creswell, 2014; Greene, 2008; Kuhn, 1970). Pragmatism is not committed to any one of the philosophical worldview systems but gives researchers the freedom to choose the methods, techniques and procedures that best answer their research questions (Creswel, 2017). Pragmatists do not see the world as an absolute unity. On the contrary, they believe the forced-choice dichotomy between post-positivism and constructivism should be abandoned (Creswell, 2014). Also, pragmatists do not distinguish between objectivity and subjectivity, or quantitative or qualitative as absolutes. They believe the researchers can choose to interact with the participants or the statistical data at various stages of research and may even bring the two methods together to answer complex questions (Teddlie, 2009).

3.3 Why Pragmatism?

The selection of mixed methods research design is rooted in my pragmatic worldview and belief that the dialectical position that the pragmatic worldview offers affords a greater insight into human phenomena. With the pragmatic worldview, I accept the influences of other paradigms in the research design.

When selecting research methods, I did not limit myself to a research method and believe both quantitative and qualitative research methods are necessary as long as they help me answer my research questions.

I analysed the survey results for each game element and used statistical tests to measure the interrelationships between different variables. When studying the qualitative interview and survey comments data, I analysed the data with the constructivism lens. I attempted to understand the gamification implementation from the participants' perspective, using rich, contextual qualitative data, identifying patterns, interpreting the phenomena and constructing new theories and frameworks from the data analysis.

Through the pragmatic worldview lens, I accept the bias dilemma of being an insider researcher. I acknowledge the existence of researcher bias, especially when studying the courses designed and developed by myself. I carefully undertook various procedures to reduce researcher bias during both quantitative and qualitative data collections and analysis phases.

3.4 Insider Researcher

While undertaking the mixed methods research, I took on various roles at the researched institution to avail of the unique opportunities and challenges that were available to me as an insider researcher.

When I undertook research in this project, the dual roles of being a staff member of the researched site and insider researcher opened up many opportunities that significantly impacted the study. Being an insider researcher facilitated obtaining permission to conduct research from the management of the institution as well as gaining the trust of the potential participants and acquiring their consent. Moreover, my insider researcher status encouraged the research participants to share their opinion more openly, knowing their suggestions could be utilised in the improvement of future courses. This position also made accessing the course data easier. As an insider system administrator, I had access to the course statistical data stored in the database and could export the various reports as permission and consent allowed. My insider course designer and developer position also permitted me to incorporate the understanding of gamification directly into the online course development and realise the gamification design without incurring a high development cost had third-party developers been hired. Furthermore, my role as the project lead equipped me with a broader understanding of gamification implementation not just from the pedagogical/andragogical perspective but also from the technical and business standpoint. All this would have been very difficult to accomplish for an outsider.

Though an insider researcher has many advantages, there also are many challenges, especially the issues associated with researcher bias (Smyth & Holian, 2008). With familiarity with the LMS system as an administrator, I knew the types of data that were accessible. Therefore, the design of the research was naturally influenced by that knowledge and the need to use the known data sources. This unconscious assumption

about the research process based on my prior knowledge is considered a form of bias (Unluer, 2012). Also, because of my insider knowledge, I was aware of the learners' demographic distribution. During the interview selection process, I was intentionally selecting interview participants based on their demographical information. Although this is considered a form of purposive sampling and is generally accepted (Fink, 2015), it could also result in the disproportionate representation of a particular population from among the students taking the research courses. Notably, as an insider, I was able to access the participants' personal information whether or not they consented to participate. Therefore, I have to be explicitly careful during the data collection process to preserve the secrecy of consent and anonymity by removing the user data that did not belong to the research participants.

Acknowledging both the advantages and challenges associated with my insider researcher position also reflects my pragmatic worldview. As a part-time PhD student, it was practical to choose my workplace as the research site and sensible to choose a job-related research topic. Also, it was realistic to research the learners who were accessible. Thus, my pragmatic worldview suggests that I take advantage of being an insider researcher and also that I am cautious of the potential bias-related issues that such status could cause.

3.5 The Mixed Methods Research Design

Convergent mixed methods is the primary research method utilised in this research. Mixed methods research involves combining or integrating quantitative and qualitative research and data in a research study (Creswell & Plano-Clark, 2007; Creswell et al., 2005).

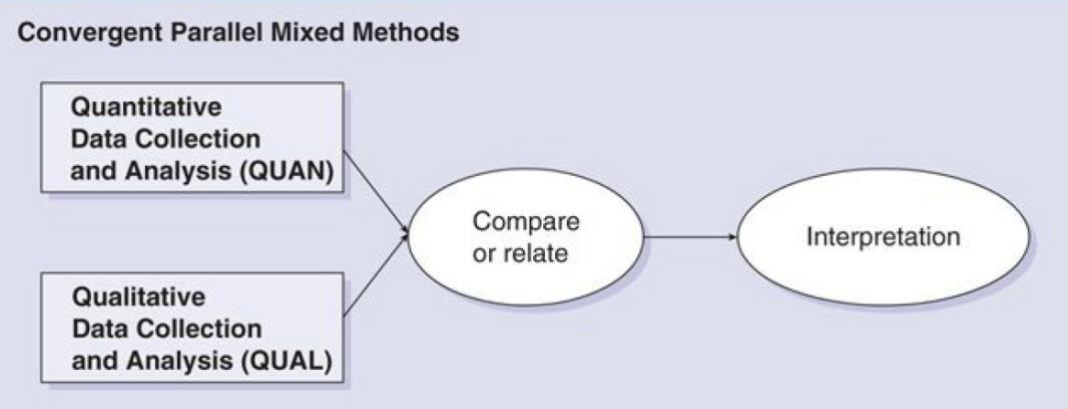
The decision to use a mixed methods design was intimately associated with the five research questions. When addressing the first question about the gamification implementation results, a mainly quantitative survey data analysis was believed to be suitable. The second and third questions are about mapping participants' gamification experiences with their demographic information and performance in the course. Quantitative analysis of the user profile and course-related data mapped with survey data is believed to be the appropriate option. The fourth question explores the participants' perspective on gamification. Qualitative interviews are believed to be

best suited for answering this question. The last research question was about the various considerations when designing and implementing gamification solutions. Integrated analysis of quantitative and qualitative data would reveal all the aspects of the topic.

Johnson and Onwuegbuzie (2004) suggested that researchers should be free to use either quantitative or qualitative research methods or both. In this study, just the numeric-based or the text-based data alone would not be sufficient to answer the research questions. While the quantitative surveys and course-related data analysis indicated the participants' overall attitude towards gamification, it could provide only a limited in depth understanding of the participants' personal experiences. Also, interviews with the participants offered an opportunity to explore participants' complex individual perceptions. It did not provide a measurable indication of the result of the implementation of gamification. Integration of both data types proved to be a more suitable approach that helped develop a complete understanding of the research questions and validate and explain the findings from both data types.

This mixed methods research is convergent. As illustrated in Figure 3-2. The quantitative data was collected by surveying the online course participants and accessing the participants' course related data. The qualitative data were collected through open ended survey comments and in depth follow-up interviews. The numeric-based data was analysed quantitatively, and the text-based data were analysed qualitatively. The convergent mixed methods permitted the examination of the two different but complementary datasets and the development of a more profound understanding of the gamification implementation results.

Figure 3-2 *The Convergent Parallel Mixed Methods Design*

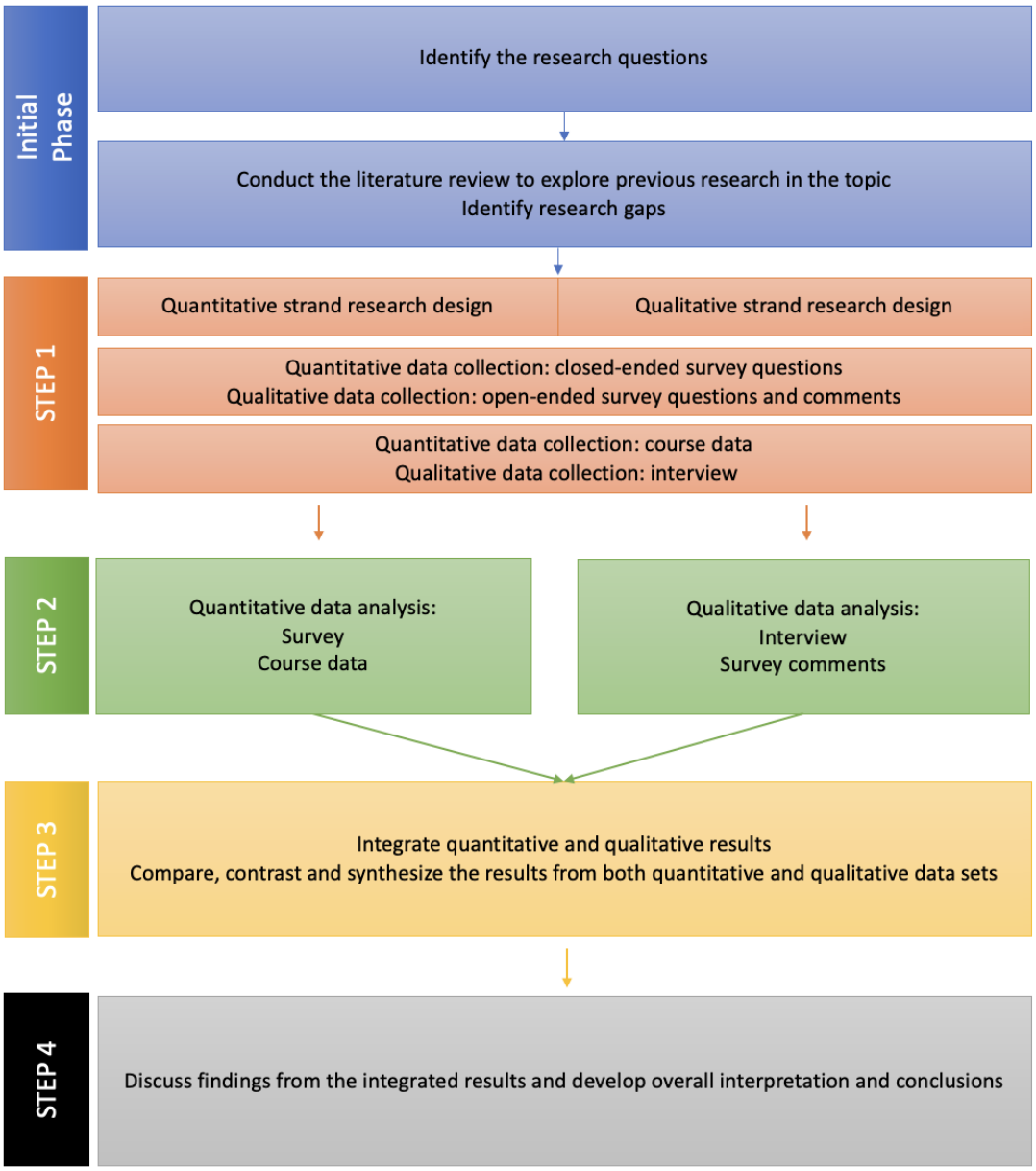


Source: Creswell (2014)

3.5.1 Overview of the Research Process

Figure 3-3 illustrates the overall process of this study, starting from the problem statement and literature review, followed by collecting two strands of data. During this step, the survey was deployed first with three purposes: to collect the participants' feedback about the gamification implementation; to obtain permissions from the participants to access their course-related data; and to select the appropriate participants for the follow-up qualitative interview. Qualitative survey comments were also collected through the survey. Each participant's course records data was exported from the database and then mapped with their survey responses. The semi-structured interview questions were developed based on the participants' survey responses. Rich, textual interview data was collected through the interviews. The two strands of data were analysed separately using quantitative and qualitative data analysis procedures in step two. Initial results from the two strands of data were then integrated and compared in the third step. In step four, research conclusions were drawn based on the findings from both quantitative and qualitative data.

Figure 3-3 *Flowchart of the Research*



3.5.2 Research Approaches Used in This Study

Deductive and inductive are two main research approaches. When using a deductive approach, a researcher first develops a theory or hypothesis and then designs experiments to test the hypotheses statistically. Traditionally, the deductive approach is associated with the positivist worldview and quantitative research method. On the other hand, the inductive approach starts with collecting observational data and develops theories based on the data analysis. Induction is commonly associated with interpretivism and its related qualitative research method (Cohen et al., 2002; Johnson

and Christensen, 2013; Schreier, 2000). With a pragmatic worldview, both inductive and deductive approaches were utilised advantageously in this study.

When working with quantitative survey and course data, the deductive approaches were used to examine the gamification implementation results and compare the differences of attitude between groups. When working with qualitative data, inductive methods were used to summarise and categorise the participants' perceptions of their online learning experiences. When analysing the data integratively, both approaches were used simultaneously to verify whether the qualitative data could explain the quantitative data and in what way might the quantitative data agree with the qualitative data. At the end of this inductive-deductive research cycle (Teddlie, 2009) a conceptual framework for gamification course design emerged based on findings from this integrated research approach.

3.5.3 Considerations for Not Adopting Other Research Methods

Other research methods that could have been adopted were phenomenography, ethnography or design-based research.

Phenomenography aims at identifying the qualitatively different ways in which people experience, conceptualise, perceive and understand various kinds of phenomena (Richardson, 1999). It explores the variations in ways of experiencing phenomena (Ashworth & Greasley, 2009). It could have been used to answer the fourth research question, where perspective variations of the participants' online gamification experiences were explored. However, phenomenography is mainly qualitative and would not have been adequate for answering the first three research questions that concerned the overall result of gamification and the demographic differences.

Ethnography can be used to discover and recognise the ways that people coordinate their actions with one another (Crabtree et al., 2012). It is commonly used as a systematic study of people and cultures. It is observational, field-based research and typically requires a prolonged presence on the research site (Boellstorff et al. 2012). In this study, the participants could enrol and leave their course at any time, thus making it difficult to follow the group to achieve "deep immersion" (Boellstorff et al., 2009).

Design-based research is based on collaboration among researchers and practitioners in real world settings (Wang & Hannafin, 2005). As mentioned above, all of the courses included in this project are self-paced online courses. Students mostly interact with pre-developed online modules. Interactions between practitioners, students and researchers are limited. As a result, design-based research is not ideal for this project.

3.5.4 Why Convergent Mixed Methods Design

There are several types of mixed methods strategies that researchers can implement in their mixed methods study. These form into three core mixed methods designs, namely the convergent parallel mixed methods, the explanatory sequential mixed methods and the exploratory sequential mixed methods (Creswell & Clark, 2014). The main differences between these mixed methods designs are the points in the process at which quantitative and qualitative data is collected and analysed. In convergent mixed methods research, the researcher collects quantitative and qualitative data, analyses them separately and then compares the results to see if the findings are mutually confirmatory or disconfirmatory (Creswell, 2014). The explanatory sequential mixed methods divide the study into two phases. The quantitative data is collected and analysed in the first phase. This is followed by qualitative interviews to help explain the survey responses. The explanatory sequential approach, on the other hand, begins with a qualitative phase and is followed by a qualitative phase. The qualitative phase is to gain an initial understanding of the research population. The findings from it are used to develop better measurements in a second quantitative phase.

A convergent mixed methods design was used in this research because the sequence of the data collection process did not have a significant impact on answering the research questions. Research questions 1, 2 and 3 mostly required quantitative data, while research question 4 required mostly a qualitative approach, and the last research question needed insights obtained from both sets of data.

The selection of the convergent mixed methods design in this study also had practical reasons. This mixed methods research requires a great deal of time to collect and analyse each data set. As the participants in this study were busy professionals, they did not have a strong tie to the institution, which limited the window of opportunity for gaining their participation. With the convergent mixed methods, I could collect the

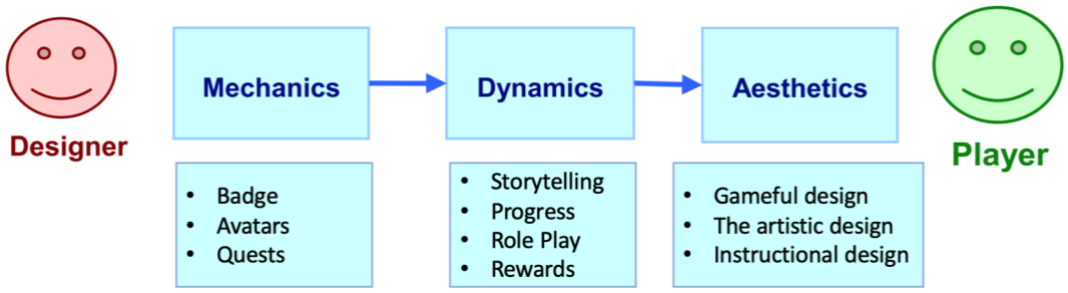
data while the opportunity was open and then work on data analysis later when it was feasible and manageable as the situation permitted. For the above reasons, a convergent mixed methods design combined with quantitative and qualitative data analysis was considered the best-fit research methodology for this study.

3.6 The Researched Game Elements

Online course gamification is achieved through the use of various game elements. The multiple game elements that dynamically interact with each other contribute to the overall course experience enhancement (Deterding, Sicart et al., 2011).

In section 2.4 four popular gamification frameworks were introduced. In this study the MDA framework was used primarily to map the gamification elements. As illustrated in Figure 3-4, three mechanics level game elements, four dynamics level game elements and three game aesthetics level elements are studied.

Figure 3-4 *The Gamification Elements Examined in This Project Mapped with the MDA Framework*



Some game elements were implemented more widely in the researched courses than others, depending on the course design needs. For example, badges and progress are included in six out of the seven courses, while storytelling and role-play are applied in only one course. However, at the aesthetics level, since it is the level with which the players (learners) directly interact, all game aesthetics elements are incorporated in all courses. Table 3-1 maps the game elements implemented in each researched courses.

Table 3-1 *Game Elements by Course*

Game Elements	Course C	Course A	Course B	Course S	Course W	Course O	Course R
			Mechanics				
Badges	Yes	Yes	Yes	Yes	Yes		Yes
Avatar							Yes
Quest							Yes
Rewards					Yes		Yes
			Dynamics				
Storytelling						Yes	
Progress	Yes	Yes	Yes	Yes	Yes		Yes
Role-play						Yes	
			Aesthetics				
Gameful Design	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Artistic Design	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Course Design	Yes	Yes	Yes	Yes	Yes	Yes	Yes

There are other game elements implemented in the courses but not included in this research for various reasons. For example, the Easter eggs game element is designed to be hidden and may not be discovered during the participants' typical learning experiences. It was incorporated in the course design but was not included in the study.

3.7 Instruments

In this study multiple instruments were deployed to form an integrated investigation of the participants' gamification experiences, perspectives and course outcomes. Table 3-2 is the list of the instruments used in this study.

Table 3-2 *List of Data Collected*

Data	Source	Type/Goal
Contact information of the research population	Moodle LMS	Identify research participants
Closed ended survey responses	Survey	Quantitative
Open ended survey responses	Survey	Qualitative
Course statistical reports	Moodle LMS	Quantitative
Interview transcripts	Interviews	Qualitative

3.7.1 Online Survey

3.7.1.1 The Survey Design

Several considerations influenced the survey design and deployment. These included the survey frequency, the number of groups involved, the length of the survey, the organisation of the questions and the survey question types.

The length of the questionnaire is an essential consideration when designing the survey. Shorter surveys tend to achieve higher response rates (Glasow, 2005), but longer surveys collect richer information from the respondents. Therefore, it was necessary to incorporate a few strategies to reduce the survey length and increase the survey response rate. Instead of including questions about the participants in the survey the additional information such as country, enrolment date, completion date, grades and access logs were mapped with the questionnaire data with the participants' consent after the survey. Conditional branching was also used to skip questions that do not apply to the specific courses.

The survey follows a cross-sectional design, which means the data are collected at a single point of time (Fink, 2015). Other survey designs, such as the longitudinal design and the experimental comparison design, were considered but ruled out. The researched courses are self-enrolled. At any given time participants could enrol into and graduate from the courses. This made a longitudinal survey design impracticable. The experimental comparison design was also considered but not adopted. There was

only one version published for each researched course. It was not practical to create a non-gamified version of the same course for experimental comparison because of institutional restrictions. Therefore, in this study, the survey was deployed to the entire list on the sampling frame as one single group.

The selection of the survey design also reflects my pragmatic worldview. As an insider researcher, it was sensible to utilise the available resources and apply an appropriate design that could bring forth answers to the research questions while avoiding unrealistic organisational challenges (Hall, 2013).

Survey Questions. The survey consisted of four sections. The first section explained the purpose of the study, briefly introduced the research topic, the procedure and the withdrawal process. The second section collected participants' personal information that was not available in LMS. Consent for using participants' course-related data was also collected through this section. The third section contained questions to discover respondents' opinions and attitudes related to their course experiences and their views on the game elements. In the last section, the participants were invited for a follow-up interview. The participants who accepted the invitation were contacted in the qualitative research phase which followed.

To ensure the reliability and validity of the survey, the use of existing surveys that have already been validated was considered and many standardised questionnaires related to education and information technology were examined. However, none of these was fully suited to address the present research questions. For example, the Constructivist On-Line Learning Environment Survey (COLLES) (Taylor & Maor, n.d.), a built-in survey that comes with the Moodle LMS core package, is most suitable for tutor-led eLearning classes with peer interactions. The IBM Questionnaires, including the After-Scenario Questionnaire (ASQ), the Post-Study System Usability Questionnaire (PSSUQ) and the Computer System Usability Questionnaire (CSUQ) (Lewis, 1995) provide an overall evaluation of a computer system but are not gamification or education specific. The Usability Scale Questionnaire (USQ) template (usabiliTEST, n.d.) examines the system's overall usability but did not offer customised investigation on each game element in gamified systems or courses. The Questionnaire for User Interface Satisfaction (QUIS) (Chin et al., 1988) examines the user's level of satisfaction with a system with various technical

measurements. It is not, however, tailored to gamification design. Other survey templates offered by various websites, such as questionpro.com, qualtrics.com, and surveymonkey.com were examined. However, none of these had a questionnaire design that fitted the need of this study. Therefore, customised survey questions based on the existing survey templates were developed to focus on learner satisfaction about different game elements and gamification design incorporated in the online courses.

Questions in this survey were designed predominantly using ordinal five-point Likert scales (Likert, 1932) with ratings from "strongly agree" to "strongly disagree" and a neutral response in the middle. The responses to these ordinal questions may be used to calculate the median or mean, could be examined with various statistical tests and further processed for categorisation or comparison. The survey also included one open ended question, which was analysed qualitatively together with the interview transcripts. A list of the survey questions is included in Appendix B. The elimination of the neutral option was considered to ensure that the participants responded either positively or negatively (Krosnick et al., 2002) or using a broader seven-point Likert scale to capture a more accurate reflection of the respondents' evaluation (Allen & Seaman, 2007; Finstad, 2010). Since this was a mixed methods research that would afford further opportunities to explore the participants' opinions through interviews, it was decided that the five-point Likert scale was an adequate and appropriate tool for the survey.

The Research Population. The research population is defined as all participants who have enrolled in one of the researched courses within the past 12 months and have completed at least 50% of the course content. The rationale behind these selection criteria was that participants who completed the courses more than one year ago might not have a clear memory of their learning experience, which would reduce the accuracy of the research results. As time passes the participants' emotional tie with the course loosens, which, too, would affect the rate of response to the survey. Similarly, learners who had not yet completed 50% of the course content were not included in the research population as they might not have enough course experience.

To justify the selection criteria, the limitations of the research population were carefully examined. First, the selection criteria excluded the participants who enrolled in the course but never completed half of the content either due to personal reasons or

dissatisfaction with the course. However, many of the gamification elements can only be experienced with some minimum adequate interaction with the course. Second, excluding from the research population those who took the courses more than a year ago meant losing a considerable number of potential respondents. However, unlike long-duration courses taught in a formal educational setting, the researched courses are short-duration online courses taken by busy professionals. Once completed, the learner's relationship with the course would end. Therefore, it was expected that the response rate from participants who completed the course more than one year ago would be relatively low. Hence the above criteria for inclusion in the research population were set. A total of 2,759 participants were identified as the research population.

The Research Sampling Frame. The difference between a research population and a sampling frame is that the research population is an abstract concept, while the sampling frame is the specific list of participants (Fink, 2015). To achieve the most representative research population, the entire set of eligible participants was included in the research population. Even though the target population of 2,759 was large, it was considered a manageable sample size as the survey was to be conducted online using the built-in email function of each course and reaching out to the large population did not entail any extra cost. Also, the relationship between the researched population and the researched site was not very strong. A relatively lower response rate was expected. To ensure a low margin of error a large sample size was considered necessary.

After establishing the scope of the research population, a list of all the individuals included in the research population was compiled. This list contained each participant's name, email address, enrolled course, enrolment date and completion status.

Adequate Sample Size to Reduce Sampling Error. The response rate refers to the percentage of individuals in a sample who participate in a research study (Johnson and Christensen, 2013). Ideally, if all the 2,759 participants responded to the survey invite, this research would be 100% representative of the research population. In reality, there would always be some persons in a sample who decline to participate or leave the survey unfinished.

This research needs to achieve a minimum number of responses to justify the non-participating population. The conventional confidence interval in the social sciences is 95% (Fink, 2015). Using an online calculator (Creative Research Systems, 2012) it was determined that, to achieve a 4% margin of error, the sample size should be at least 493. In other words, the survey response rate should be 17.9% or higher. This target survey response result would give the reader 95% confidence that if, for example, 70% of the participants answer yes to a question, the research population of those who answer yes would fall between 66% and 74%.

The Survey Sampling Bias. Sampling bias is likely to occur when the selected sample does not truly reflect the characteristics of the population (Alvi, 2016). Participants in this study are learners who responded to the survey invitation. Participants who did not respond to the survey or declined the invitation were excluded from the study. This self-selection strategy may exclude those who were disappointed with the course quality and abandoned the course shortly after their enrolment. It could also exclude those who were too busy to respond to the survey invitation. Furthermore, the participants who responded to the survey were more likely to have a stronger opinion, either positive or negative, about the course.

However, despite the identified sampling bias, the sample is still considered to represent the research population for the following reasons:

1. This study has a relatively large sample size (N = 741), representing 25% of the entire population. The larger the sample size, the better the representation of the researched population (Bartlett et al., 2001).

2. The participants are chosen independently. Students of the online courses progress through the courses individually and are unlikely to be in communication with others in the population. Therefore, the selection of one member will not influence the participation of other respondents.

3. To participate in the research is a voluntary decision. The researcher did not influence the participants' decisions.

3.7.1.2 The Survey Administration

The Online Survey. The survey was developed using SurveyMonkey.com, an online survey development, collection and analysis tool. The choice of using the web-based survey as the only survey administration method was made for the serveral considerations. Firstly, other survey delivery methods, such as face-to-face, mail or phone were not feasible in this research. This study's population consisted of participants in online courses whose physical locations were likely to be far away from the research site. This made the face-to-face mode impractical. The LMS does not capture course participants' mailing addresses or phone numbers, which made the use of the phone or mail impossible. Throughout the participants' learning experience, email was the primary method of communication between the institution and the learners. This made the online survey delivered via email the ideal method. Secondly, a good questionnaire makes the task of responding as easy as possible (Salant & Dillman, 1994). In this study, participants could access the online survey at any time and without having to pay for postage or printing. The online survey also has a conditional branching function allowing a customised survey path based on a respondent's answers. Lastly, the online survey can be deployed at a low cost, which made it affordable to send the survey to the entire research population. The large sample size reduced the probability of the sampling error. It is worth noting that methodological issues associated with the web-based survey, such as low response rate, technological problems and security issues were carefully weighed during the survey design process.

The Pilot Test. Before the survey was conducted, a pilot test was carried out about another online course, namely: "The Ten Quick Tips for Residential Settings" course. It is a short module that was developed using similar gamification designs as the other researched course. This course was excluded from the research because of the small number of active participants.

The purpose of the pilot test was to examine whether the participants could properly respond to the survey and to identify and eliminate redundant or misleading questions and see if there were any questions that most of the participants did not answer. The pilot survey served as a practise run for deployment and administration of the main

survey on the seven researched courses. The pilot survey showed that some minor adjustments in the survey questions were necessary, and the adjustments were made.

The Survey Response Rates. An invitation email was sent to all the 2,759 persons in the research sampling frame. A follow-up email was sent out two weeks after the initial survey email. Participation in the survey was voluntary and financial incentives were not offered for participating in the research. Table 3-3 is a summary of the survey that was sent out.

Table 3-3 *Surveyed Courses and the Response Rates*

Course Title	Candidates
ABA for Educators Level I	738
Coordination and Collaboration	572
Charting a Path to Success	445
Who Says ABA is Just for Autism?	373
Supporting Children with ASD	296
ABA for Educators Level II	293
RWA Works	42
Total	**2,759**

In total 751 participants responded to the survey. Baruch and Holtom (2008) suggested that a non-incentive survey, on average, would evoke a 21.9% response. Therefore, the 27.0% rate of response to this research survey is above the anticipated response rate. Using an online calculator (Creative Research Systems, 2012), it was found that with the sample size of 2,579 and the response number of 751 for this survey, with 95% confidence interval, the margin of error was 3%. Krejcie and Morgan (1970) suggested a 5% margin of error as acceptable in educational and social research for categorical data and 3% as an acceptable margin of error for continuous data. The survey respondent data in this study is considered categorical data and this being a study in the field of education, the 3% margin of error is satisfactory.

3.7.1.3 Survey Reliability Test

In this survey, all survey questions were worded positively, and the participants were asked to evaluate overall course experience and each of the game elements. There should be some level of internal consistency among the survey questions. If the participants had high satisfaction with the overall course, they would also give a higher rating to the game elements used to build the course. To test for internal consistency, the coefficient alpha (Cronbach's alpha) was calculated. This coefficient describes how well different items in a questionnaire complement each other in measuring the same quality or dimension (Fink, 2015). The game elements used in each of the courses are presented in Table 3-3. It is seen that some of the game elements were omitted in some courses. Therefore, the survey questions were branched into four different skip patterns depending on the game elements applied in the course. Cronbach's alphas on all four question branches were found to be highly reliable (Cronbach's alpha = .805, .867, .828, .959). Detailed information about Cronbach's alpha tests is listed in Appendix C.

3.7.2 Interview

3.7.2.1 Interview Sampling Design

The objective of the interview sampling design is to gain access to a wide range of individuals relevant to the research questions so that many different perspectives can be obtained (Harding et al., 1990). Rather than getting information from a large number of individuals through interviews, it was thought necessary to reach those participants who could share their unique experiences and stories to collect a varied assortment of perspectives on gamification. Therefore, three factors were identified for designing the interview sampling strategy:

1) The participants selected to be interviewed should represent a wide range of variations of backgrounds, including the courses enrolled on, age, gender, geographical location and job profiles.

2) There should be at least one participant representing each of the researched courses and at least one participant representing each of the identified target audience groups, such as teachers, parents, employers and autism service providers.

3) The interview participants should have voluntarily agreed to participate in the interview.

Warren (2002) suggested that a quality non-ethnographic qualitative interview study should have a minimum of 20-30 interviews. Onwuegbuzie and Collins (2007) also stated that the sample size should not be so small as to make it difficult to achieve data saturation. However, it should not be so large that it becomes difficult to conduct an in depth case-oriented analysis.

There were 96 participants who had, through the survey questionnaire, expressed their interest in taking the interview. The interview participants were carefully selected from the candidates based on the above-mentioned three considerations. Some of those participants did not reply to the invitation to the interview. Toward the end of the interview phase, the theoretical saturation occurred. This meant that further interviews did not suggest new insights, new variation did not emerge nor were new dimensions of any category revealed (Harding et al., 1990). This occurred when 36 interviews had been conducted and no more interviews were carried out.

3.7.2.2 The Interview Sampling Limitations

All interview participants were self-selected through the survey, which meant they are a subset of the survey participants. Non-survey participants are not represented among the interviewees.

The interview sampling strategy utilised in this research is a form of purposive sampling. The goals of interview sample selection were to purposefully pick a wide range of variations among participants, understand their context, and identify the common patterns and unique variations. These goals were notably different from the survey sampling goals discussed in the previous section. The selected 36 interview participants were from various backgrounds and, during their interviews, presented a broad range of perspectives. Despite the limitation, there is reason to believe that the interview sampling procedure described in this section was appropriate for this study and could yield the data to answer the research questions.

3.7.2.3 Interview Protocol Development

The majority of the participants chose to be interviewed over the phone. Only one participant elected to be interviewed face-to-face in a coffee shop. A few days before the interview, respondents were provided with the participant information sheet. The information sheet clearly outlined the interview process for the respondents, assured the respondents that their anonymity would be preserved.

The interviews were semi-structured. Since the interview participants were a sub-group of the survey participants, their survey responses and comments were examined before each scheduled interview. Participants' demographic information and course-related data were also obtained and reviewed in advance. By doing so, the interview questions could be tailored based on each participant's responses to the survey and the course records.

Each interview began with questions about the reasons that led them to take the courses and their overall course experience. This strategy was used to ease the participants into the interview process (Kvale, 1994). As the interview progressed, detailed questions about their perspective and experiences of various gamification elements were asked. During the interview, it was endeavoured to provide the respondents with a high degree of flexibility to express their thoughts and opinions freely. Particular attention was paid to comments that could lead to the generation of new themes or to participants who had negative experiences.

The depth of the interview varied among respondents. In some interviews, respondents actively shared their thoughts about the experience of the courses they took. Such interviews were less structured. In other cases, the participants required prompts during the conversation, and these interviews followed a more structured style. There were a few cases of respondents who were not fluent enough in English to express their thoughts effectively. For these individuals, the interview questions were adjusted to be suitable.

Most of the interviews lasted between 20 and 30 minutes. The interviews were recorded and transcribed verbatim by a professional transcription service provider. These transcripts were later imported into ATLAS.ti for further processing. There was no monetary compensation for participating in the interview. A letter of thanks was

sent to each interviewee shortly after the interview. Some respondents have expressed their interest in receiving the research findings. The contact information of such participants was noted and a copy of the thesis will be sent to each of them after it is published.

To preserve the privacy of the participants, each participant was given a pseudonym with the same initial letter as that of the course in which each had enrolled. For example, those who took the Charting a Path to Success course (Course C) would have pseudonyms such as Cynthia and Christopher, while participants in the RWA Works course (Course R) would have pseudonyms such as Roger and Rebecca.

3.7.2.4 Limitation of the Interview Method

Although the interview is believed to a suitable instrument for this project, it is not a flawless method. Hence, it is important also to address its limitation. The interview participants were aware of my insider status. While some participants, knowing their openness could help future course development, felt encouraged to provide their critical insights, other participants seemed to be reluctant to make negative comments about the researched courses.

Another limitation related to the interview was the delay of the feedback on participants' experiences. A few participants had completed the course several months before, and they may not have been able to recall their course experiences perfectly. There were some questions asked in the interview to which the participants responded, "Sorry, I cannot remember".

All the interview participants in this research had completed their online courses. Therefore, the non-completion group, constituting about 38% of the research population, was not represented among the interviewees. This limitation happened by chance because all participants who replied to the interview invitation happened to have completed their respective online courses. However, it is considered a sampling bias and imposes certain restrictions on the generalisation of the findings as there might be potentially valuable insights that could have been obtained only from the non-completion group. Nevertheless, focusing exclusively on participants who had fully experienced the courses made the study more bounded, which permitted further exploration of the opinions of the selected participants.

3.7.3 Course Records

In this study 735 survey participants, that is, 97.9% of the survey participants, permitted access to their course-related data. The remaining 16 survey respondents participated in the study anonymously.

Participants' course records were retrieved through multiple channels within the LMS. For example, the course completion records and the badge reports were the LMS's built-in reports; the user profile reports were generated using a reports plugin called the Configurable Reports, and the user access logs were exported directly from the MySQL database using SQL queries.

3.7.3.1 Data Collection Procedures

The data exporting procedure that was followed was in strict adherence with the informed consent and the guidelines laid down for voluntary participants, detailed in the Ethical Considerations section (section 3.9). Whenever possible, only consenting users' data was exported from the database. In some cases, data needed to be exported in their entirety, such as the course grader report and the course access logs. The non-participating users' data were deleted immediately and were not stored or analysed.

3.8 Participants

3.8.1 Demographic of Survey Participants

Survey participants' demographic information was gathered through two different channels: survey and LMS. Table 3-4 is a summary of the survey participants' demographic information. In this study, participants were not evenly distributed among the demographic groups. Most participants were women, aged 31-55 who live in Canada, work in the education system and were sponsored through their workplace. The participants' concentration in specific demographic categories provided the opportunity to understand the researched population in its context. However, it also posed a challenge in generalising the findings from this research to other demographic populations.

Table 3-4 *Demographics of Survey Participants*

Category	Sample Count	%
Course Short Name		
Course A	190	25.6%
Course C	130	17.5%
Course W	114	15.4%
Course B	92	12.4%
Course S	89	12.0%
Course O	89	12.0%
Course R	37	5.0%
Course Type		
Course	501	67.6%
Module	240	32.4%
Funding Type		
Funded	469	63.3%
Free	240	32.4%
Purchased	32	4.3%
Gender		
Female	672	90.7%
Male	58	7.8%
Prefer not to say	11	1.5%
Age		
21-30	75	10.1%
31-40	216	29.1%
41-55	368	49.7%
56 and over	69	9.3%
Prefer not to say	13	1.8%
Job Profile		
Educator	642	86.6%
Community and social service provider	48	6.5%
Other	51	6.9%
Country		
Domestic	697	94.1%
International	44	5.9%

As indicated in Table 3-4, the overwhelming majority of the participants were women (90.7%, n = 672) and only 7.8% (n = 58) were men. All participants in the sample were adults, with almost half of the participants (49.7%) in the age group of 41-55 years, 29% in 31-40 years, about 10% younger than 30 years and 9.4% older than 56 years. Only three participants were aged 66 years or more. To avoid an overly small group, the "66 and over" were merged with the "56-65" age group to form a new age group: "56 and over".

Participants' job profiles obtained through LMS consisted of more than twenty categories, which would have over-complicated this study. Data grouping was performed through SPSS by combining job titles into three broad categories, educators, community workers and others. A majority (86.6%) of the participants were professionals working in the education field, a small percentage (6.5%) constituted the social services professional group and 6.9% formed the other group. "Individual with autism" is listed as one of the profile selections. However, no participant in this study self-identified as an individual with autism.

Participants' original geographic information including country, city and postcodes, was excessively detailed for this research. Therefore, the participants' geographic information was placed in two broader categories: domestic (Canada) and international (outside of Canada). In this study, most survey participants were Canadian, with only a few (3.8%) international participants.

Most of the participants (67.6%) had taken certificated courses and 32.4% had studied the free modules. The majority of the participants received sponsorship from their workplace and only 4.3% were self-funded.

3.8.2 Validation of the Uneven Group Distribution

Some categories, such as gender, country and job profile, exhibit great unevenness in the sample size. Their group distribution was compared with the total research population to verify that the unevenness in the sample size were not caused by a sampling error.

Since the gender information was not available in the total research population, the sample distribution validation could not be achieved by directly comparing the sample with the research population. However, Statistics Canada published data about the gender distribution among teachers and service workers in Canada. Most of the participants in this study belong to the above-named groups. Hence, the validation can be conducted by comparing the survey data with the Statistics Canada industry data. In the latter data, the dominance of women among teachers and social service providers is notable. In the teaching profession 84% were female and 16% were male (Statistics Canada, 2014), while in the community and social service workers, 77% were female and 23% male (HR Council for the Nonprofit Sector, 2013). The

similarity of these percentages with those found in the sample in this study indicates that the dominance of female participants is unlikely to have been caused by sampling error and is likely to be a characteristic of the research population.

Survey participants' countrywide distribution was compared with the total research population. The data indicated that about 94.9% of the entire 2,759 research population were Canadian participants. This distribution is similar to the survey result (94.1%). Therefore, the survey sample can be considered as representing the research population (Cohen et al., 2007).

The survey participants' job profile distribution was also compared with the total research population. A similar pattern of uneven distribution of the job profile is also observed among the research population. Therefore, is not likely caused by a sampling error.

3.8.3 Demographics of Interview Participants

There were 36 interview participants of whom 28 were women and eight were men. 21 of the participants belonged to the 41-55 year age group, seven were between 31 and 40 years old, four were 56 years or older, three were 21 to 30 years old and one participant did not disclose their age. A majority (34) of the participants were from Canada while one was from the United Arab Emirates and another was from Uganda. Most of the participants (29) worked in education settings, three were community and social service providers and four were in other professions. Most of the participants (21) had enrolled in the courses through the government-sponsored program, 13 had enrolled in the free courses and two participants had paid for their enrolment to the certificate courses. Table 3-5 is a breakdown of the demographic information about the interview participants by course, gender, age, location and funding sources.

Table 3-5 *Interview Participants' Demographic Information*

Interview Participants' Demographic Information	Frequency
Course Name	
Course A	11
Course C	9
Course W	6
Course C	4
Course R	3
Course B	2
Course S	1
Gender	
Female	28
Male	8
Age	
Prefer not to say	1
21-30	3
31-40	7
41-55	21
56 and over	4
Location	
Canada	34
United Arab Emirates	1
Uganda	1
Funding Source	
Funded	21
Free	13
Purchased	2

3.8.4 A Comparison Between the Survey and the Interview Participants

One of the interview sampling strategies is to include a wide range of participants so that it adequately represents the research population. In this research, the interview participants were a subgroup of the survey participants. As indicated in Table 3-6, the distribution among the interview participants roughly resembled the distribution among the survey participants in various demographic categories. Every category appearing in the survey population had at least one representative among the interviewed participants.

Table 3-6 *Demographics Comparison of Survey and Interview Participants*

Category	Survey Participants (N = 741)	Interview Participants (N = 36)	%
	Course Name		
Course C	130	9	6.9%
Course A	190	11	5.8%
Course B	92	2	2.2%
Course S	89	1	1.1%
Course W	114	6	5.3%
Course O	89	4	4.5%
Course R	37	3	8.1%
	Course Type		
Module	240	13	5.4%
Course	501	23	4.6%
	Funding Type		
Free	240	13	5.4%
Funded	469	21	4.5%
Purchased	32	2	6.3%
	Gender		
Female	672	28	4.2%
Male	58	8	13.8%
Prefer not to say	11	0	0%
	Age		
21-30	75	3	4.0%
31-40	216	7	3.2%
41-55	368	21	5.7%
56 and over	69	4	5.8%
Prefer not to say	13	1	7.7%
	Job Profile		
Educator	642	29	4.5%
Community and social service provider	48	3	6.3%
Other	51	4	7.8%
	Country		
Domestic	697	34	4.9%
International	44	2	4.5%
Total	**741**	**36**	**4.9%**

3.9 Data Analysis

3.9.1 Quantitative Strand

3.9.1.1 Survey Data Process

Creating the Lookup Table. Survey responses collected through the online survey system, SurveyMonkey.com, were exported into Excel. Preliminary data processing was performed using Excel to remove irrelevant data. Participants' personal identification information, including first name, last name and email addresses, was extracted from the spreadsheet and replaced with a Participant ID. The extracted

personal identification information was stored in a separate look-up table and stored in a secure place. This information was later used to map the survey data with the interview and course data. After the initial processing, the survey data was imported into IBM SPSS Statistics for further data transformation and analysis.

Editing the Likert Scale Data. Most of the survey questions were constructed using a five-point Likert scale. A Likert scale provides a range of responses to a given question or statement (Cohen et al., 2002), which creates a sense of distance between the options (Mathers et al., 2007). In this study, Likert scale data are treated as interval data, assuming the intensity of an attitude is linear and distances between the successive points on the scale are the same. Therefore, each response is given a numerical value: "strongly agree" - 5, "agree" - 4, "neutral" - 3, "disagree" - 2 and "strongly disagree" - 1.

Dealing with the Missing Data. Data missing because of unanswered questions or incomplete surveys is unavoidable for various reasons, therefore, several approaches were used to deal with the missing data.

1. If the participants dropped out of the survey before answering at least one of the course experience-related questions, their responses were considered incomplete and, therefore, removed.

2. The survey consists of multiple conditional branching. Survey questions that are not relevant to a course are skipped. This type of missing data is expected by design and did not need any further action.

3. Some participants may have skipped one or more of the survey questions because they were possibly unsure of the answers or the survey questions were unclear. An evaluation of the missing values patterns revealed that there were 188 missing values accounting for 2.85% of the total data entries. Since the missing values were randomly distributed across the questions and the percentage of missing values was small in comparison with the total responses, the missing values in this data computing were not likely to result in a loss of variation in the data set (Creswell, 2012). If participants skipped one survey question, their survey response was excluded when analysing that survey question. However, that participant's other responses were included in the data analysis.

3.9.1.2 The Course Records Data Process

Course records data, such as course completion records and course access logs, were exported from LMS in Excel and imported into IBM SPSS Statistics. Course records were mapped with the survey responses and the interview records using participants' email addresses or name as the key identifier. Through data mapping, each participant's course data, survey responses, and interview information were linked together to form an integrated database of the participants' course experience.

3.9.1.3 Selection of the Statistical Tests

An investigation into quantitative data involves two types of statistical analysis - descriptive statistics and inferential statistics. Descriptive statistics describe numerical data and summarise variables within a data set (Mathers et al., 2007). In this study, it is used to describe basic patterns in the data (Neuman, 2013). Inferential statistics use the laws of probability to make inferences and draw statistical conclusions about populations based on sample data (Johnson & Christensen, 2013). In this study, inferential statistics are used to explore the relationship among different variables and to discover patterns and associations arising from the survey responses and course-related data.

The choices of statistical tests are determined by the purpose of the analysis. If the purpose of the test is to discover the association and the strength of the relationship among variables, the Pearson correlation coefficient r test or Spearman rank correlation test would be the better fit. If the purpose of the study is to make a prediction, the simple linear regression or the multiple linear regression test would be the better choice.

The choices of statistical tests are also determined by the type of data collected. In SPSS, data types include scale, ordinal and nominal (Wagner, 2019). Nominal and ordinal data are non-parametric data, which means the data are not required to fit a normal distribution (Creswell, 2012). Parametric data, on the other hand, exhibits a normal distribution of values. Statistical tests that can be applied to parametric data include the t-test, ANOVA, regression analysis and the Pearson correlation coefficient test. Statistical tests that are suitable for the non-parametric data include the Kruskal-

Wallis H test, the Mann-Whitney U test, the Spearman Rank Correlation and the Chi-Square test.

There has been an ongoing debate among scholars on whether Likert scale data should be analysed as parametric statistics (De Winter & Dodou, 2010). Some researchers argue that the Likert scale data should be treated only as ordinal, as reflecting the order of the choices, and it should not be assumed that intervals between values are equal (Jamieson, 2004). For example, if on a five-level Likert scale someone who chooses "agree" (score 4) cannot be assumed to agree twice as much as someone who chooses "disagree" (score 2) (Willet, 2013). Other scholars believe it is appropriate to treat the Likert scale questions with at least five levels of the ordinal scales as interval data when the sample size is larger than 30, (Willet, 2013). In this study, the sample size of the survey is relatively large (N = 741). The impact of using a non-parametric test versus a parametric test is not as significant as in the cases of studies with smaller sample sizes. Therefore, in this study, Likert scale questions may be treated as interval data and subjected to analysis using both parametric and non-parametric tests.

Furthermore, some of the statistical tests are based on a set of assumptions. If these assumptions are violated, the results of the analysis could become questionable. For example, when analysing the differences among multiple groups, the one-way analysis of variance (ANOVA) is often used. However, ANOVA analysis requires the data to meet three main assumptions, namely the data normality, homogeneity of variances and independence of observations (Bergin, 2018). That means the data needs to be normally distributed in each group, the population variances in each group should be equal and the data are independent. If the data indicates a high level of abnormal distribution, or the data violated the homogeneity assumption, parametric tests such as ANOVA should be avoided.

When examining the quantitative data in this study, it was discovered that many of the survey and course record data were not normally distributed. This data abnormal distribution suggested that parametric tests such as ANOVA should be avoided. This abnormal distribution of quantitative data was verified by the Shapiro-Wilk normality test. Detailed results of the Shapiro-Wilk normality test are presented in Appendix D.

Levene's test was used to discover any violation of the homogeneity assumption when comparing groups. The results from the test indicated that the homogeneity was not significant ($p < .05$) in some of the groups. Hence, it violated the homogeneity of variance assumption, which meant there were differences in variances among some of the groups. The results of Levene's test can be seen in Appendix E.

Results from both the Shapiro-Wilk normality tests and Levene's test together suggest that non-parametric, rank-based statistical tests should be the primary statistical tests used in this study.

3.9.1.4 The Kruskal-Wallis H test

When measuring the significant differences between groups, The Kruskal-Wallis H test by ranks (one-way non-parametric ANOVA) and the Mann-Whitney U-test can be used. The Kruskal-Wallis H test measures the significant differences between three or more independent samples, while the Mann-Whitney U-test measures the significant difference between two independent samples. Since the Kruskal-Wallis H test can be used to evaluate the differences between two groups, and among three or more groups, in this study it was used in all scenarios when comparing groups.

To run a Kruskal-Wallis H test, the following four assumptions must be met (Aldrich, 2018):

Assumption 1: The dependent variable is measured at the continuous or ordinal level. In this study, the dependent variables were the ordinal 5-point scale survey responses ranging from "strongly agree" to "strongly disagree". Therefore, assumption 1 is satisfied.

Assumption 2: The independent variables consist of two or more categorical, independent groups. In this study, when evaluating the participants' demographic data, the independent variables are demographic groups such as age, location, job profile, course type and funding source which are all measured as categorical data. When evaluating the course records data, the independent variables were the course completion status (completed or not completed), which were also measured as categorical data. Therefore, assumption 2 is met.

Assumption 3: There should be independence of observations, which means there must be different participants in each group and none of the participants should be in more than one group. In this study, there was no overlap among the categorical groups. Therefore, data used in this study met the third assumption for the Kruskal-Wallis H test.

Assumption 4: The shape of the distribution of scores in each independent variable group must be examined. If the distributions have the same shape, the dependent variables' medians should be used for comparison. If the distributions have different shapes, mean ranks should be used. In this study, when conducting each Kruskal-Wallis H test, the compared groups' boxplot charts were generated. The shapes of the boxplots were visually inspected to determine whether the groups' distributions were similar. If the distributions were of similar shapes the median scores were used, otherwise mean scores were used.

3.9.1.5 The Spearman's Correlation Test

Spearman's rank-order correlation coefficient test measures the association and relationship between two continuous or ordinal variables (Cohen et al., 2002). In this study the Spearman's correlation test was used to measure the strength and direction of the association between the participants' evaluation scores on game elements and their course records data measured on continuous scales. There are two types of such data: the participants' course log count and the final course grade. The Spearman's correlation test requires the data to meet the following three assumptions to yield a valid result (Aldrich, 2018):

Assumption 1: The two variables that are measured are on a continuous or ordinal scale. In this study the participants' survey-related evaluation scores were measured on an ordinal 5-point scale, while the course log count and final course scores were measured at a continuous level. Hence, assumption 1 was satisfied.

Assumption 2: The variables represent paired observations. In this study the same participants' course records data was mapped with the same participants' survey data. Hence the second assumption is met.

Assumption 3: There is a monotonic relationship between the two variables. Testing of this assumption required the visual inspection of the scatterplots. Discussions on

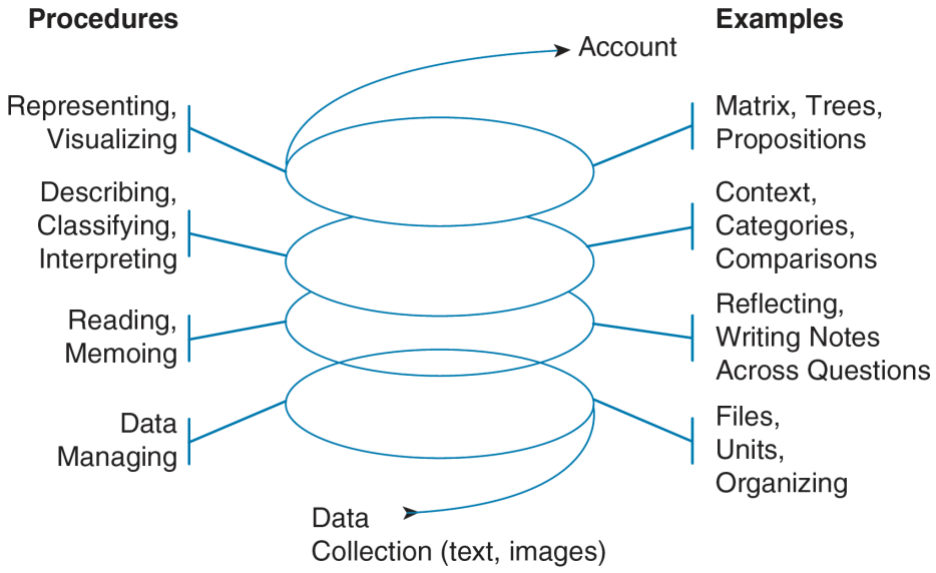
the evaluation of the third assumption were conducted on a case-by-case basis and are included in Chapter 4.

3.9.2 Qualitative Strand

3.9.2.1 Interview Data Analysis

The qualitative data analysis process was guided by the data analysis spiral approach. As illustrated in Figure 3-5, the data analysis spiral approach consists of several steps: data managing, reading, reflecting, describing, classifying, data presenting and visualising. The spiral shape implies the data analysis process moves in continuous circles rather than in a fixed linear way. They are "interrelated and often go on simultaneously in a research project" (Creswell & Poth, 2017).

Figure 3-5 *The Data Analysis Spiral*



Source: Creswell and Poth (2017)

To analyse the data, both interview transcripts and the open ended survey feedback were read through several times to make sense of the participants' input as a whole, capturing what was said by the participants and the context or setting associated with the text. During the reading process, memos were created as a form of record-keeping, which helped in identifying my position and perspective. Then the memos were reflected upon to categorise them into several initial categories, which formed the

preliminary coding frame. The initial categories were then revisited and refined to increase their credibility and dependability. For example, the category "psychological factors" had been developed as one of the preliminary categories. After reviewing the scheme, I realised that some of the factors within this category were associated with adult learners' characteristics. As a result, these factors were placed in a new category the "andragogical factors". The six preliminary coding categories developed during this process were psychological, andragogical, technical, instructional design, user experience and game design.

ATLAS.ti software was then used to go through each interview transcription and survey feedback to assign codes to the text segments. Particular attention was paid to any information that was conceptually unusual or interesting (Creswell, 2017). During the following review process some overlapping and repetitive codes were combined, and other codes were renamed to replace vague expressions with specific terms. 28 codes emerged during the coding process. Figure 4-6 in section 4.5.1 illustrates the codes that emerged from the data analysis process, their relation to the coding categories and possible links with each other.

Some researchers (Huberman & Miles, 1994; Namey et al., 2007; Ryan & Bernard, 2003) suggest counting the number of times the codes appear and reporting the code frequency in their articles. They argued that the high occurrence frequency within the text typically associates with the importance of the codes. Other researchers, however, raised caution about this approach. Creswell (2015) explained that the code counting conveys a qualitative orientation of magnitude and frequency, which implies that all codes should be given equal emphasis, which is contrary to qualitative research. In qualitative research, however, codes carry different levels of importance, and the count of the codes should not be overly emphasised. In this research, Creswell's suggestion was adopted and the code frequency was used as one of the indicators when deciding the importance of the codes but code frequency has not been emphasised in this report.

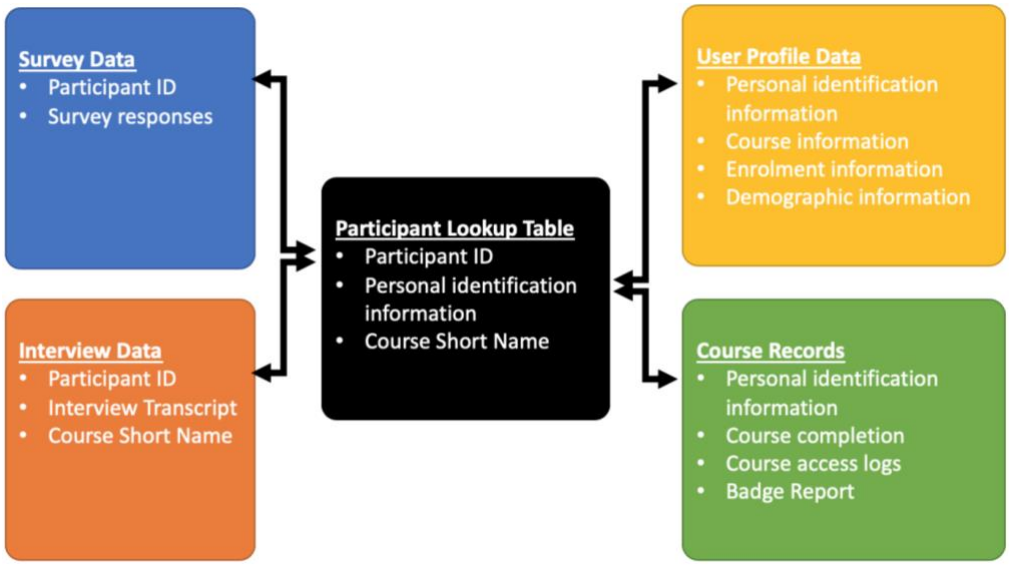
Six categories emerged from the qualitative data analysis. Detailed discussions about the codes and the categories are included in Chapter 4.

3.9.3 Integrative Analysis

Data integration is the centrepiece of mixed methods research. Creswell and Clark (2017) defined integration as the point in the research procedure where qualitative research interfaces with quantitative research. The integration in mixed methods research is not merely collecting and analysing quantitative and qualitative data (Bryman, 2006). The value of the mixed research method arises from the additional insights that emerge beyond what is learned from the quantitative and qualitative results separately (Creswell & Clark, 2017).

In this study, integration took place at several stages. Figure 3-6 illustrates the relationship between the various datasets used in this research. In the data preparation stage, the participants' responses to the survey, course records and the interview participants' transcripts were reviewed and linked. In the data analysis stage, both the quantitative and qualitative data were used and compared to answer the research questions.

Figure 3-6 *Relationships of the Datasets Used in the Research*



3.10 Ethical Considerations

Though the subject matter of this research is not particularly sensitive and the research process is relatively straightforward, potential ethical issues were carefully

considered. In the conduct of this research, the code of practise set by the Research Ethics and Research Governance at Lancaster University and the British Educational Research Association (BERA) guidelines (2011) were complied with.

3.10.1 Permission

Before the project began, the management team granted permission to research the online courses at the Geneva Centre for Autism. Ethical risk self-assessment was also conducted. This project was categorised as a low-risk research project and was approved by the University Research Ethics Committee as well as the supervisor for this research at Lancaster University.

3.10.2 Informed Consent

The survey participation consent was obtained when the respondents clicked on the "Yes, I agree to participate" button at the beginning of the survey. Consent of access to the participants' course-related data was also obtained through the survey. The interview participants' consent was obtained verbally at the beginning of the interview. Before the interview, participants were provided with a copy of the information sheet. Participants were advised to read the information sheet and were made aware that they were free to withdraw from the interview. None of the interviewees cancelled the interview after receiving the information sheet.

3.10.3 Voluntary Participation

I respected the participants who decided not to take part in the research and limited the invitation email to one initial email and one follow-up email one week later. To avoid being "pushy" throughout the research, I restricted the communication with the participants to email, even if the participant's phone number was available because soliciting by phone is considered more intrusive (Salant & Dillman, 1994).

The voluntary participation principle was followed also in the interview process. Although some survey respondents expressed their interest in participating in the interview, not all respondents to the survey responded to the interview invitation. To avoid becoming intrusive, the follow-up was limited to a single email.

Participants were informed they had the right to withdraw from the research within two weeks after their survey submission or their interview. However, none of the participants in this research contacted me to withdraw.

3.10.4 Confidentiality

Several measures were taken to ensure confidentiality. When conducting the survey, the respondents were informed that the survey was confidential but not anonymous. The participants were assured that their personal information would be protected and their true identity would be replaced with a pseudonym.

3.10.5 Privacy and Data Storage

Participants' privacy was respected throughout this research. Policies about personal data collection and usage were posted in the privacy section on the LMS and repeated in the footer of each webpage.

Interview recordings were transcribed by a professional voice transcription company, and the original audio recordings were deleted after the transcription. At the beginning of the interview participants were informed about the recording, the transcription and the use of a third-party the transcribing company.

This research complies with the provisions of the collection, storage and use of personal data stated in the Personal Information Protection and Electronic Documents Act (PIPEDA) in Canada, the UK Data Protection Act and the General Data Protection Regulation (GDPR) in the relevant legislation of the European Union.

For data safety considerations, all research-related data were stored in secured cloud-based storage provided by Lancaster University. The computer used to connect to the storage is protected by a strong password and up-to-date antivirus software.

3.11 Concluding Remarks

This chapter presented my pragmatic world view and how it served as a guide throughout the various stages of the research process. I acknowledged being an insider-researcher and discussed its positive and negative impact on the research.

Convergent Mixed Methods was identified as a suitable research method with two distinct but integrated strands. The quantitative strand was based on the survey and course-related data group comparisons, while the qualitative strand was derived from the themes developed through the interviews. The details of the seven online courses, the research instruments, the participants, and the plan to integrate the quantitative and qualitative data was presented. At the end of the chapter ethical concerns were discussed, and the justification of the measures taken to address them was discussed.

4 Results and Findings

4.1 Introduction

The primary purpose of the study was to gain an understanding of the results of the gamification implementation in self-paced online courses, its association with user groups and correlation with the course results, as well as the learners' perception of the gamification design. In pursuit of attaining a comprehensive understanding of the research topic, both quantitative and qualitative data were collected and analysed. In this chapter, the results derived from assessing the quantitative and qualitative strands of data and the integrative analysis are presented.

4.2 Participants' Feedback on Game Elements

Descriptive statistics (Table 4-1 and Figure 4-1) reveal that the participants' overall experiences with the gamified online courses were overwhelmingly positive (M = 4.27, N = 741). About 91.2% of the participants divulged that their overall course experiences were either highly positive or positive. Only 4.2% of the participants thought their course experiences were negative, with an additional 3.0% rating the experiences as very negative. Participant feedback on individual game elements, however, reflected a wider range of differences, wherein some game elements received mostly positive feedback, while others received mixed responses. Role-play received the highest evaluation score among all the researched game elements, with more than 77% of the participants rating it as either very positive or positive. Badges

and avatars received the lowest scores, accumulating mean ratings of 3.18 and 3.32 respectively.

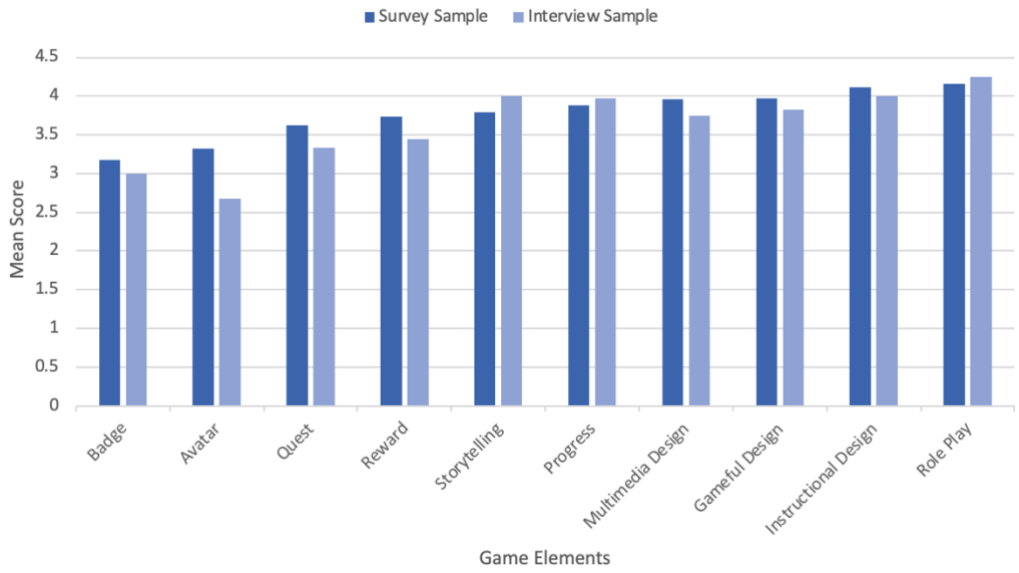
The descriptive data analysis also indicated that gamification elements spread away from the mean differently. Storytelling (SD = 0.73), multimedia design (SD = 0.742) and reward (SD = 0.752) were viewed in a moderately unified way by the participants, while avatar (SD = 1.132), badges (SD = 1.052) and quests (SD = 1.037) were perceived in a much-diversified manner.

Nonetheless, there were some noticeable similarities among the responses of survey participants (N = 741) and the subset interview participants (N = 36). This supported the previous assumption that the results from the interview data analysis can be used to integrate the survey findings.

Table 4-1 *Descriptive Statistics of Survey Responses on Game Elements*

	Survey Sample (N = 741)		**Interview Sample** (N = 36)	
	M	SD	M	SD
Badge	3.18	1.052	3.00	1.136
Avatar	3.32	1.132	2.67	2.082
Quest	3.62	1.037	3.33	0.577
Reward	3.74	0.752	3.44	1.130
Storytelling	3.79	0.730	4.00	0.000
Progress	3.88	1.027	3.97	1.282
Multimedia Design	3.96	0.742	3.75	0.500
Gameful Design	3.97	0.864	3.83	0.878
Instructional Design	4.11	0.758	4.00	1.016
Role Play	4.16	0.767	4.25	0.841
Mean	**3.77**	**0.886**	**3.62**	**0.944**

Figure 4-1 *Comparison of Responses from the Survey (N = 741) and Interview Participants (N = 36)*



4.2.1 Rating Differences among MDA Framework Categories

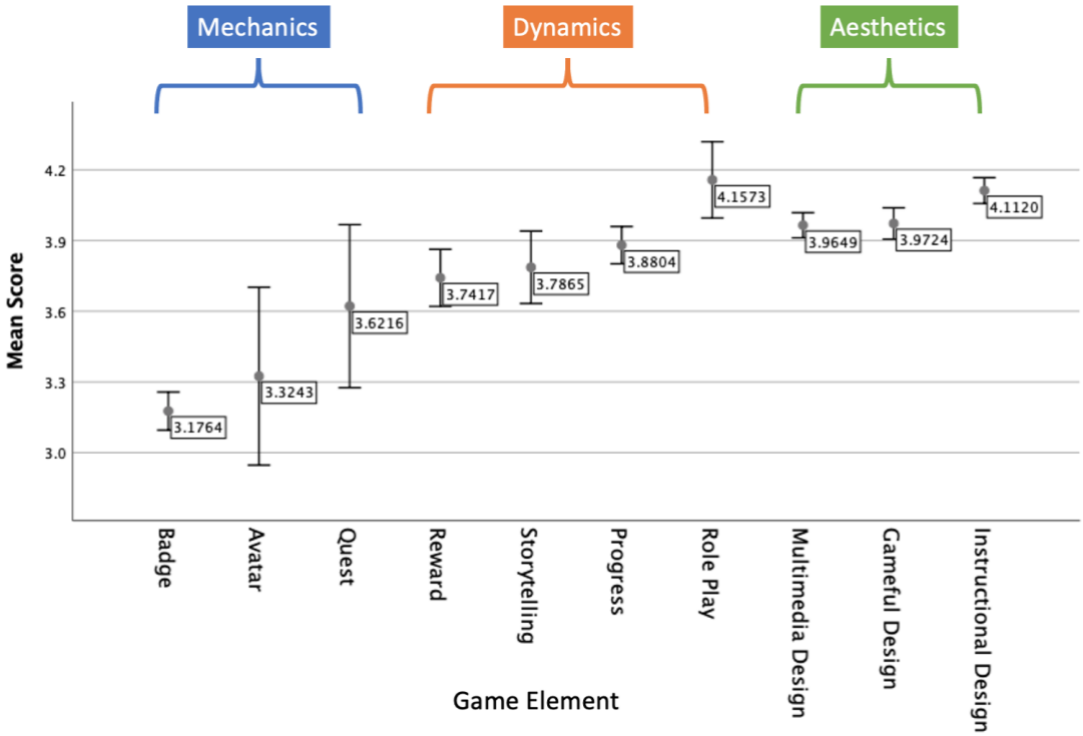
One noticeable pattern in the quantitative survey data was the categorical rating differences among the game elements as per the MDA framework. As described in Chapter 2, the MDA framework categorises game design into three categories, namely mechanics, dynamics and aesthetics, with mechanics being the foundation of the game system which is linked by dynamics and experienced by the players through aesthetics.

Game aesthetics such as multimedia design, gameful design and instructional design, received the highest average ratings from the participants, followed by game dynamics such as storytelling, progress, role-play and rewards. Game mechanics such as badges, avatars and quests received the lowest average ratings. Figure 4-2 illustrates the differences among these three groups.

The study results support the MDA framework's three levels of abstraction conceptual structure. As illustrated in Figure 2-11 (section 2.4.1), the aesthetics layer is associated with the players' emotional responses while interacting with the system and was the most direct layer experienced by the player. The participants associated their learning directly with the game elements in this layer and rated them more highly through their responses. The game elements in the dynamics layer can be dynamically influenced

by the player's inputs during the gameplay. Participants can associate their game interaction with the elements in this layer, hence having some strong impressions. Game elements in the mechanics layer, on the other hand, are the control mechanisms and rules created by the designers to support the gameplay. They tend to serve specific functions in the system. If such function is not entirely in line with the overall game design or is poorly implemented, it may result in a lower rating. For example, the badge is a mechanics layer game element, which received the lowest rating among all studied game elements. Through the unpacking of interview and survey comments, it is observed that many adult learners do not believe badges are suitable for professional training. However, such negative views about badges do not significantly impact their overall attitude towards gameful design and gamification in online courses. Detailed discussions about badges and gameful design are included in the following sections.

Figure 4-2 *Confidence Interval of the Means of Survey Responses to Game Elements*



4.2.2 The Least-Rated Game Element: Badges

Notably, according to the survey responses, the participants rated the game element badge the lowest (n = 652, M = 3.18). It also has the second-highest standard deviation (SD = 1.052). This means that badges not only were the least favourable game element but also had a wider spread from the mean. Furthermore, about 23% of the participants rated badges negatively, and a large number of participants (42.0%) rated badges as neutral.

These mixed views on badges were also observed and further unpacked through interviews. Some interview participants considered badges as a form of recognition of their accomplishments. They indicated that badges offer them a sense of achievement, acknowledging their progress in the course. However, the badge is also the most criticised game element in the interview. Some of the participants believed that badges were not suitable for adult learning, as professional learners are already highly motivated and do not need badges to remind them that they did a good job. Moreover, some participants opined that badges made the course seem childlike and took away from the spirit of professionalism of the course. This criticism was particularly strongly expressed by educators working with younger children. Table 4-2 below presents an integrated report about badges from both survey and interview participants.

Table 4-2 *Survey Responses and Quotes Regarding the Use of Badges (n = 652)*

Responses	n	%	Interview/Survey Comments
Strongly Agree	42	6.4%	Very motivating - a great way to encourage the completion of modules. I am not a competitive person at all, and even I was motivated by the badges!! They also made me feel like I accomplished something. (Survey Comments, Course F)
Agree	108	16.6%	It was fun. I enjoyed that part of the badge and the idea that you had. (Cheryl, Course C)
Neutral	274	42.0%	They had no impact on my motivation. I was aware of them but did not look at them. (Christopher, Course C) They were a cute addition but did not really contribute to my motivation. (Survey Comments, Course C)

Disagree	149	22.9%	I don't need a badge to tell me that I've reached this mark or whatever. Like I said, I found it to be very juvenile. (Catherine, Course C)
Strongly Disagree	79	12.1%	These are unnecessary and demean the professionals taking the courses. I strongly recommend you remove them. I think the badges reflect a complete, profound misunderstanding of the clientele for these courses, who are already professionals and do not need, nor benefit from, being treated as if they are five years old. (Survey Comments, Course S)

4.2.3 The Favourable Game Elements: Storytelling and Role-play

Storytelling and role-play are the most correlated game elements, often used together to provide learners with a contextually immersed learning experience. Survey responses to both storytelling and role-play were highly positive. As indicated in Table 4-3, the responses to role-play (n = 89, M = 4.16, SD = .767) were the highest among all researched game elements, with 87% positive or highly positive ratings. As indicated in Table 4-4, storytelling also received positive ratings (n = 89, M = 3.79, SD = .730) with 73% of the respondents believing that the storytelling enhanced their course engagement. This positive feedback on storytelling and role-play can be viewed as evidence of the effectiveness of introducing a narrative into online courses. It is worth noting that both of these game elements were only implemented in one course, with 89 survey responses. The significance of this finding needs to be justified with the use of a smaller sample size and single implementation instance.

The analysis of the qualitative data also echoed the interview participants' preference for role-play and storytelling. They claimed that the experiences of learning through stories allowed them to hear words through the character, to see their gestures and expressions, and "learn how to deal with different situations and students' responses to those scenarios" (Survey Comments, Course O). Similarly, the participants also enjoyed the opportunity to interact with the courses from different perspectives with the help of role-play. "I like the option that you had with the scenarios where you could watch as a parent, teacher or intervenor. Watching them in that way gave [me] a different perspective each time" (Ona, Course O). Interview participants also reported that the role-play element made the course content much easier to understand and retain. The findings demonstrate how storytelling and role-play could be used as an

effective means to convey "information in a compelling and memorable way (Neal, 2001)" and can be considered as a valid form of gamification in online education.

Table 4-3 *Survey Responses and Quotes Regarding the Use of Role-Play (n = 89)*

Responses	n	%	Interview/Survey Comments
Strongly Agree	29	32.6	It makes me remember things more clearly, and I like the option that you had with the scenarios where you could watch as a parent, teacher or intervenor. Watching them in that way just gave a different perspective each time. (Ona, Course O)
Agree	49	55.1	I liked getting to see the different options and perspectives. (Survey Comments, Course O)
Neutral	8	9	I don't recall seeing parents in the course. (Survey Comments, Course O)
Disagree	2	2.2	No data is available.
Strongly Disagree	1	1.1	No data is available.

Table 4-4 *Survey Responses and Quotes Regarding the Use of Storytelling (n = 89)*

Responses	n	%	Interview/Survey Comments
Strongly Agree	10	11.2	I loved the use of those [stories] in explaining how to deal with different situations and student responses to those scenarios. (Survey Comments, Course O)
Agree	55	61.8	[I] found it kept my attention, and I found it engaging. (Survey Comments, Course O)
Neutral	20	22.5	The voices of the character should have an interesting way of speaking to us, so as not to bore us with a monotone voice. (Survey Comments, Course O)
Disagree	3	3.4	No data is available
Strongly Disagree	1	1.1	No data is available

4.2.4 The Widely Accepted Game Element: Progress

The visual progress received very positive feedback from the course participants (n = 651, M = 4.16, SD = .962). As indicated in Table 4-5, about 70% of the participants believed that the progress game element motivated them to complete the course.

Compared to other game elements, progress had a smaller standard deviation (SD = 1.027), suggesting a relatively unified view of the participants.

An analysis of the interview data provided further insights into why participants believed the progress were helpful during their online courses. The interview participants indicated that the checklists and progress bars helped them identify what was completed, what was coming up next, and what more was required to be completed. They also used these tools to budget their time, pick up where they left off and ensure nothing important was missed. Some participants also mentioned the positive feeling of accomplishment when they checked their tasks off the list; this motivated the learners to complete their courses.

Table 4-5 *Survey Responses and Quotes Regarding the Use of Progress (n = 652)*

Responses	n	%	Interview/Survey Comments
Strongly Agree	209	32.1	Sometimes when in some of the modules that were a little bit longer, you were saying, ‘Oh I just have two more things to go. I'll push a little bit further and complete this.' I really liked the visual aspect of having that checklist there for me. (Alexandra, Course A)
Agree	241	37	The progress checklist helped me feel organised and plan out my time and schedule. It helped me feel confident or motivated me to push on when I needed it. (Survey Comments, Course A)
Neutral	132	20.2	It helped me see my progress; however, I would have completed the course without it. (Survey Comments, Course C)
Disagree	55	8.4	This is just standard for an online course design and nothing special. (Survey Comments, Course S)
Strongly Disagree	15	2.3	No data is available

4.2.5 The Feeling Matters: Aesthetics

The Gameful Design. This design brings holistic gameful experiences to the online courses (Deterding, Dixon et al., 2011). It focuses on the "fun" aspect of gamification and is often associated with those design concepts that promote intrinsic motivation. There were two survey questions related to the gameful design: one about the content

understanding and the other one about the engagement. The responses to both statements were visibly positive, with 81% of the participants believing that the gameful design improved their understanding of the course content (a combination of strongly agree and agree) and 78% of participants thinking these gameful components kept them engaged with their courses. Notably, the participants' responses to these two survey results had similar patterns. Further, Spearman's Coefficient of Rank Correlation test also indicated a significant association between the two survey responses ($p < .001$). To reduce the repetitiveness in data analysis, the two gameful design survey responses in this study were consolidated. The non-parametric Spearman's correlation test was used as the survey responses were measured on ordinal scales, and the data did not show normal distribution when checked using histograms. Detailed statistical test considerations were included in section 3.8.

The examination of the qualitative data offered more insights into the participants' opinions on the gameful design. Many participants valued the added entertainment gameful design brought to the courses. They reported that gameful design kept them engaged in the course and enriched their learning experience. They also believed that game playing offered them the opportunity to put what they learned during the course into practise, which enhanced their knowledge retention. However, some participants did not believe a gameful design was necessary for professional training. They found the gameful design distracting and preferred the traditional academic course style. Furthermore, regarding the interactive games incorporated in the online courses, some participants commented that it "seemed a little bit juvenile and nostalgic" as compared to computer games. Table 4-6 presents the survey response results and provides some examples of the participant responses on gameful design.

Table 4-6 *Survey Responses and Quotes Regarding Gameful Design (n = 625)*

Responses	n	%	Interview/Survey Comments
Strongly Agree	175	26.8	Some were just so excellent. As an educator, I was just so pleased to feel the process of learning being enhanced by the game; it was wonderful. (Andrea, Course A)
Agree	331	50.8	Anything that could use more games, I find that, especially when you're having fun and you're relaxed, you learn a lot

			better as opposed to the traditional academic format. (Christopher, Course C)
Neutral	111	17	I found the games pretty, but they were too simplistic. The answers were obvious almost simply from the framing of the material on the screen. It seemed to me to be more of a diversion, an appeal to interpersonal engagement just to keep the user hooked, rather than serving any deep purpose re-inquiry or critical thinking by the user. (Survey Comments, Course S)
Disagree	23	3.5	Maybe it's because I'm older, but content means much more to me. Had the content not been presented, the activities and games would have seemed irrelevant and condescending. (Survey Comments, Course S)
Strongly Disagree	12	1.8	I personally already wanted to learn the material, so I actually found the games distracting. (Survey Comments, Course W)

The Multimedia Design. The survey question about the multimedia design enquired about the participants' experiences with the graphics and the sound in their gamified online courses. As indicated in Table 4-7, the majority of the participants were satisfied with their course experiences (N = 741, M = 3.96, SD = 0.742). Compared to other game elements, multimedia design exhibited a much smaller standard deviation indicating more concentrated opinions of the participants.

The comments about the multimedia design from the interview participants and survey respondents were also mostly positive. The participants indicated that the combination of video lectures, interactive games and graphics provided them with a rich learning experience. The animation and interactive design kept them engaged in the course. However, there were some participants who mentioned that they would have preferred to just read the material and "would have completed the course regardless because the material itself was relevant and engaging" (Survey Comments, Course W).

Table 4-7 *Survey Responses and Quotes Regarding Multimedia Design (N = 741)*

Responses	**n**	**%**	**Interview/Survey Comments**
Strongly Agree	147	19.8	I was listening, and it was helpful to have a diagram, or a picture, or an animation there. When you answer questions, you remember the picture more than what you listen to. (Oliver, Course O)

Agree	456	61.5	Whether we admit it or not, adults like an engaging format as well. (Survey Comments, Course W)
Neutral	112	15.1	I don't believe animation and sounds are a necessary part. (Survey Comments, Course C)
Disagree	17	2.3	I had a great deal of difficulty recalling the graphics and sounds. (Survey Comments, Course C)
Strongly Disagree	9	1.2	No data is available

The Instructional Design. The instructional design is concerned with how the instructional materials are designed, developed and delivered (Gagné et al., 2005). Although the instructional design can be used in traditional teacher-led classroom training, it is often tied closely with the use of instructional technologies and is sometimes referred to as instructional system design.

The survey participants' responses regarding the course's instructional design were quite positive, with more than 86% of the participants agreeing or strongly agreeing with the statement (N = 741, M = 3.96) and a smaller standard deviation (SD = 0.758), which suggested a more unified view on this topic by the participants (Table 4-8).

The interview transcripts and survey comments confirmed this overall unified view about instructional design. Many participants expressed that they noticed the instructional design strategies placed in their course and believed that they enhanced their course experiences.

Table 4-8 *Survey Responses and Quotes Regarding Instructional Design (N = 741)*

Responses	n	%	Interview/Survey Comments
Strongly Agree	217	29.3	I found the course very insightful. I like the way that it was laid out. I like the progression of the programme such that you could see how each module kind of built on the previous knowledge. (Armand, Course A)
Agree	422	57	The multi-sensory approach was definitely beneficial. Just reading or listening to content isn't nearly as effective. (Survey Comments, Course S)
Neutral	80	10.8	I think it is not necessary to make it exciting or fun. Just present the material in a clear and concise manner. (Survey Comments, Course W)
Disagree	12	1.6	I think the content was presented in a way that made ABA seem far oversimplified and gave the impression that one could learn all about the science in 20 minutes. (Survey Comments, Course W)
Strongly Disagree	10	1.3	No data is available

4.2.6 Reflections on the Participants' Preferences for Game Elements

Overall, the survey responses from the participants on various game elements were positive, with all of the mean ratings being greater than 3 on the 5-point Likert scale. The findings also indicated some rating differences among the game elements, although not all of the differences were found to be statistically significant. Some game elements, such as role-play, received better reviews, while others, such as badges, received more negative reviews. Similarly, some game elements, such as storytelling, received more unified feedback, while the responses for others, such as avatars, were more mixed. The survey participants seemed to be in the favour of higher-level gamification design concepts, such as gameful design, over the lower-level game mechanics. Moreover, the survey responses about the overall course experience were better than any of the individual game elements.

A potential explanation for this can be attributed to the differences in perspectives between the gamification designers and the learners. Gamification designers tend to direct their efforts on designing a functional system and selecting the appropriate game elements that can achieve their design goals. On the other hand, the players

(learners) mostly cared about the overall experiences, instead of paying attention to the individual mechanics that construct the overall experiences. This finding further supports the MDA framework and suggests that gamification design is a holistic design concerning the interconnection of the various levels of game elements, rather than simply putting game elements together. When designing a gamification course, each game element should not be viewed as a standalone element but as an interlinked system that works together as a whole.

Another reflection from the participant responses came from the observation that the overall course experience received the highest rating among all the surveyed questions. The high-quality course content could also be an important contributing factor to this high level of overall satisfaction rating. Even though the focus of this research was on the gamification design, it was important to acknowledge the importance of the course content quality. A successful gamification design relies on the solid foundation of the course content. Without it, online course gamification would become pointless.

4.2.7 Answering Research Question 1

One of the goals of this study was to investigate the results of the gamification implementation in the researched online courses. My first research question was as follows: RQ1: To what extent do participants perceive gamification and game elements implemented in their researched online courses positively?

The results from the quantitative and qualitative data analyses demonstrated a high satisfaction rate around the gamification implementation. The survey and interview participants viewed the researched online courses as high-quality and welcomed the implementation of gamification in their courses. According to the quantitative survey responses, 91.2% of the participants indicated that their overall course experiences were either very positive or positive. Data analysis of the game elements also revealed a mixed view regarding some game elements. Upon examining the game elements using the MDA framework, it was noticeable that game elements belonging to the aesthetics category received higher ratings than those in other categories, while game elements in the mechanics category received lower ratings.

Further integrated analysis of the interview transcripts and survey comments provided me with a more in depth insight into this mixed perception of game elements. For example, badges received the lowest rating among all the game elements. Some participants associated badges with children and disapproved of the use of badges in professional training. In contrast, progress received a more unified acceptance from the participants. Learners reported that a progress bar and checklists helped them plan, track and organise their learning progress and provided them with a sense of accomplishment when their course progress was displayed visually.

4.3 Group Analysis

4.3.1 Participants' Views on Gamification

Participants' viewpoint comparison on gamification was carried out by a set of Kruskal-Wallis H (one-way ANOVA) tests. Independent variables of the Kruskal-Wallis H tests were set as age, gender, job profile, country, funding source and course type, while the dependant variable for each test was set as the survey evaluation score. Pairwise post-hoc comparison tests were also performed on those tests indicating statistically significant results. A summary of the test results has been presented in Table 4-9, and detailed test results are listed in Appendix F.

As mentioned in section 3.9.1.4, four assumptions are required for a Kruskal-Wallis H test to produce a valid result (Aldrich, 2018): assumption 1, the dependent variable is measured at the continuous or ordinal level; assumption 2, the independent variables consist of two or more categorical, independent groups; assumption 3, there should be independence of observations; and assumption 4, the shape of the distribution of scores in each independent variable group must be examined. When selecting the appropriate statistical tests, detailed in section 3.9.1.4, the first three assumptions were examined and passed. While conducting each Kruskal-Wallis H test, the fourth assumption was checked through visually inspecting the shapes of the groups' boxplot charts. If the distributions were of similar shapes, the median scores were used, otherwise, mean scores were used.

Upon visually examining the shapes of the boxplot by each demographic category set, it was discovered that the majority of them exhibit noticeable differences in their distribution. For example, the boxplot in Figure 4-3 demonstrated visible differences

among different age groups, especially for the age group ‘56 and older'. As a result, in this study, the categorical mean, instead of median, will be used during data analysis.

From the examination of the results of the Kruskal-Wallis H tests, it became clear that the majority of the mean rank scores were not statistically significantly different between different groups. Among the results of 50 sets of group comparison, as indicated in Table 4-9, only 15 of them were considered statistically significant ($p < .05$). This suggested that learners in the researched courses shared similar perspectives about gamification despite their demographic differences. This finding gives an assurance to the gamification designers not to excessively concern themselves with the learners' varied demographics when designing gamification for courses. The gamification design is likely to be enjoyed by a wide range of learners with different backgrounds.

Table 4-9 *Kruskal-Wallis H Tests Summary: Survey Evaluation Scores of the Gamification Elements by Demographic Groups*

	Age				Gender				Job Profile				Country				Funding Source				Course Type			
Game Elements	Sig.	N	Kruskal-Wallis H	df	Sig.	N	Kruskal-Wallis H	df	Sig.	N	Kruskal-Wallis H	df	Sig.	N	Kruskal-Wallis H	df	Sig.	N	Kruskal-Wallis H	df	Sig.	N	Kruskal-Wallis H	df
Badge	0.187	639	4.80	3	0.091	642	2.86	1	0.311	614	1.03	1	0.597	652	0.28	1	0.090	652	4.82	2	**0.036**	652	4.39	1
Avatar	0.949	32	0.36	3	0.424	31	0.64	1	0.051	26	3.82	1	0.073	37	3.21	1								
Quest	0.895	32	0.61	3	0.455	31	0.56	1	0.608	26	0.26	1	**0.044**	37	4.05	1								
Reward	0.580	141	1.96	3	**0.002**	145	9.21	1	0.307	129	1.04	1	0.976	151	0.00	1								
Storytelling	**0.033**	89	8.75	3	0.663	88	0.19	1	0.895	76	0.02	1	0.642	89	0.22	1								
Progress	**0.001**	639	16.52	3	0.371	642	0.80	1	0.598	614	0.28	1	0.288	652	1.13	1	**0.003**	652	11.84	2	**0.001**	652	11.69	1
Role Play	0.883	89	0.66	3	0.920	88	0.01	1	0.085	76	2.97	1	0.904	89	0.02	1								
Multimedia Design	0.687	728	1.48	3	0.668	730	0.18	1	0.060	690	3.54	1	0.574	741	0.32	1	**0.023**	741	7.50	2	**0.027**	741	4.86	1
Gameful Design	0.107	639	6.09	3	0.424	642	0.64	1	**0.001**	614	11.20	1	0.257	652	1.29	1	**0.000**	652	17.56	2	**0.050**	652	3.83	1
Instructional Design	0.213	728	4.49	3	0.532	730	0.39	1	0.081	690	3.04	1	0.552	741	0.35	1	**0.017**	741	8.11	2	**0.024**		5.13	1

Asymptotic significances are displayed. The significance level is .050.
Statistical significances are boldfaced $p < 0.05$

4.3.2 Age

Although the online course participants shared a similar overall view about gamification, there were some differences in ratings on game elements among different age groups.

A Kruskal-Wallis H test was conducted to determine whether there were differences in the evaluation scores on the 10 tested game elements among age groups: ‘21-30' (n = 75), ‘31-40' (n = 216), ‘41-55' (n = 368) and ‘56 and over' (n = 69). Distributions of game element evaluation scores were not similar for all groups, as discovered through the visual inspection of a boxplot. Although there were no statistically significant differences in the evaluation scores for most of the game elements among the different age groups, there were two game elements that exhibited statistically significant difference: storytelling, $\chi2(3) = 8.749$, $p = .033$ and progress, $\chi2(3) = 16.517$, $p = .001$.

The Kruskal-Wallis H test with statistically significant result ($p < .05$), indicates that the mean of at least one group is different from the mean of another group. To identify which group(s) are different to which other group(s), a post hoc pairwise comparison test was performed when the Kruskal-Wallis H tests indicate significant results.

The pairwise comparison test uses Dunn's (1964) procedure, along with a Bonferroni correction. Adjusted p-values have been presented. The post-hoc analysis on storytelling revealed statistically significant differences in evaluation scores between the ‘41-55' group (mean rank = 3.58) and ‘31-40' (mean rank = 4.01) ($p = .023$) but not between any other group combinations. The post-hoc analysis on progress revealed statistically significant differences in evaluation scores between the groups ‘56 and over' (mean rank = 3.63) and ‘21-30' (mean rank = 4.16) ($p = .005$) and the ‘56 and over' group (mean rank = 3.63) and ‘31-40' group (mean rank = 4.01) ($p = .013$) but not between any other group combinations. Figure 4-3 demonstrates the mean differences between the four age groups. Detailed Kruskal-Wallis H test results have been listed in Appendix F.

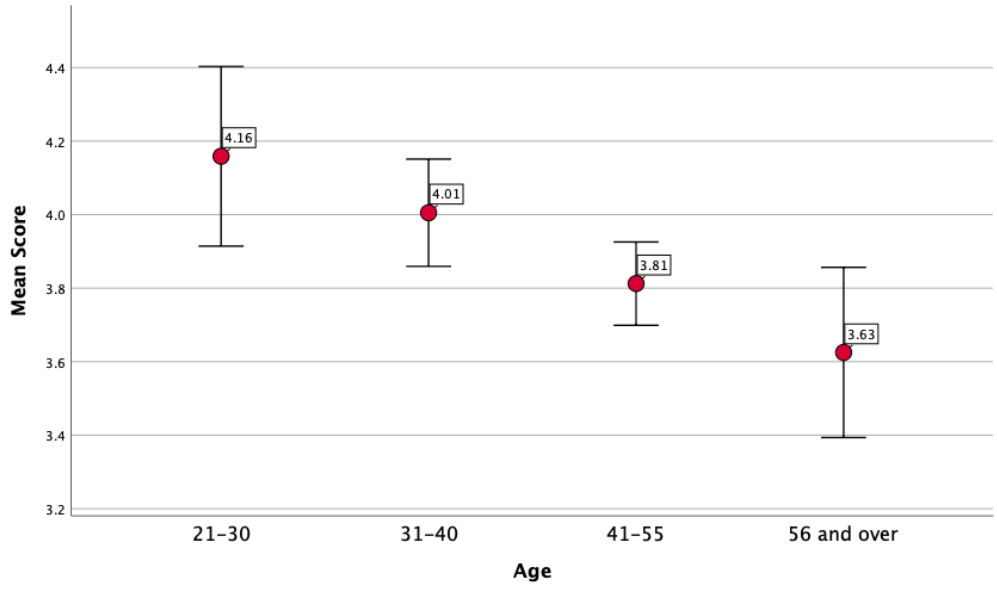
According to the pairwise post-hoc comparisons of age groups, participants aged 56 and over viewed the game element progress differently to the younger age groups (21-30 and 31-40). Further qualitative data analysis about the association between age groups and the progress elements provided a greater understanding of the different

views among participants. The comments made by two participants belonging to different age groups demonstrated how age-related factors influenced their views on the game element progress.

> Carrie: This was great, because you could see how much more you had to get through in a module, so I knew I had to be at a certain point at that time. It really worked into my life, especially being at home... I was working full time, I have a family. (Carrie, Course C, Age 21-30)

> Andrea: I didn't find it a good interface, and I haven't taken a lot of online courses. So, maybe someone who's a student, who's finished their teacher education and has gone right into that, would be more familiar with those online interfaces. But mine just come from doing them occasionally, and it wasn't all clear. (Andrea, Course A, Age 56 and over)

Figure 4-3 *Confidence Interval of the Means of Progress by Age*



4.3.3 Course Type

The findings from the data analysis indicated a statistically significant difference in gamification ratings among the participants who enrolled in long certificate courses and those in the short free modules. Overall, the participants seemed to be more

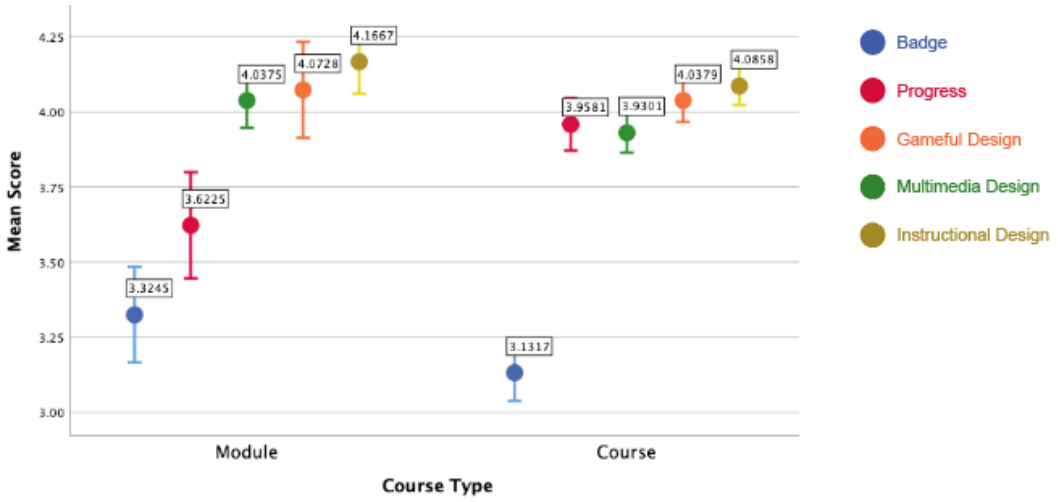
satisfied with the game elements being implemented in short modules than long certificate courses.

A Kruskal-Wallis H test was conducted to identify any differences in evaluation scores between certificate courses and short modules. Distributions of the game element evaluation scores were not similar among the groups, as assessed by the visual inspection of a boxplot. All five comparable game elements' evaluation scores for two categories were found to be statistically significantly different, with badges $\chi2(1) = 4.385$, $p = .036$, progress $\chi2(1) = 11.686$, $p = .001$, multimedia design $\chi2(1) = 4.859$, $p = .027$, gameful design $\chi2(1) = 3.828$, $p = .050$, and instructional design $\chi2(1) = 5.127$, $p = .024$. Detailed Kruskal-Wallis H test results have been listed in Appendix F.

As illustrated in Figure 4-4, among the five investigated game elements, four (badges, multimedia design, game design and instructional design) had higher mean scores in short modules. A preliminary explanation for this phenomenon might be that the participants took a less serious look at the free modules and were more accepting of the novel design approaches that made their course experiences more fun. The certificate course participants, on the contrary, treated their learning more seriously and were motivated to complete the certificate course regardless of the gamification implementation.

Noticeably, the game element progress received a much higher average rating among long certificate courses than those short free modules. This phenomenon confirmed the initial gamification design intention of using the progress game element to motive participants to complete the long courses. The qualitative data analysis also provided some explanation on the rating differences between short modules and certificate courses. For example, survey participants commented on the use of progress, ‘The course was too short to bother with the checklist.' (Survey Comments, Course W)

Figure 4-4 *Confidence Interval of the Means of Selected Game Elements by Course Type*



4.3.4 Funding Source

The participants in this research enrolled in courses through three different channels: free, funded and purchased. It is worth noting that the funding source categories are closely related to the course type categories. All short modules are free of charge, while all certificate courses require payments either through sponsorship or purchase. Hence, the results of the demographic group comparison of course type and finding source were similar. In this study, only the test results unique to the funding source comparison were reported, while the results overlapping with the course type categories were not repeated.

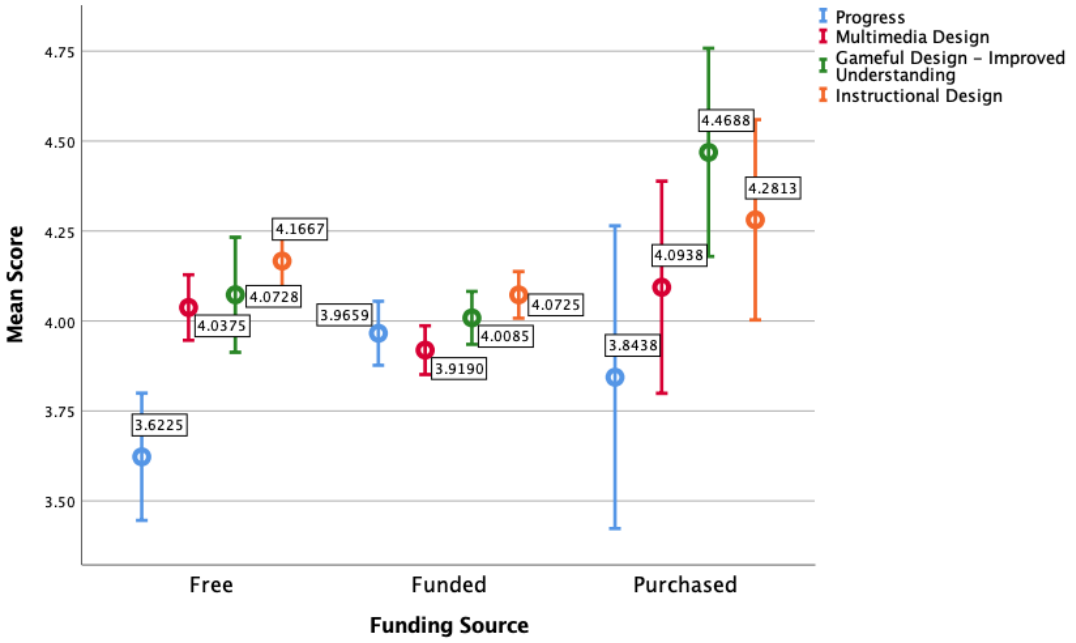
A Kruskal-Wallis H test was conducted to determine if there were differences in evaluation scores among the three funding source groups: free (n = 240), funded (n = 469) and purchased (n = 32). Distributions of the evaluation scores were not similar for all groups, as assessed by the visual inspection of a boxplot. Evaluation scores were statistically significantly different with progress $\chi2(2) = 11.842$, $p = .003$, multimedia design $\chi2(2) = 7.502$, $p = .023$, gameful design $\chi2(2) = 17.561$, $p < .000$ and instructional design $\chi2(2) = 8.109$, $p = .017$. Subsequently, pairwise comparisons were performed using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. The post-hoc analysis on progress revealed statistically significant differences in evaluation scores only between the free (mean rank = 3.62) and funded (mean rank = 3.97) groups ($p = .002$) but not between any other group

combinations. The post-hoc analysis on multimedia design revealed statistically significant differences in evaluation scores only between the free (mean rank = 4.04) and funded (mean rank = 3.92) groups (p = .047) but not between any other group combinations. The post-hoc analysis on gameful design revealed statistically significant differences in evaluation scores between the free (mean rank = 4.06) and funded (mean rank = 3.91) groups (p = .049) and between the funded (mean rank = 3.91) and purchased (mean rank = 4.41) groups (p = .001) but not between any other group combinations. The post-hoc analysis on instructional design revealed statistically significant differences in evaluation scores only between the free (mean rank = 4.17) and funded (mean rank = 4.07) groups (p = .038) but not between any other group combinations. Detailed Kruskal-Wallis H test results are listed in Appendix F.

Overall, self-funded participants tend to be more satisfied with the gamification implementation, followed by the participants who enrolled in the free courses. The participants who enrolled through the sponsored programme tend to be more critical about the gamification implementation. This phenomenon can also be visually identified in Figure 4-5.

The interview data provided some preliminary explanation of this finding. The sponsored participants were mostly educators who viewed the online courses as a formal government-funded professional development programme. There were different levels of readiness among the participants to be playful during training, and some participants had different views about playing by adults or playing at work (Jones and Moseley, 2019). Further discussions about the participants' perspectives on gamification are included in section 4.5.

Figure 4-5 *Confidence Interval of the Means of Selected Game Elements by Funding Source*



4.3.5 Gender

The participants' rating differences are also evident in terms of gender: between men and women. However, there was a significantly higher number of female participants (n = 133) than male participants (n = 12). As discussed in section 3.8.2, this gender group difference was a part of the characteristics of the researched population and was unlikely to be caused by a sampling error. However, the drastic unequal group size made the group comparison lose its statistical power. Although there was no good rule of thumb about the cut-off point for how unequal the sample sizes could be (Keppel and Wickens, 2004), and the non-parametric Kruskal-Wallis H test is not as sensitive to population distribution (Pallant, 2020), for reliability considerations, in this study, no further data analysis were conducted to determine the evaluation differences between the man and woman.

4.3.6 Reflections on Group Analysis

The group comparisons carried out in this section identified a few key areas of interest related to the use of game elements in self-paced online courses. It is clear from the data analysis that the learners' perspective on the gamification was contextual,

affected by a variety of factors, including the participants' demographic, such as gender, age and course-related factors such as the course length, type and cost. It is also clear that the impact of these factors is not equal, with some exhibiting more significant differences than others.

The data analysis also reveals that the game elements have different effects in various game design contexts. For example, progress tracking was appreciated more by participants enrolled in longer courses than those enrolled in shorter modules, while the game-style activities seemed to be enjoyed more in free module courses than in the certificate courses.

In this study, course-related factors, such as course length, course type or course cost, showed more significant differences than learner-related factors such as the learners' age, job profile or geographical location. This funding could be useful for gamification designers, as it suggests a course-centric gamification design approach when designing courses for audiences with a wide range of demographic differences.

It is worth noting that there were still some gamification preference differences among groups, despite their overall similarities. For example, there was a significant rating difference in the game element progress among age groups, where younger participants rated progress higher than their older classmates. This finding could be valuable for gamification designers, as it suggests that we should pay attention to the heterogeneous preferences of the learners when designing courses for specific demographic groups.

Another reflection from the study of the quantitative data was the importance of the execution of a gamification project. In this study, some game elements received different evaluation scores at different courses. For example, Course C and Course S were both certificate courses, where similar gamification strategies were implemented. However, Course C received much higher ratings on most of the game elements compared to Course S. This suggests the rating differences are likely related to the project execution, not due to the selection of game elements.

4.3.7 Answering Research Question 2

This section aims to answer the second research question: RQ2: Are there any demographic differences in participants' perceptions of gamification elements? Data analysis of the quantitative survey responses, supported by the qualitative interview transcripts offered an integrated understanding of the participants' opinions about the game elements. Overall, the online course participants exhibited a united view about the game elements implemented in their courses. There were only a few statistically significant differences when comparing the evaluation scores of the groups. In this study, 50 sets of group comparison tests were conducted, but only 15 of them were considered statistically significant ($p < .05$).

Further data analysis about these statistically significant groups indicated that the learners' perspective on gamification was contextual. Course-related factors such as the length or cost of the course exhibit higher categorical differences than learner's demographical factors. The gamification elements were more welcomed by the learners in the short module courses than those enrolled in the long certificate courses, except for progress, which received significantly higher ratings from the participants in the long certificate courses. When examining the learner's demographical differences, the data revealed that the participants aged 56 and over rated the progress game element much lower than the younger age groups (21-30 and 31-40).

4.4 Course Data Analysis

4.4.1 Gamification and Course Engagement

The students' engagement level indicated how involved the learners were in the online course. Cocea and Weibelzahl (2006) and Romero et al. (2008) suggested that a large amount of log entry was an indication of higher engagement with the course, while low log volume suggested a lower level of course engagement. In this research, course log counts were used as an indicator to measure the students' engagement level in the online courses. The volume of logs generated was relevant to the length and complexity of each course. The average log counts varied significantly among the seven researched courses. Thus, in this research, each course's student log counts were tested separately.

Spearman's rank-order correlation was used to measure the association between the evaluation scores on game elements and the access log counts of each course. As detailed in section 3.9.15, non-parametric Spearman's rank-order correlation was used as the data in this study was not normally distributed and violated the homogeneity of variance assumption. Spearman's correlation requires compliance with three assumptions: the data must be measured on a continuous or ordinal scale, the two variables are paired observations and there is a monotonic relationship between the two variables. The first two assumptions were examined and confirmed during the statistic test selection process (see section 3.9.15). The third assumption was also checked while conducting each Spearman's correlation test by visually examining the scatterplots of the log count by those game elements indicating statistical significance. Among the five statistically significant results, four of them approximately exhibited a monotonic relationship, while one of them did not meet the third assumption. As a result, four of those results were further examined using Spearman's rank-order correlation, while the other one was visually examined using the scatterplot instead. The scatterplot of the log count and game elements are included in Appendix G.

Spearman's rank-order correlation revealed that there was no statistically significant correlation between most of the evaluation scores and the participants' course access log counts, except for a few instances (Table 4-10). On further drilling down on the four instances with the statistically significant results, it was apparent that all of the correlation coefficient values were smaller than 0.25. Although there are no guidelines related to Spearman's correlation for different values, the closer the correlation coefficient is to zero, the weaker the association between the ranks is (Sheskin, 2007). In this study, Spearman's correlation test revealed either no statistically significant correlation or a very weak association. This means that there was no or a very low correlation between the participants' gamification ratings and the number of logs generated in the researched courses.

Table 4-10 *Spearman's Correlation Coefficient Test Results on Course Log and Game Elements*

	Course C			Course A			Course B			Course S			Course W			Course O			Course R		
Game Elements	Sig.	N	Correlation Coefficient	Sig.	N	Correlation Coefficient	Sig.	N	Correlation Coefficient	Sig.	N	Correlation Coefficient	Sig.	N	Correlation Coefficient	Sig.	N	Correlation Coefficient	Sig.	N	Correlation Coefficient
Badge	0.369	128	0.800	**0.005**	187	0.206	0.509	92	0.070	0.647	88	-0.045	0.320	103	0.099				0.647	34	0.081
Avatar																			0.482	34	0.125
Quest																			0.671	34	-0.076
Reward													0.462	103	-0.073				0.519	34	0.115
Storytelling																0.374	83	0.099			
Progress	0.119	128	0.138	0.051	187	0.143	0.853	92	-0.020	0.555	88	0.064	0.222	103	0.121				0.554	34	0.105
Role Play																0.158	83	0.156			
Multimedia Design	0.578	128	-0.050	0.218	187	0.090	**0.031**	92	0.226	0.409	88	-0.089	**0.025**	103	-0.222	0.053	83	0.213	0.616	34	0.089
Gameful Design	0.992	128	-0.001	**0.012**	187	0.183	0.422	92	0.085	0.809	88	-0.026	0.668	103	-0.043				0.606	34	0.092
Instructional Design	0.654	128	-0.040	**0.008**	187	0.193	0.076	92	0.186	0.617	88	-0.054	0.859	103	-0.018	0.058	83	0.209	0.865	34	0.030

Asymptotic significances are displayed. The significance level is .050.
Statistical significances are boldfaced $p < 0.05$

4.4.2 Gamification and Course Performance

The participants' performance in the researched courses was measured by two indicators, which are the course completion status and the final score. The course completion status variable was recorded as dichotomous nominal data, with two available values (completed/uncompleted), and the final course score was a continuous numerical variable.

The Course Completion Status. The course completion rate among the participants (95%) was than the entire research population (62%) (shown in Appendix H). The higher-than-average completion rates among survey participants are likely associated with one of the participant selection criteria: only learners who have completed at least 50% of the course content are invited to the research. A discussion of this selection strategy is included in Chapter 3 and detailed further in Chapter 5.

Kruskal-Wallis H tests were conducted to determine if there were differences in the gamification survey evaluation scores among the participants who had completed their course (n = 38) and those who had not (n = 687). A non-parametric test was performed as the data used in this test was not normally distributed and violated the homogeneity of variance assumption. Distributions of the 10 evaluation scores were not similar among the two groups, except in one instance, as determined through the visual inspection of the boxplot. Considering the large group size differences between the completed group (n = 38) and the uncompleted group (n = 687), no further investigation was conducted on the one game element that showed statistical differences. Detailed Kruskal-Wallis H test results are listed in Appendix F.

A similar view on game elements between participants who completed the course and who did not suggest that, in the researched courses, the participants' gamification experiences were not associated with their course performance. It is worth noting that the group sizes of the completed and uncompleted groups were different. The findings of this research should be justified when used in other gamification contexts.

The Final Course Grade. Among the seven researched courses, four included assessments with a final course grade. Spearman's rank-order correlation was conducted to assess the relationship between participants' final scores and their gamification evaluation ratings. A non-parametric test was used as the data used in

this test was not normally distributed and violated the homogeneity of variance assumption.

Preliminary analysis showed the relationship between the final scores and the survey ratings to be roughly monotonic, as assessed through the visual inspection of the scatterplot charts. There was no statistically significant correlation between the final scores and the survey ratings on game elements such as multimedia design, $r_s(493) = .007$, $p = .869$ and instructional design, $r_s(493) = .087$, $p = .053$. However, there was a statistically significant but very weak positive correlation between the final scores and the survey ratings on elements such as badges, $r_s(493) = .134$, $p = .003$, progress, $r_s(493) = .235$, $p < .001$ and gameful design , $r_s(493) = .162$, $p < .001$ (Table 4-11).

Spearman's correlation indicated that there was no or very low correlation between the participants' survey responses about the gamification implementation and their final course scores.

Table 4-11 *Spearman's Correlation Test Results on Course Grades and Game Elements*

Game Elements	Sig.	N	Correlation Coefficient
Badge	**0.003**	495	0.134
Progress	**0.000**	495	0.235
Multimedia Design	0.869	495	0.007
Gameful Design	**0.000**	495	0.162
Instructional Design	0.053	495	0.087

Asymptotic significances are displayed. The significance level is .050.
Statistical significances are boldfaced p < 0.05

4.4.3 Reflections on Course Data Analysis

The results in this section indicated no or a minimal difference in the gamification ratings between participants who completed the course and those who did not. Similarly, there was no or a very low correlation between participants' game element ratings and their course log volume or final course scores.

These findings seem to contradict the initial goal of implementing gamification in online courses. However, after a careful examination of the research findings, it can be strongly asserted that these findings hold great value and could be used to support gamification design decisions.

First of all, the participants' game element attitude scores were neither the cause nor the result of the course engagement and performance records. It was the participants' views about the game elements that were not correlated with their course data. During the survey and interview processes the participants indicated that the gamification implementation enhanced their course experience. The gamification implementation certainly improved the learners' overall learning experiences, but this experience improvement was not measured or reflected by the course records data captured in the LMS.

Moreover, the findings from this project were contextual. The research results were associated with the self-selection sampling procedure, which excluded the participants who dropped out of the course early and likely recruited more participants with a higher level of engagement. The size of the uncompleted group (n = 38) was much smaller than the completed group (n = 687), which made the results less generalisable, even with the rank-based nonparametric tests.

Furthermore, the findings of this study indicated that the participants' engagement and performance records might be impacted by many other factors such as the quality of the course content, topic, length, the navigation, the learners' internet speed and level of motivation. Although gamification could be used to enhance the learners' course experiences, it was neither the only nor the primary determiner of an online course's success. Gamification cannot turn a poor course with inadequate content into a great one. The selection of gamification elements and strategies should not be an isolated consideration. Other course development considerations from the instructional design, technology and andragogy aspects are also critical.

The no or low association between the game element survey scores and the learners' performance data also provided some valuable insights to the gamification designers and developers. Adult learners are intrinsically motivated to acquire new skills and knowledge and to complete the course. The use of game elements and gamification

strategies should be supportive in helping learners achieve their goals, not pushing them to complete the courses.

4.4.4 Answering Research Question 3

In order to examine the association between the participants' survey responses and their course engagement and performance records through RQ3, mostly quantitative data analysis was conducted. The findings from the data analysis suggested that although gamification implementation might have improved the learner's course experiences, it is not, however, fully in line with the participants' course performance and engagement records. Overall there was no or a very low correlation between the participants' survey responses and their course engagement and performance records, with a few exceptions.

There were also no or very few differences in the gamification ratings between participants who had completed the course and those who had not. This was also the case when comparing evaluation scores with the learners' course access logs and final course scores.

Research findings in this section are subject to the methodological limitations of the research sample selection and the uneven group size. The results may require some level of justification when used beyond the context of the researched courses.

4.5 Participants' Perspectives on Gamification Design

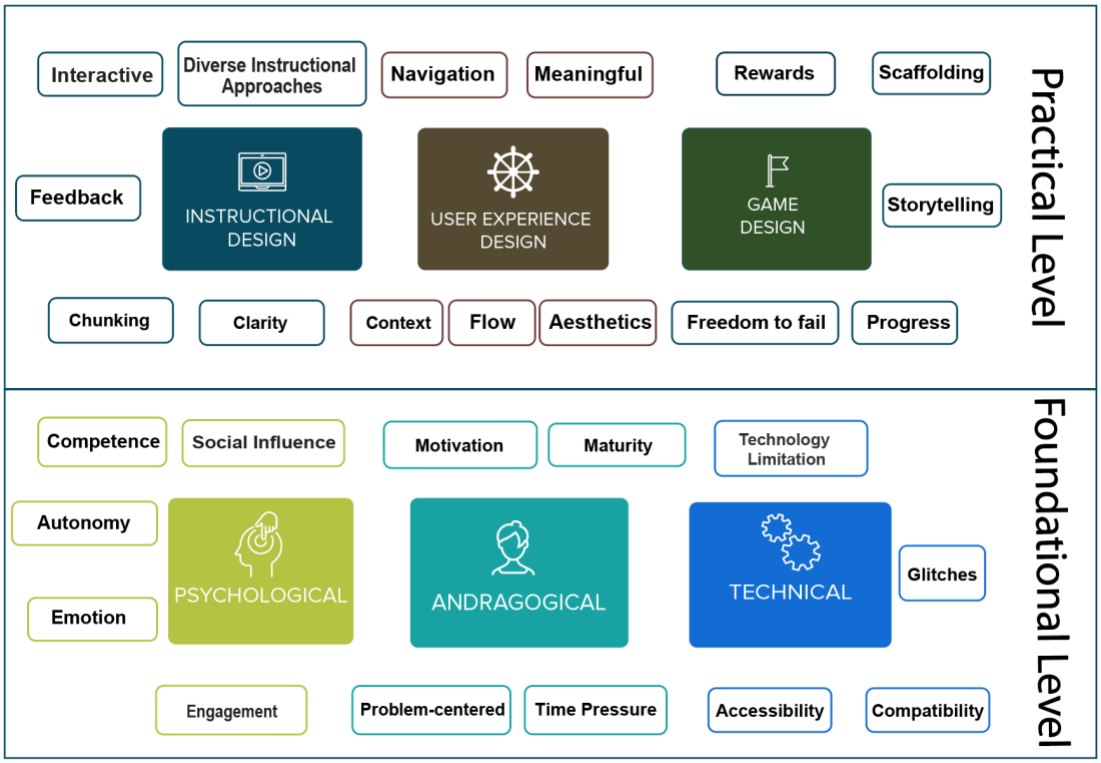
The survey and course data analysis provided insights for gaining an overall understanding of the participants' views on gamification in self-paced online courses. Overall, gamification was welcomed by the participants, and most of them believed that it enhanced their learning experiences. Through data analysis, it could be found that participants' views on each game element were not always the same, with some elements being welcomed more than others. The findings of the group comparison suggested that although the views on gamification were mostly similar among the participants, there were some cases where the participants' views on game elements were different for different course types and demographic backgrounds. These findings highlighted some areas of interest that were to be unpacked through an

analysis of the interview data, particularly the diverse perspectives about the game elements among the participants.

4.5.1 The Categories that Emerged from the Data Analysis

Six categories emerged from the data analysis of the interviews and open ended survey responses (Figure 4-6), which represented the six different perspectives on gamification namely, psychological, andragogical, technical, instructional design, user experience and game element design. These categories can be divided into two layers. At the lower layer there are the foundational factors associated with the gamification design such as psychological, andragogical and technical factors. On the other hand, at the upper layer, there are practical considerations regarding the gamification design process, including instructional design, user experience (UX) design and game element design.

Figure 4-6 *Codes and Categories that Emerged from the Data Analysis Process*



4.5.2 Participants' Perspectives through the Psychological Lens

The psychological factor category mostly emerged as the participants responded to the lead questions about why they were taking the online courses, as well as the follow-up questions about which gamification elements affected their learning experiences. As the participants explained their personal experiences of the course and expressed their views on various game elements, several psychology-related themes emerged.

4.5.2.1 The Desire for Competence

The need for competence refers to the feelings of efficiency and success while interacting with the environment (White, 1959). The participants from the online courses promptly expressed their desire for gaining competence through their learning experiences. For example, Willa from Course W indicated that it was the feeling of gaining competency through learning that drove her to complete the course, not the rewards or certificates:

> Willa: I don't need any more certifications. I'm at the very top of my pay scale. There's nothing more I want to do now. But I want to know, I want to learn, I want to understand, and I want to do it easily. I want to do it when I do it. (Willa, Course W)

The desire for competence was not just associated with the outcome of the learning but throughout the learning process. The participants in this study noticed and approved the gamification design that fostered their need for competence. Brandy from Course C explained that she liked the visual feedback she received when she completed a section. She viewed these messages as a form of acknowledgement that provided her with the feeling of competence:

> Brandy: I think that's what's important there is you feel that you are building your knowledge […] That's how I learn, right? I think that that's a validation of your efforts but also to remind you, ‘You have done this before, to have confidence, move forward.' (Brandy, Course C)

Meanwhile, some participants also expressed their frustration when the gamification design failed to provide them with a feeling of competence, for example, when the

participants took the effort to enter their answers into the system but did not receive enough feedback:

> Catherine: Sometimes there would be those interactive screens where you could type in information, or there were maybe some of the game pieces… Sometimes I found that maybe there wasn't enough feedback on the screen, or sometimes it would end abruptly. (Catherine, Course C)

4.5.2.2 The Desire for Autonomy

Another psychological need expressed by the participants was the need to stay autonomous. It refers to the individual need of a person to be responsible for their own meaningful choices. During the interview, many participants commented on the positive feeling that emerged within them when the courses provided them with opportunities to take control of their learning path. For instance, Aloma from Course A compared Course A with another course she took from a different website:

> Aloma: I find when they force you to, like in the AG courses, they force you to comment... you have to go in and comment on three people's answers, and they have to comment on your answers, and it creates online discussion, but you could also tell people are just doing it because it's a requirement in order to finish the course. (Aloma, Course A)

Likewise, the desire for autonomy was also reflected through the participants' preferences to interact with the course material independently without the interference of others. Albert from Course A shared his view on staying autonomous during his online learning experience, indicating his preferences to develop his own understanding of the course through self-study:

> Albert: I guess it's just more my style where I can understand the material and not necessarily maybe develop my own kind of idea of what, how to use the information instead of being influenced by someone else. (Albert, Course A)

The desire to stay autonomous was also expressed by a few other survey participants:

> Everyone is busy, and as I said it's very hard to do anything during the school day, so it's all on our own time. I found the way it was set up to be way more beneficial for myself. (Anonymous, Course A)

In a self-paced online course, the sense of autonomy also came from the guided conditional learning path when the participants studied alone. By clearly providing the learners with the available learning paths, the online course can offer a certain level of assurance to the learners that they are on the right track and will not miss out on anything:

> Craig: Once you complete this, then you can move on. Don't try and hop all over the place. Don't try and work ahead. Do your work and then you can move on. That's exactly how I think a course should be set up. (Craig, Course C)

4.5.2.3 The Desire for Social Relatedness

Social relatedness refers to one's feelings of belonging, attachment and care in relation to a group of significant others (Ryan & Deci, 2000b). The self-paced online courses in this study were designed to be taken with minimum social interaction. The participants of this research revealed diverse views on social relatedness, with some appraising the minimum social interaction design, mostly for logistical and practical reasons, and others criticising the lack of social interaction with tutors and peers. Armand from Course A revealed that it was his busy professional life and the time restriction that led to his preferences for a self-paced learning experience over the social version:

> Armand: Obviously, it would be wonderful to be able to be in a classroom with a bunch of colleagues so that we could have discussions and learn from each other. That would be wonderful. But to be honest, that might be more of a stumbling block for people to do this. And I'll tell you why. From my own experience, I don't have the time… it's an extra layer of dedication for people that are trying to do the course and spend as little time as possible, without it interfering with their professional life […] You might lose out on the opportunity to share with other people, but at the same time, you gain the time factor where you don't have to spend time

> doing it. So, it's a good and a bad thing. It's a two-edged sword. (Armand, Course A)

On the other hand, some participants preferred the opportunity to learn from others and believed that they thrived from social relatedness and learned better through interactions with others:

> Alicia: I hope that it doesn't sound too vampire-ish, but I get kind of energised through interacting with other people. Yeah. (Alicia, Course A)

> I don't like participating in online courses. I thrive on interactions with actual people, not clicking buttons. That being said, there was nothing egregious about this particular online course. (Survey Comments, Course C)

Some participants enjoyed the flexibility of self-paced online courses but also desired social relatedness. Recognising the logistical challenges to adding the social elements to the course, they found a middle ground between social relatedness and the convenience of self-paced learning. For example, Susan from Course C shared her knowledge acquired from the online self-paced course with her offline colleagues:

> Susan: Time-wise, I would rather do it by myself. It is nice to have this valid information. I would bring that information into my classroom and share it with my teaching partner. ‘This is what I learned,' it was good that way. I was able to have that opportunity to share those ideas with other people, not necessarily with people in a group that are taking the course. (Susan, Course S)

4.5.2.4 The Emotions Associated with Gamification

Gamification brought richness to the participants' learning experiences. Lazzaro (2004) listed many emotions associated with play, namely pleasure, frustration, pride and curiosity. When the participants described their emotional experience in the gamified online courses, various types of emotions were mentioned. For example, Andrea from Course C described her feeling of pride upon receiving a badge:

> Andrea: It was just like a little pat on the back. But it, there was that feeling… 'Yeah, yeah, I knew that.' (Andrea, Course A)

Amy, from Course A, expressed her pleasant feeling while playing the game actives:

> Amy: It was challenging, but at the same time, you know, [it was] fun and... Yeah, it was a great way, I thought, to learn, rather than just to get to the quiz. (Amy, Course A)

Pleasant emotions were also associated with the feeling of satisfaction the game elements brought to the participants. For example, when referring to the use of the progress bar, a survey participant commented:

> [It is] clear, visual and provided a sense of completion... very satisfying... just like what our students need! (Survey Comment, Course A)

On the other hand, if the gamification solution is not carefully designed, it might trigger some negative emotions among the participants. Susan from Course S expressed her strong negative opinion about the use of badges in her course:

> Susan: This was ridiculous. Honestly, I was offended. It seemed like the kind of silly little thing we see in the worst possible workshops and more akin to stickers we give to primary students. (Susan, Course S)

Meanwhile, some participants believed that professional training courses are supposed to be emotionally neutral and that the additional elements of gamification to the course were not necessary:

> This type of material is meant to be factual, not engaging. So, the extra frills are more annoying than useful to me anyway. (Survey Comment, Course C)

4.5.2.5 The Mixed Views on Engagement

The participants expressed mixed views about using gamification to improve engagement. Some participants acknowledged the effectiveness of using gamification solutions to enhance course engagement; they enjoyed the gamified activities and believed that they improved their learning experiences. Others believed gamification

had little impact on their course engagement, as they were already motivated to learn and had planned to complete their course regardless of the gamification:

> Winifred: They're so cute. They're great. You know what? That was engaging. Not too stressful by any means, but just make sure that you were getting it. If I was to get an incorrect answer, then I would know that I was a little bit off track; so, I think it's a good way of kind of checking [the level of] understanding as you're listening. I thought it was very well done. (Winifred, Course W)

The participants also emphasised the importance of engaging course content, not just course design or presentation:

> The method of presentation was stimulating and followed a logical progression, much better than the bullet points on a PowerPoint. It is very important to make sure the course has substance in addition to an engaging presentation. This course had both. (Survey Comment, Course W)

4.5.2.6 Reflections on the Psychological Perspective

It was noticeable from the data analysis that participants were aware of their psychological needs during online learning. Online course participants had different needs and preferences about how the course content should be presented. It is challenging to create a perfect programme that meets all participants' needs. There are examples of the same gamification strategies that were welcomed by some participants but disliked by others. For instructional designers and developers, it was recommended that solutions be explored that can be accepted by a broader range of participants and to avoid strategies that are likely to be only enjoyed by a smaller percentage of the audience. For example, most of the interviewees in this study enjoyed the convenience of self-paced learning and were concerned about the time and logistical challenges associated with those mandatory social learning components. As a result, when designing self-paced online courses for a similar audience, gamification elements that focus on autonomous learning, such as a progress bar and awards, are preferred. Meanwhile, game elements that rely on social participation such as leaderboards should be limited.

Another reflection on this section is the importance of voluntary participation when designing a gamification solution. Not everyone plays or is playful in the same way (Charnock, 2019). By letting the learners opt-out from the gamification solution without allowing there to be a significant impact on their learning output, we can improve the approval of the gamification solution. For instance, by making badges an optional course element, we can reduce the negative experiences reported by some of the interview participants.

4.5.3 Participants' Perspectives through the Andragogical Lens

As discussed in the literature review chapter, adults and children learn differently. Gamification theories and strategies that emerged from traditional school-based educational settings may need some adjustments in order to apply them to adult learners.

4.5.3.1 Learners are Motivated to Learn

During the interview the participants were asked if their workplace offered any incentives. The majority of the participants took the course in their spare time, without any employers' incentives. Many participants explicitly expressed their strong motivation to enrol in the researched courses. The reasons provided by the participants varied, but one of the common reasons was the desire to use the learned knowledge to better serve their students or clients with autism. For example, Roger from Uganda explained that his main reason for taking Course R was to raise awareness about his country's employment issues associated with individuals with autism:

> Roger: It's been a question here in my country, given that many people have little knowledge about autism, so they keep asking, ‘So after having all the treatment, all the therapies, where is my child going?'… So, I give them my word that with appropriate interventions, these children are going to grow up very well and have life, a life that includes having jobs. (Roger, Course R)

Amy from Course A had a more practical reason. She is a classroom teacher and realised her existing knowledge about autism was not as comprehensive as that of her

colleagues. Amy signed up for the course aiming to better support her students and to catch up with her peers:

> Amy: And it was through working with the educational assistants who had an ABA background because they came from jobs where they were working with children who had autism. They knew so much, and they had so much information. But I felt, ‘Oh my goodness, I don't have this background. And I need something.' (Amy, Course A)

This strong intrinsic motivation to gain knowledge about autism was also reported by the parents of children with autism. A survey respondent explained her motivation to enrol in the course:

> I am a mother of a child with autism. I wanted the best for him. (Survey Comments, Course R)

Although intrinsic motivation was the most-reported emotion, extrinsic motivators such as gaining the certificate for one's resume or CV, finding a job, and advancing careers were also mentioned:

> Wendy: I'm happy about the certificate because I will put it inside my portfolio, which I'm being asked to get registered. (Wendy, Course W)

> I am trying to get a full contract and wanted a course that would distinguish me from other candidates. (Survey Comments, Course A)

> I need to be fully eligible to substitute teach / teach in the autism transition classroom in my school board. (Survey Comment, Course B)

It is worth noting that there was no clear division among participants who were intrinsically driven or extrinsically motivated. Many research participants demonstrated both intrinsic and extrinsic motivation in their online learning:

> Willow: I took the course because it was part of a programme with my school board, and then they were using parts of it, and it was interesting so I just thought I'll just go online and do the other ones. (Willow, Course W)

It is also worth mentioning that the high motivation among the participants was likely due to the participant selection procedure. As discussed in Chapter 3, the research participants are learners who have enrolled in the researched courses within the past 12 months and have completed at least 50% of the course content. The participants who dropped out shortly after their enrolment were not included. Similarly, the interview participants volunteered by responding to an invitation. These participants were likely to be more engaged in the course than those who did not respond to the invitation.

4.5.3.2 Learners Want to be Treated as Adults

Another prominent trend in the interview participant responses was their strong desire to be treated as capable and responsible adults. Griffin (1983) described this as the unshakeable sense of our self-worth as an individual. Knowles and Swanson (2014) also described this desire as a deep psychological need to be seen by others and treated by others as being capable of self-direction. This desire for being treated as respected adults was expressed consistently by the participants during the research. Gamification elements commonly used in a child-focused teaching approach were viewed as unnecessary, childish and a contributor to lowering the professionalism of the courses. This view was especially strong among participants who work in the K-12 (kindergarten to the 12th grade) and who practise similar game strategies in their classroom. For example, Alicia from Course A thought the badges she received in her course were childish and completely unnecessary for adult learning.

> Alicia: I just kind of felt that I'm an adult, I don't need a badge to tell me I'm doing good. (Alicia, Course A)

A survey participant from Course W shared a similar view about the gameful design in the course:

> I like to read for information. Game-like learning is for children. (Survey Comments, Course W)

The comments from Alicia and the above-mentioned survey participant suggested the need for different gamification strategies for adult learners. Adults are not oversized children (Taylor et al., 2000). Their maturity is a unique characteristic that needs to be understood and respected when designing an online course.

4.5.3.3 Learners are Busy

The participants of this research are primarily working professionals. They carry out numerous responsibilities and commitments outside of the online courses and often experience the pressures of finding time to work on their online courses. Data analysis indicates that gamification elements that can help learners manage their busy schedules were appreciated. For example, the visual checklist, which assisted the participants in tracking learning progress, received overwhelmingly positive feedback. Armand from Course A commented on how the checklist helped him:

> Armand: So, my time through the day was not mine. I was basically solving problems from the moment I walked in the door to the moment I left the school… It is nice to pick up where I have left quickly. (Armand, Course A)

A survey participant used the checklist to budget time:

> When I would sit down to do a session of work, the checklist let me know if I had more time to finish the section or start another section before my self-imposed time limit was up. (Survey Comment, Course C)

Nevertheless, gamification elements that unnecessarily consume participants' precious time were not so welcome. For example, notification emails about rewards were viewed as unnecessary and a waste of time. A survey participant shared their view on the notification emails they received while working on the online course:

> I would get an email about the badges after I earned them. They just clogged up my email and wasted my time. (Survey Comment, Course S)

4.5.3.4 Learners Have Problem-Centred Goals

Adult learners bring rich life experiences to their learning activities. Different from the subject-centred learning orientation of children and young people, adult learners are motivated to attain knowledge and skills that will help them perform tasks or deal with problems (Knowles & Swanson, 2014). Many interview participants in this research demonstrated this problem-centred learning preference. The gamification elements that can be used to solve their real-life problems were well-received. For

example, Carrie from Course C liked the simulation game activities that allowed her to practise classroom organisation strategies for students with ASD:

> Carrie: The games were great. I loved how they really went with what we were doing, which was really beneficial because it was putting theory into practise. So what does this look like in my classroom? Am I doing this already? Okay, I do have colourful bins. Am I doing this? So, that for me was really beneficial, and it was great putting that theory into practise. (Carrie, Course C)

Alongside these preferences for practical game simulation, some participants with educational backgrounds also viewed their online courses as practical examples of gamification implementation, which can be incorporated into their own teaching practises:

> They presented the information in a different manner… I would like to incorporate this style of activity into my own presentations. (Survey Comment, Course W)

4.5.3.5 Reflections on the andragogical perspective

It was clear that many interview and survey participants were aware of their adult learners' characteristics. They were motivated to learn skills and knowledge, had many obligations outside of the online courses, needed to be treated as mature adults, and were seeking practical solutions to their real-life problems and challenges.

Online courses that are designed for professional adult learners require different gamification implementation considerations and strategies as compared to when designing courses for K-12 or university students in formal education settings. Currently, many of the published journals about gamification focus on children, adolescents and young adults' in the formal education settings. The results and recommendations from these research studies require careful andragogical adjustments when applying them to the gamification solutions for professional adults.

Furthermore, the individual differences among people increase with age (Knowles et al., 2014). Adult learners have different anticipated objectives, expected outcomes and ways of responding to the gamification design (Jones & Moseley, 2019). These

individual differences were also reflected in this research. A wide range of perspectives, opinions and feedback was collected through the interview and survey responses.

As for the instructional designers and developers, it is recommended to apply the andragogical lens when designing gamification solutions for adult training programmes and avoid simply replicating solutions tailored for a younger population. For example, a clean, professional badge design might result in a better acceptance from the adult population than a busy childish badge design.

Another suggestion for instructional designers and developers would be to acknowledge the differences among adult learners and be aware of the challenges this diversity posed for gamification design. Not everyone wants to participant in gamification. We should allow the learners to complete the course without making them take the gamification route. For example, we could provide the learners with a PDF version of the game simulation activity so that they could print it and practise it offline.

4.5.4 Participants' Perspectives through the Technical Lens

The implementation of gamification in the field of distance education using computer-based instruction relies deeply on the available technology. As Piatt (2019) explained, we do not need computing to play, but technology can create an expanded world where we can play. Furthermore, an increasing number of people playing video games in their leisure time constitute a vast gamification-ready user-base. However, technology-related challenges such as the availability of technological resources and the implementation and maintenance cost could also become a hindrance to the success of gamification. Through the interviews, the participants shared their perspectives on the technical aspects of gamification implementation.

4.5.4.1 Technological limitations

The gamification design is closely associated with the available technology. There is a noticeable gap between the participants' expectation of a well-designed online course and the reality of what is actually achievable with the restricted technical resources.

For example, Ryan from Course W compared the gamification solution in his course with the Second Life, a well-known online 3D virtual world:

> Ryan: When I'm comparing these platforms like Second Life and these, you know, probably multi-million dollar game developers. I mean, I totally appreciate the notion that the execution may slightly be... 'less sophisticated'. (Ryan, Course R)

Wanda from course W also compared the gamified activities in the course with commercial video games:

> Wanda: It's a little nostalgic for me. Because it's not that I never played many computer games, right? The animation of some of the activities was outdated, as it does so rapidly in this field. (Wanda, Course W)

Other participants also helped to identify areas for improvement. For example, a survey participant pointed out the lack of printing function in the interactive activities:

> The interactive games added great value to the course. However, the only way to print the answers to these activities was to screenshot them. I would have liked to have had these as part of the handbook for the course, even as a supplemental chapter offered at the completion of the course. (Survey Comment, Course C)

4.5.4.2 Technical Glitches

Technical glitches were reported at both the LMS level and the course modules level. These technical glitches negatively impacted the participants' perception of the gamification implementation and hindered their learning experiences. Among the glitches reported, some of them are technical issues that are likely associated with the system setup or programming. For example, a participant described the technical difficulties she encountered with the checklist:

> The checklist didn't update… Sometimes I checked and was worried that it hadn't recorded my progress but found I had to log out and then back in to show the most recent progress. (Survey Comment, Course B)

The glitches might also occur due to the limitation of the learner's internet connection or computer hardware which results in time lags, screen freezes or system crashes. For example, a survey participant described her experience with the game activity:

> I did find it frustrating that the pirate ship activity kept freezing, and I would have to keep restarting that activity from the beginning until it finally worked. It took a few tries. I did enjoy it though. (Survey Comment, Course W)

4.5.4.3 Compatibility with Mobile Devices

Learners of online courses access the e-learning courseware through various devices, operating systems and web browsers. Whether the gamification solution works and functions in the same way across devices and browsers can also have an impact on the success of gamification implementation. The interview participants commented on some of the compatibility issues they experienced with the course. For example, Charlie from Course C had some issues with the game activities while using an iPad:

> Charlie: Maybe it's just me, but I found it difficult to drag the answers around from my iPad. So, [I] had to use a different device. (Charlie, Course C)

Some participants also noticed the absence of a native mobile app with the researched online courses:

> The course was valuable and exceptionally well designed. However, an app for an iPad would be useful, rather than opening it through the internet. (Survey Comment, Course A)

4.5.4.4 Accessibility Considerations

Accessibility refers to the design of products, devices, services, or environments for people who experience disabilities (Accessibility Services Canada, n.d.). As a public-funded non-profit agency, Geneva Centre for Autism's online courses needed to meet the standards set by the Accessibility for Ontarians with Disabilities Act (AODA). Although there were no participants in this project who self-identified as individuals with disabilities, some of the participants expressed their appreciation of the accessibility features incorporated in the researched courses. A survey participant

from Course C took advantage of the closed captioning function while watching videos:

> I actually worked with the sound off and used the captioning on the videos for my learning as I am more of a visual learner than an auditory one and found the sounds and speaking a little distracting. It was nice to have the option, though, as this is rarely the case. (Survey Comment, Course C)

It is worth noting that accessibility-related issues can affect people with a broad range and degree of conditions, including varying degrees of auditory, physical, speech and visual difficulties. Poor design with accessibility issues such as small font size, low colour contrast, missing descriptive text tags at the image or non-enlargeable text can impact the learning experiences of all learners, including seniors with age-related problems. Andrea from Course A described her challenge with the font size used in the images and her innovative walk-around solution of enlarging the screenshots:

> Andrea: I had trouble with getting the image to be large enough to see the text. I'd take screenshots of images that were really helpful and then make my own study notes from them. (Andrea, Course A)

The accessibility considerations not only apply to people with physical limitations but also those with cognitive, learning and neurological challenges. Tricky quiz questions, busy screen layout, fast-moving objects or complex game activities can all add new challenges for some learners. For example, a survey participant commented on the difficulty level of some of the game activities:

> Anyone with a disability, unless they have someone to help, most likely won't pass. (Survey Comment, Course S)

Accessibility-related comments and concerns raised by the study participants identified some areas for improvement in the researched courses. When designing gamified online courses, special considerations are needed to be made for creating an inclusive design to promote full participation of people with various challenges. This does not mean lowering expectations or changing the educational outcomes, rather reducing or removing barriers to the course design, including using less busy interfaces, adding hints in activities, providing detailed feedback and offering

alternative non-gamified content. Designers should also follow the standards set by the Web Content Accessibility Guidelines (WCAG). This will ensure the course meets the needs of different ability groups.

4.5.4.5 Reflections on the Technical Perspective

The qualitative data analysis suggested that most of the participants were satisfied with the technical aspect of gamification. However, technical issues such as glitches, mobile compatibility and accessibility issues were also reported.

Technical problems can quickly become an issue and source of student dissatisfaction with the learning experience (Garrett et al., 2018). If participants experience too many glitches or technical challenges, it can lead to them abandoning the course. In order to address the technical aspects of the gamification implementation, a multi-level approach may be considered. At the learner support level, quick and adequate technical support is needed. This can help participants overcome technical difficulties or find a work-around solution. At the course development level, thorough testing is needed to detect potential design flaws and glitches, while at the system administration level, a timely system upgrade and patches are necessary to fix the known bugs and issues. Moreover, additional or even alternative applications can be considered should the technical issues ever become a major problem.

4.5.5 Participants' Perspectives through the Instructional Design Lens

The participants' perspectives through psychological, andragogical and technical lenses address the fundamental level of considerations that influence the design of gamification; the participants' views on the gamification implementation were influenced at the practical level where participants interact directly with the course interface through instructional design, UX design and game design. This section captures the participants' perspectives on the practise of design, development and delivery of the instructional courseware.

4.5.5.1 Diverse Instructional Approaches

One noticeable phenomenon arising from the qualitative data analysis is the frequent reference to the learning styles by the interview and survey participants. The learning

style theories claim that students have particular learning styles and that these styles should be accommodated by instructions tailored to their learning style (Pashler, 2008). There are a variety of learning style paradigms (Joniak & Isaksen, 1988; Kolb, 1985; McCarthy, 1993; Suessmuth, 1985), with different measurements and focuses.

Noticeably in this study the VAK (visual, auditory and kinesthetic) learning styles were often mentioned. The VAK preferences designed by Barbe et al. (1979) and further developed by Neil (2001) classify learners into three sensory modalities: visual learners, who absorb information by seeing or reading; auditory learners, who learn when they listen and speak; and kinesthetic learners, who learn through practise. Some participants in this research self-associated themselves with one or a combination of the learning styles, especially when commenting on how the course design affected their learning, either positively or negatively:

> Armand: The interactivity of the courses, I think, is one of the things that I like the most. Especially for me, personally, I'm more of a kinesthetic learner - a doer. So for me, it was great. I really enjoyed that. It's a perfect thing. The more you include activities that a person can do, I think the better the course will be. (Armand, Course A)

> Carrie: I'm a visual learner. So it was nice to see that I knew what else I needed to do, how much more I needed to do. (Carrie, Course C)

> Wanda: I am more of a visual learner than an auditory one and found the sounds and speaking a little distracting. (Wanda, Course W)

Pashler et al. (2008) challenged the widely accepted learning style concept. They argued that there is a lack of credible evidence to adequately support the learning style hypothesis. A number of other researchers also raised speculation about learning styles (Clark, 2010; Sharp et al., 2008) and cautioned that the expansion of the VAK learning styles mainly occurred due to the thriving learning styles industry despite the lack of empirical support (Fridley & Fridley, 2010; Scott, 2010). Critics also argue that people learn with all sensory modalities. The VAK model simplifies the complexity of learning, and the labelling of learners as visual, auditory, or kinaesthetic ‘Is not only unforgivable, it is potentially damaging' (Sharp, 2008, p. 311). Cuevas

(2015) suggested that educators should not waste valuable instructional time on misguided and unsupported learning style models.

Despite the speculation raised by scholars in recent years, it seemed that the VAK learning styles concept was popular among the researched participants, especially among the participants with substantial educational backgrounds, who likely were introduced to the learning styles concept through work or through pre-service training programmes.

Sankey et al. (2011) suggested that using various instructional approaches can enhance engagement and motivation. This dynamic was not associated with learning styles but related to the decrease in boredom and interest stimulation when information is presented in different methods (Cuevas, 2015). In the researched courses, when participants mentioned learning styles, they were often referring to how a certain type of instructional approach enhanced their learning experience:

> Rebecca: Whether it's funny or weird or embarrassing, and if I can be involved kinaesthetically, I can do some kind of action, or apply the concept, and I can do all of that in a game format, it is the tool that I will definitely use. (Rebecca, Course R)

> The multi-sensory approach was definitely beneficial. Just reading or listening to content isn't nearly as effective. (Survey Comment, Course S)

The findings presented in this section suggest that although many research works are against implementing learning styles-based instruction, there is still some value in adopting diverse instructional approaches and presenting information visually, verbally and tactilely. It is not to create multiple versions of the courseware to match the learners' learning style but to present the information with the most suitable format and offer the learners an interesting and diverse online learning experience.

4.5.5.2 The Interactive Design

The computer-guided interactive design forces the learners to make meaningful choices and experience consequences, which prompts them to actively think about the course content. Many participants in this research noticed the interactive design and explained how these interactive elements impacted their learning experiences.

Winifred from Course W indicated that the interactive elements in her course boosted her engagement with the course content through her active interaction with the course elements:

> Winifred: Then I realised there was an interactive section to it, so it actually made a really big difference… By actually trying to engage my brain and answer those questions, it definitely made me understand it a lot more, and [I] knew that I was on the right track. (Winifred, Course W)

Carrie from Course C believed that in her course, the game activities linked examples with theory through interactions with the courseware:

> Carrie: When talking about visual aids, they would give an example of a visual aid, and then we would have to drag it to the umbrella it would fall under. … That was really beneficial because it was putting theory into practise. (Carrie, Course C)

However, the preprogrammed interactive design in the self-paced online course still cannot fully replace the student-tutor and student-student interactions. Catherine from Course C pointed out the lack of human interactions in her course. She believed the computer-guided interactive design should not replace the role of a tutor:

> Catherine: I can't raise my hand and ask a question. For me, it is the lack of interaction (Catherine, Course C).

4.5.5.3 The Timely Feedback

Timely, consistent and coherent feedback guides, updates and corrects the learners' learning process. In a self-paced online course, feedback is often provided by the preprogrammed system, rather than from a tutor or peers. The participants noticed the absence of direct feedback from other people but also acknowledged the value of the computer-programmed feedback. For instance, Olivia from Course O valued the feedback she received from the courseware when the system verified her understanding of the course content:

> Olivia: In general, when the course is interactive, when you maybe can talk to your peers, have discussions, ask questions, [do] group projects, I

> find them helpful. If it's by myself, then those interactive programmes that ask me questions to see how much I learned are also helpful because then I can see if I can remember material or not. (Olivia, Course O)

Similarly, Armand from Course A believed the game element badge was also a form of feedback and it provided him with the feeling of assurance and encouragement during the course:

> Armand: It's a good motivator to feel encouraged, right? Because it does get very dreary… It provides at least some feedback, it's not from a human being, but at least it is a bit of feedback to say, 'Okay, it's worth sticking it out for.' (Armand, Course A)

4.5.5.4 Clear Instructions and Expectations

The interview participants also emphasised the importance of having detailed instructions and clear exceptions at the beginning and throughout the learning journey. In gamification, it referred to explaining the rules of the games in great detail and ensured that the learner understood what was expected.

At the system level, detailed explanations were needed on how gamification works, the actions needed from the participants and how the participants can benefit from participating. Unclear or unexpected gamification may cause unnecessary learner frustration:

> Willow: And it was kind of like, 'Oh, here you go. You've gotten this.' But I was like, 'What is this?' I think I just don't have the knowledge about what exactly it is. (Willow, Course W)

At the course content level, if the games are critical elements of the course or part of the course assessment, then detailed instructions about the game rules are needed rather than assuming the learners can figure it out by themselves:

> Charlie: There were times I was trying to figure out what was required of me to do. I think there was some sort of assumption on behalf of the programmers that I knew what I had to do. So, yeah, I think there was ...

> maybe I need a little more guidance in them or direction. (Charlie, Course C)

4.5.5.5 Content Chunking

Chunking is a method of splitting content into smaller pieces or chunks, in order to make the content easier to understand and retain. Chunking can be applied to the course level, breaking the course into smaller lessons or units, and can be used at the screen level, breaking down the content into tabs, short bullets and paragraphs.

There were many positive comments about the long course being broken into smaller digestible sections both at the course level and at the screen level. For example, Ona from Course O believed the content chunking helped her better plan her learning schedules and made resuming the study easier:

> Ona: I like the fact that you could take a break between each one and go, 'You know, do something else for a short-term before heading back and doing more to it.' (Ona, Course O)

The individual game elements that supported organisation, tracking and resuming of the content were also liked by the participants. For example, Rebecca from Course R viewed the checkpoint badges as milestones during her course journey:

> Rebecca: They're kind of like milestones, I think. It's good because it's like the site lets you know, that they're recognising you've completed something. It helps especially if you're taking a larger course, it's kind of like those little positive reminders. (Rebecca, Course R)

4.5.5.6 Reflections on the Instructional Design Perspective

The findings in this section identified the tension between the convenience of self-paced learning and the absence of social interaction. The participants mentioned that they missed the opportunity to ask questions and receive feedback from the instructor and the social learning opportunities from their classmates.

Although communication with instructors and peers in a self-paced course is limited, it does not mean it must be absent. For example, the instructors can embed timely feedback with personalised and direct language with a supportive and encouraging

tone in the activities, scenarios, case studies and role-play, providing the participants with the sense of being taught directly by the tutor. Moreover, the boundary of learning is not limited to the learning management system (LMS). The social connection with instructors and peers can also be achieved outside of the online learning environment through various social and communication tools such as email, social media and face-to-face meetings.

Another reflection in this section is the importance of fitting the instructional design into the adult learners' lifestyle. We understand that adult learners are busy in life and often experience difficulties in allocating time for their online courses. By dividing the content, screen and game activities into smaller bits, we can support busy adult learners in unifying their fragmented time to study. Furthermore, by adding interactive games, offering diverse instructional approaches and providing timely feedback, we can make learning less boring and more enjoyable, especially when it happens after a long working day.

4.5.6 Participants' Perspectives through the User Experience Lens

The gamification design is tied closely with the UX design, an approach to design products such that they meet the requirements of the customer, and it provides a good experience to the intended users (Allanwood & Beare, 2019). This section of the thesis captures the participants' feedback on whether the gamification solutions in their online courses are functional, understandable and enjoyable.

4.5.6.1 Meaningful Design

Meaningful design is an essential element of the UX design. It refers to creating something that is purposeful, logical, that feels right and matters to the users (Mekler & Hornbæk, 2019). During the interview, many participants noticed the efforts in making the design meaningful in the researched courses. For example, Amy from Course A commended the game elements in the course which, she believed, made her learning experiences lighter and more enjoyable. This fun learning experience was also mentioned by another survey participant from the same course as Amy:

> Amy: I thought that it was a lot of information but having those badges, having those little games, all of that kind of made it lighter and, I think,

> made you feel more connected. Yeah. I think it just gives you a good feeling. (Amy, Course A)

> The game-like interactive activities presented a relief, a break from the course content. It was a way to apply my knowledge in a fun way. (Survey Comment, Course A)

Gamification is not just about the cute characters, dazzling visuals, and funny sound effects. Without meaningful design being integrated with the course content, it could be seen as cosmetics that bring little or no value to the course, or even worse, may be distracting to the learners:

> They were cute but not very challenging. It was easy to read through the design as more of an add-on embellishment rather than as a provocation to thought. (Survey Comment, Course S)

> I think the gaming idea is interesting and unique, but at times, it's more distracting than helpful. It did very little to engage me. (Survey Comment, Course W)

4.5.6.2 Navigation

Navigation in a typical online training module seems straightforward: they are the menus and hyperlinks that allow learners to navigate the course. In a gamified online course, navigation could be more complex due to the non-linearity of the course design. In this study most participants were satisfied with navigation; however, some participants found the non-linear gamified course design somewhat confusing. For example, a couple of survey participants from Course W described their frustration about navigating through the interactive actives:

> I had some navigation issues when provided with a selection of choices to complete an activity or read more information on a topic; it was confusing as to how to get back to where I left off. (Survey Comment, Course W)

> Sometimes I found it confusing as to how to continue after completing an activity, or when I selected a topic to get back to the main page, or where was I to continue to the next step. (Survey Comment, Course W)

4.5.6.3 Aesthetics

The aesthetics of the gamification solution concerns its look and feel. As mentioned in the literature review, aesthetics, with some variation in its definition, is one of the three categories in the MDA gamification design framework (Hunicke et al., 2004). A good aesthetic design makes the right first impression on potential players, drawing them into the gameplay and making their game experiences enjoyable (Schell, 2014). Good aesthetic design can also positively influence learners' perception of the quality of the courses and can strengthen their understanding of the course content. Similarly, poor aesthetics design can distract learners' attention from the course learning and hinder their overall learning experience. A survey participant explained how the quality of the graphics in the course improved their learning experience:

> I think it was the quality of the graphics of the gamification that I enjoyed the most. (Survey Comment, Course W)

Another survey participant explained how the appearance of the animated character distracted her from learning:

> I couldn't help but notice that the woman graphic [character] used throughout the tutorial had a large pointy chest. I would think that the audience for this type of tutorial would appreciate a different type of female portrayal. (Survey Comments, Course W)

4.5.6.4 Context

Contexts in the UX design refer to the circumstances or situation in which the learners are working. It includes a wide range of considerations such as the location, the time of the day, the devices used, the learners' demographics and their previous experiences with e-learning and gamification. The participants in this research experienced their gamified online courses through a unique personal context, and their feedback reflected the relevant contextual influences.

For instance, the participants with busy schedules liked the gamification elements that helped them organise their learning progress. Alexandra from Course A described how the checklist helped her manage her learning progress:

> Alexandra: I really like the visual aspect of having that checklist there for me. In the evening, when you're sitting down and you think, 'I'll dedicate a couple of hours to work on this course…' You can see things [and think], 'Oh, I'm making pretty good progress.' (Alexandra, Course A)

The participants with a substantial educational background, who also used the award system in their classrooms, were split on their views regarding the use of badges. Some participants praised it, believing it to be an effective motivator for learners of all ages. However, others thought that badges should not be used in the professional training context.

> The badges were very motivating... I wanted more, and it was an excellent example of how positive reinforcement works... It made me realise how important and effective it is for kids... What a great example! (Survey Comment, Course A)

> The badges made me laugh because I'm a teacher so I have plenty of real stickers to give to myself. (Survey Comment, Course C)

4.5.6.5 Flow

The gamification elements in a course do not work in isolation. They work together with other course elements to generate a wholesome learning experience for the learners. This sub-category under the user experience theme is concerned with how the gamification elements can fit into the rest of the course design, interact with other non-game course elements and create an integrated course flow.

For example, Willa from Course W mentioned her pleasant experiences with the gamified workflow in her online course:

> Willa: It gives you something to read, then to put it into practise so you're playing a game to see do you really get it. So, you got to read, you got to listen and then you got to put it all into practise by playing games or doing activities. (Willa, Course W)

Aloma from Course A also mentioned her positive workflow experience in her interview, praising the seamless transition between the elements in her course:

> Aloma: Every module led to the other. They were like a seamless transition, and everything you needed to know was well-ordered, well-thought out, and everything blended just splendidly, I thought. (Aloma, Course A)

The online course design flow can also generate some anticipation for the upcoming fun game elements in the study. This anticipation could be used to motivate the learners to move through those less exciting sections in the courses:

> Andrea: You were going through the process of learning something and then you would think, ‘Oh, there's gonna be an activity coming up, and I wonder what it's gonna be like, and then there wouldn't be one. Or maybe there was one, but it wasn't as engaging as the other ones. Something I was looking forward to. So it is a very significant part of the course. (Andrea, Course A)

4.5.6.6 Reflections on the User Experience Perspective

This section summarises the comments and feedback from the interview and survey participants through the user experience lens. A good UX design is one that works with the course content, is easy to navigate and flows well.

It is noted from the study that learners do appreciate high-quality aesthetic design. The pleasant look and feel of the course can improve the learners' learning experience and enhance the creditability of the course.

Another reflection from the study is that the gamification design should be learner-centric. When designing a gamification solution, the characteristic of the targeted learner population should be carefully considered. The gamification elements selection, the navigation, the look and feel, the imagery design and the colour and fonts, should all be suitable for the targeted audience.

Lastly, the gamification of the online course should fit with the flow of the rest of those non-gamified course elements, offering the learners an integrated learning experience. This is particularly true when gamification is applied at the LMS level, where the gamification solutions are often viewed as ‘add-ons' to the existing system and are sometimes created separately from the system's core functions.

4.5.7 Participants' Perspectives through the Game Design Lens

The game design section summarises the feedback from the participants about the individual game elements at the game dynamics level that were implemented in the gamified online courses. In this section, five aspects related to game design are discussed. As discussed in the literature review, there is a wide range of game elements identified by game designers and scholars, and many were implemented in the researched online courses. The subsections included in this section are not an exhaustive list of game dynamics listed in the game element frameworks, but the game design concepts highlighted through the qualitative data analysis.

4.5.7.1 Rewards

Rewards in the researched courses were created in various forms. Six out of the seven courses incorporated a badge system and two courses included a points and coins reward system. The findings from the qualitative data analysis are consistent with the findings from previous quantitative data analyses. The perception of the effectiveness of badges was one of the most divided among all researched game elements. Some participants were glad to receive badges and saw the badges as recognition of their achievements, while others saw little value in badges and thought they were rather superficial, inappropriate, and even childish.

For example, Ada and Amy from Course A thought the badges motivated them to move forward in the course:

> Ada: It's an accolade. It kind of motivates you to move forward. When you were halfway through you got the email that said, ‘Yay, you're halfway there.' (Ada, Course A)

> Amy: It made me want to also, I think, keep going. It just felt like, ‘Oh well, it's not just stagnant.' There's something, something there. You know, something is acknowledging what you're doing. (Amy, Course A)

On the other hand, Albert from Course A believed the badges neither positively nor negatively impacted his learning experiences:

> Albert: My motivation to take the course was just to, for my own general knowledge, and to help my own students. So, the badges, they were fine. I

> didn't hate them, but it didn't really affect my continuing in the course on a daily basis. (Albert, Course A)

Some of the negative feedback towards points, badges or coins were associated with the learners' lack of recognition outside of the online course, as well as the absence of the tangible value of the earned rewards:

> Wendy: The certificate is more valuable than a badge, because I can get a couple of badges. But, how can I print them with my name, saying I was able to complete that course? (Wendy, Course W)

> They were useless. If collecting badges lead to a significant (50-100%) discount on a future course, then I might care about the badges. Otherwise, they just feel like a tired gimmick. (Survey Comment, Course C)

4.5.7.2 Storytelling

Storytelling can transform a boring training course into an engaging one. People have a natural affinity towards learning from stories and tend to remember facts more accurately if presented in the context of a story (Kapp, 2012). Among the seven researched courses, Course C incorporated the storytelling game element the most. The feedback from the participants on this game strategy was mostly for Course C and was overall positive:

> People taking the course are not always hands-on, and things get forgotten. By telling a story in a simple way, with fewer words, I found it kept my attention, and I found it engaging. (Survey Comment, Course O)

The participants also provided suggestions on how to improve the storytelling, for example, by adding new scenarios to the existing storyline:

> Offer different ways to participate from a child's lens, from the parent and professional lenses. Show the perspectives from their eyes and how this is impacted. (Survey Comment, Course O)

4.5.7.3 Scaffolding

Scaffolding in gamification design is significant in providing support to students but only enough to allow them to complete their tasks on their own (Benson, 1997). It

often refers to the reduction of complexity and offers hints, checklists, clues and prompts at the beginning of the learning and gradually withdraws the amount of support as the learners progress through their course.

The participant feedback on the scaffolding strategies was overall positive. For example, Armand from Course A recalled his experiences with the scaffolding in his course:

> Armand: If I knew from the beginning how the course was gonna challenge me, I may not have stuck it out. I may have said no. I just can't do it right now. Just too much time, too much effort, too much dedication. So having the smaller chunks I thought it was really well done. (Armand, Course A)

However, the system's preprogrammed scaffolding support does not always meet the support needs of the learners. The participants also expressed their wish for a real teacher to support them through their learning progress:

> Alicia: It might have been nice to be able to contact someone if I was confused about something. If I knew some people are there so that if I had questions, I could say, ‘Okay. Can you help clarify this?' (Alicia, Course A)

4.5.7.4 Progress

Another frequently mentioned point by the participants was the need to receive an immediate and accurate understanding of their progress in the course. Progress in gamification can be in the form of a status bar, a completion checklist and a set of checkpoints or levels. Consistent with the quantitative findings, the qualitative data analysis also revealed positive views on those game elements that facilitate participants' self-progress monitoring needs:

> Craig: I liked the percentage. That was a big motivator to see, ‘Okay, I'm 40% done in the course.' Then do a couple of things and [feel], ‘Oh, I'm 47% done in the course.' (Craig, Course C)

> The checklist was helpful to me, in that it provided a quick reference of my progress in the modules; especially with the longer modules, the checkmarks did provide motivation. (Survey Comment, Course A)

Furthermore, a visual indicator of how far from course completion a learner is can also be a motivator for the learners to complete the course:

> Wanda: And I find people, myself included, are more willing to persist if they know how much longer it is this is going to take. If they know they're halfway or three-quarters way, [they would] find that motivating too. (Wanda, Course W)

It is worth noting that progress tracking is not necessary to be in a gamified format. Traditional tracking methods, either online or offline, can also serve the purpose. For example, Crystal from Course C did not use the progress bar in the online course. She tracked her progress with a notebook instead:

> Crystal: I kept notes in a notebook, and I just knew what lesson I was on, so I just clicked right to that last note. I clicked right to the module that I need to finish. (Crystal, Course C)

4.5.7.5 Freedom to Fail

Another sub-category under the game design theme is the preference of being able to fail without any consequences. Failure is normal and an essential element in a game. Having the freedom to fail, recover and learn from the failure encourages the learners to take on challenges that they would not have otherwise (Lee & Hammer, 2011). Willow from Course W shared this viewpoint about having the freedom to fail:

> Willow: I'm a person who always likes to get everything right. But when the game was good, if I didn't get it right, but I tried again, and then I got it right, I got the experience. (Willow, Course W)

Some learners took advantage of being able to fail safely, purposely selecting incorrect choices and exploring the course from different scenarios:

> Ryan: I answered all of the questions wrong on the first round just to see what would happen and then answered all of the questions correctly in the second round just to see the difference. (Ryan, Course R)

The freedom to fail also encourages the learners to learn from their mistakes, prompting them to gain a deeper understanding of the subject. For example, Andrea from Course A expressed her view on the practise games in her course:

> Andrea: It was just a marvellous opportunity to learn in stages, and we only learn by making mistakes … and that's what I really loved about the games. It's more iterative that you learn as you keep going… And… psychologically, it was just really positive. (Andrea, Course A)

4.5.7.6 Reflections on the game design perspective

It was clear that interview and survey participants were aware of the game strategies implemented in their online courses and were generally satisfied with the game design.

Games are fun to play. The identified game design themes are all associated with this fundamental principle of games. According to Lazarro (2014), there are four types of fun: hard fun, easy fun, serious fun and people fun. The rewards and progress in a gamification system trigger hard fun, which is derived from overcoming frustration and achieving the win state. The storytelling and freedom to fail provided the learners with an enjoyable, relaxing and playful learning experience (soft fun). Scaffolding offered the learners an opportunity to improve themselves, which can trigger serious fun. The playfulness of the game design provided the participants with a fun learning environment that ‘Values the acceptance of failure, openness, democracy, willingness to try something new and to enter into the spirit of pay' (Whitton & Moseley, 2019).

A further reflection on the game design perspective highlights the need for the connection between the virtual online course and the real world. Although learners are generally motivated by virtual rewards such as points, badges and coins, tangible rewards, such as certificates, gifts and discount codes that can be used in real life, are still preferred. Similarly, despite the complex design of the preprogrammed scaffolding support, the participants still preferred to receive personalised support from a real teacher. This preference for linking online and offline worlds was also

reflected by the use of the physical pen and paper for taking notes and tracking learning progress by some participants.

For instructional designers and developers, there are many well-established game design principles (Salen et al., 2004; Schell, 2014) that can be borrowed from the game industry and applied in the educational context. The five subcategories identified in this research are only a small section of these design strategies. Developers and designers are encouraged to explore and experiment with other strategies and principles and to avoid restricting themselves to the limited list identified through this research.

4.5.8 Answering Research Question 4

This section aims to answer the fourth research question: RQ4: What are participants' perceptions of including gamification in their online courses? Through quantitative data analysis, six themes related to gamification in self-paced online courses were identified. The findings revealed that gamification is not a standalone implementation that can simply be added to an existing online course. It needs to be deeply embedded into various aspects of the course design. The participants' perception of gamification is closely associated with their overall experiences in the online courses. There is no clear division between gamification experiences and online course experiences.

Through the psychological lens. Online participants have the desire to be competent and successful, be responsible for their own choices and to stay connected with other people. They adore the positive emotions associated with achievements and enjoy the additional engagement added by gamification to their learning experiences. Perceptions regarding the gamification elements vary among participants due to the differences in their psychological desires.

Through the andragogical lens. The participants in this research were all adults. They shared some common characteristics as adult learners, including high motivation for learning, the desire to be treated as capable and responsible adults, the presence of many other commitments outside of the online course, and ability to bring their rich experiences to their learning process. These characteristics greatly influenced their perception of the gamification implementation. Gamification elements and strategies

that support their andragogical learning needs received better feedback than the ones that misaligned with their adult learner characteristics.

Through the technical lens. The available technology determines the functional capabilities and limitations of the gamification implementation. The rapidly growing gaming industry not only provided an ever-expanding user base, great examples and ideas but also inflated the expectations for the gamification solution. Issues such as LMS limitations, glitches and cross-platform compatibility, as well as accessibility considerations, all have an impact on the participants' perception of their gamified course experiences.

Through the instructional design lens. Gamification is tightly associated with the instructional design of online courses. Gamified instructional design should include diverse instructional approaches, present the information in the best suitable format, promote the interactivity of the course instruct, provide timely and meaningful feedback, offer clear instructions and support learners' desire to learn the course in small chunks as busy adult learners.

Through the user experience lens. From the participants' perspective, gamification is not a standalone experience but a part of the overall user experience of online courses. There is no clear division between the gamification design and UX design. User experience considerations that are common in other forms of human-computer interaction are also critical for gamification design. Such considerations include clear navigation, functionality that serves a meaningful purpose, visual appeal, fitting with learners' personal needs and game elements that flows well with other non-gamification course elements.

Through the game design lens. The majority of the online course participants more or less had some video game experiences. Their perceptions towards gamification were naturally associated with their video game experiences. Design principles and considerations that are common in the game design industry also apply in the online education discipline. This includes using rewards to acknowledge achievements and motivate behaviour, building interesting stories and narratives, providing a support system that gradually introduces the learner to the courses and allowing the learners to learn from failure and mistakes without any consequences.

The various lenses listed in this chapter formed a complex multilayer, multi-dimension perspective system regarding the gamification design and implementation in the self-paced online courses. Further discussions about this system will be carried out in the next chapter.

4.6 Summary of the Findings

In this chapter the quantitative survey, course data, the qualitative survey comments and the interview transcripts were examined. They broadly confirm that gamified design and game elements were positively accepted by the online course participants. Among the ten researched game elements, role-play received the highest rating, while badges revived the lowest scores. Game elements categorised as game aesthetics and game dynamics, according to the MDA framework, received higher evaluation scores than the ones in the game mechanics category.

The participants' views on their overall course experience and the game elements were generally consistent across a variety of groups with a few exceptions. The perception differences regarding the game elements were more notable among course-related groups than demographics-related groups. The participants from the short, free module course seemed to appreciate gamification more than learners from the long, paid certificate courses. A further drill-down on the data revealed that the participants from the latter group rated the progress game element more highly than those from the former group, and the younger participants appreciated the progress game element more than older learners.

The learners' course engagement and performance records did not seem to correlate with their survey responses, except on a few occasions. There are no significant evaluation differences about game elements among learner groups with different course access records, completion status or final grades.

The qualitative analysis of the interview and survey comments data provided more insights into the participants' perspectives on gamification. It confirmed that gamification implementation was well received by the participants. The game elements and gamification strategies mostly had a positive impact on the participants' learning experience. The participants' views on the gamification elements varied from individual to individual and from game element to element. Game elements such as a

progress bar and gameful design that fit in with the needs of result-oriented, self-motivated, busy adult learners were better received. Meanwhile, gamification elements and strategies such as badges that misaligned with the adult learners' characteristics received mixed feedback.

The participants also expressed their frustration with technical glitches experienced in their course. They additionally revealed that other aspects of the gamification design such as instructional design, aesthetics design and UX design also had a great impact on the participants' perceptions of gamification.

In this study, several contradictory findings between the quantitative and qualitative data were discovered. First, the quantitative survey result showed that the younger participants appreciated the progress game element more than the older participants ($M = 4.16$ among 21-30 age group, $M = 4.01$ among 31-40 age group, $M = 3.81$ among 41-55 age group, $M = 3.63$ among 55 and over age group). The qualitative interview findings indicated a different story. Most interviewees aged 41 and above praised the progress bar as it helped them plan their learning, track their progress and helped motivate them to complete the course; while some younger interview participants saw progress as a nice feature to have but it did not impact their learning experiences as much. My explanation for these differences is that the views from the interview participants were contextual and unique to each participant. Therefore, interview participants' opinions on the topic may not be fully in line with the statistical average of the research population.

The second inconsistent finding between the qualitative and quantitative data is the gamification impact on course engagement and performance. The statistical data analysis of the course indicated that the participants' course engagement and performance data, measured by the course log counts, completion status and final grade had little correlation with their survey evaluation about gamification. However, during the interview, the majority of the interviewees indicated that gamification made their course feel more engaging and helped them in the course completion. Further examination of the interview participants' course data provided some explanations for the occurrence of this phenomenon. The participants in the interview study had volunteered in the research. They were more likely to be satisfied with the course outcomes and motivated to share their course experiences. Further data comparison

confirmed this theory. All of the interview participants in this research completed their courses with higher than average final scores and log counts (see Appendix H).

4.7 Concluding Remarks

This chapter analysed the data collected from both quantitative and qualitative sources. Data analysis revealed that gamification implementation was mostly positively received by the participants. Participants with different demographic backgrounds had similar views on gamification, albeit with some variations. The perspective differences were more prominent among course-related factors than demographics-related factors. Data analysis also indicates that there is little correlation between participants' perspectives on gamification and their course records, with a few exceptional scenarios.

Through qualitative data analysis, six different perspectives of the online participants about their gamification experiences were identified including psychological, andragogical, technical, instructional design and UX and game design. These six perspectives are interlinked and form a multi-layered, multi-dimensional perception of gamification in online courses.

In the following chapter, I will further explore these multi-dimensional considerations from the perspective of instructional designers when designing and developing gamified online courses for adult learners.

5 Discussion and Conclusions

5.1 Introduction

The previous chapter answered the first four research questions through the examination of both quantitative data collected through participants' survey and course records as well as qualitative data amassed through semi-structured interviews and survey comments. Findings from the data analysis offered some valuable insights about the gamification implementation results in the self-paced online courses for adult learners. Six categories of participants' perspective emerged through the data analysis.

In this chapter, further examination of the six categories are carried out from the perspective of instructional designers and developers, thus answering the last research question (RQ5): What are the considerations when designing and implementing gamification in self-paced online courses for adult audiences?

5.2 The Gamification Strategy Framework

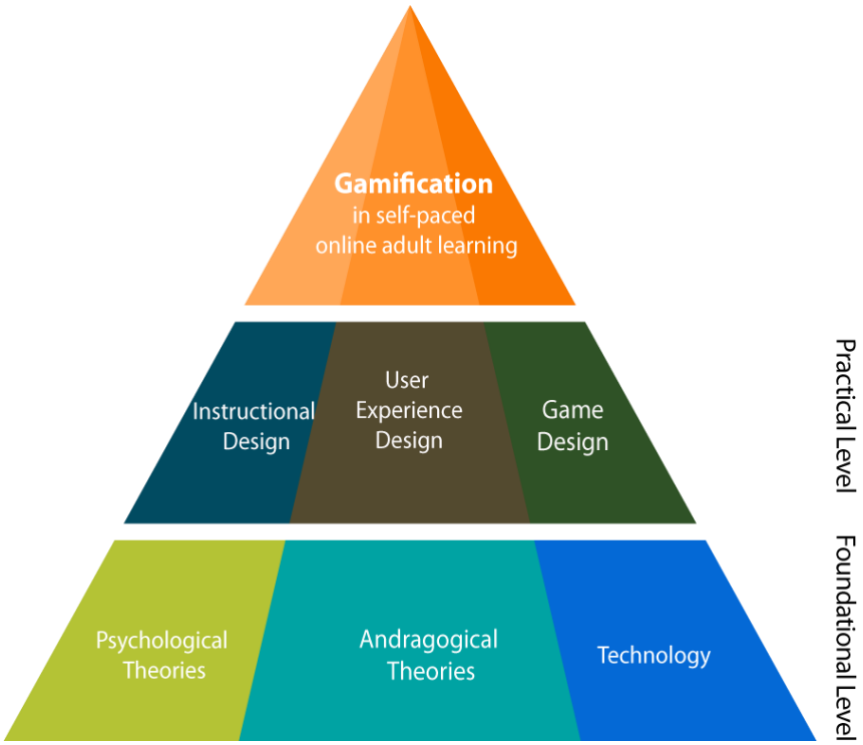
Gamification in online education is an interdisciplinary topic that requires an understanding of psychological and andragogical theories, the available technologies and various practical design and development strategies. With the support of existing research literature and findings from this mixed methods research, I applied the MDA framework into the context of self-paced online training for adult learners and developed a gamification strategy framework illustrating the multidimensional considerations when designing, developing and implementing gamification solutions

in this context. Figure 5-1 is an illustration of my understanding of the hierarchy of this gamification strategy framework.

The Gamification Strategy Framework lays out the six interconnected areas of knowledge needed when designing and developing gamified online courses. It can be used as a strategy framework by the organisation management when establishing the project team, ensuring a diverse representation within the team covering content experts, education, instructional design, game design, technology, and project management. This strategy framework can also support project managers to identify strengths and weaknesses among the team members and areas for further team professional development. Further, it illustrates the multidisciplinary considerations and strategies required in the gamification design process and, hence, provides the designers and developers with a practical framework when creating gamified online courses.

The pyramid shape of the diagram indicates the hierarchical relationship that appears to exist between various considerations in an online course design process. The foundational level of the pyramid is made up of the three disciplines related to gamification: psychology, andragogy and technology. The psychological and andragogical theories provided a foundation as to why gamification might work, while the associated technology ensures the gamification solution is achievable. In the middle of the pyramid are the practical principles and strategies related to the instructional design, user experience design and game design, indicating the various considerations when designing and implementing gamification solutions. Gamification is placed at the top of the pyramid, built upon the underlying practical and foundational theories and strategies.

Figure 5-1 *The Gamification Strategy Framework in Self-paced Online Training for Adult Learners*



5.2.1 Psychological Considerations

As discussed in the literature review chapter, many psychological theories can explain the success of the gaming industry and they can also be used to guide gamification design in education. Findings in this research provide valuable insights into how the psychological theories are reflected in the gamification design.

In gamification, badges and points can all find their roots in the behavioural theories. These behaviour theories explain how rewards can be used to suggest targeted behaviour (Stangor, 2012). Findings in this research revealed mixed results on the use of rewards systems. In this study, the qualitative findings suggest that some participants enjoyed the positive feeling of receiving rewards, while others believed they were unnecessary. Some participants associated rewards with children and did not believe they should be used for adults. Many of the participants indicated that they are intrinsically motivated to complete the course to gain skills and knowledge to better support individuals with autism at work or at home. Although the rewards issued in the researched courses improved the participants' learning experiences, they are often not the determining factors for the participants to complete the online

courses. This finding is consistent with Mekler et al. (2017), who studied the impact of gamification on motivation among university students and discovered that game elements such as points, leaderboards and levels functioning as extrinsic motivators are effective only for promoting performance quantity, but that they did not significantly affect competence or intrinsic motivation.

The quantitative data analysis also revealed that game elements, including rewards, do not have a strong association with the learners' course performance and engagement. This finding echoes the result from a study conducted by Kyewski and Krämer (2018) about the use of gamification in a university-level online course. In that study, the researchers discovered that badges neither increased nor decreased students' motivation and activity during the course and did not influence grades or quiz results. However, some other research yielded different results and suggested a more promising potential to use the online courses' reward system. Başıbüyük et al. (2016) studied an in-class course for adult educators and found that gamification has not only substantially influenced student engagement, but also positively contributed to academic performance. In a more recent study, Saran et al. (2018) found that gamification elements, such as points, level-ups, badges and leaderboards, have a significant positive impact on college students' motivation and their learning output.

The mixed results about rewards suggest that instructional designers should focus on using gamification strategies to support the learning objectives and enhancing learners' learning experience, rather than simply using rewards to push learners to achieve a targeted performance goal.

Gamification elements, such as goals, levels, progress, challenges, quests, choices and leaderboards, are all associated with the self-determination theory (SDT). SDT suggests that, in an educational setting, students should feel like they are in control of their learning (autonomy), gain competence when achieving a learning goal (competence) and be connected with and respected by others (relatedness) (Deci & Ryan, 1991). In their study, Mekler et al. (2017) found that the competition toward the gamified quiz activities employed outside of the class made the students feel more competent as they had more opportunities to take ownership of their learning.

Qualitative data analysis in this study revealed that online participants have a strong desire for competence, autonomy and social relatedness. As such, gamification design that can improve participants' feelings in these aspects is positively received, while game elements that hinder their learning experience were not welcomed. For example, research participants appraised the immediate visual feedback when they completed a task. They believed the acknowledgement provided them with a feeling of competence. On the other hand, participants also expressed their regrets about the lack of social interaction in their self-paced online courses as it obstructed their need for social relatedness.

This study's findings also revealed the tension between the desire for social relatedness and the limited or lack of a teacher's role in the self-paced online courses. However, findings also suggested that social relatedness does not necessarily require complex gamified social activities within the gamification system. Integration of existing social media platforms or traditional offline communication tools can also provide participants with a sense of social relatedness. This view is also shared by Anderson et al. (2015) as, in their case study, the researchers utilised external social media software in a self-paced online course and received positive feedback from the students. They then argued that modest amounts of social interactivity could be added at relatively low cost to self-paced courses.

When designing the self-paced online courses, gamification designers and developers should be realistic about the available teaching resources. If the teaching resources are limited or absent, the gamification design should avoid social elements that require extensive engagement from the tutors. Thus, student-centred social elements that are low cost and require minimum teacher involvement should be considered.

5.2.2 Andragogical Considerations

The second area of consideration when creating a gamification solution for adult learners is andragogy. Andragogy refers to a set of learning principles that believe adults and children learn differently (Knowles, 1989) and that adult education professionals should develop modules that foster adult learning. Knowles and Swanson (2014) listed six core principles of andragogy: the learner's need to know,

self-concept, prior experience, readiness to learn, orientation to learning and motivation to learn.

The above andragogical principles are essential considerations when designing a gamification system for adult learners. They ensure the gamification solution fits with the adult learners' characteristics and that they are effective when applied to adult learning situations. For example, one of the andragogical principles is the self-concept. Adults have a self-concept of being responsible for their own decisions and have the deep psychological need to be seen by others and treated by others as capable of self-directing. During the interview, many participants' comments reflected their agreement with this andragogical principle. Participants praised the gamification elements that offered them opportunities to make decisions that have a real impact on their learning, including game-style activities and role-play.

Observations in this research also revealed the tension between gamification and certain beliefs among some adult learners: games are for kids, games are for leisure, professional courses should be serious, gamification reduces the professionalism of the course. Some participants in this project believed the use of games and game strategies could be a good idea for children, but that it may not be appropriate when used in professional development courses.

The association of game and gamification with children is a common phenomenon in the literature. When conducting the literature review, most empirical research on gamification implantation was about children, adolescents or young adults in colleges or universities. As such, the exploration of using games or game-based learning in adult education is uncommon. Although games are more often associated with younger students, they can also be effective for adult learners. For instance, Somers and Holt (1993) suggested that games can offer an effective adult teaching strategy that produces various learning outcomes, but care should be given when selecting the game design. They emphasised, "The bottom line is that a game must support your instructional objectives" (Tobias, 1990, p.40). Findings from both qualitative and quantitative data in this study supported Somers and Holt's argument. A majority of the learners in this study are open to gamification in adult training, as long as the gamification strategies are perceived to be effective for the learning outcomes.

When designing online courses for adult learners, gamification designers should put the learning outcomes or objectives at the centre of the design, selecting game elements and strategies that can support the learning goals. For example, if the learning goal is to provide practical strategies on a topic, storytelling and role-play would be ideal to give the learner a contextual understanding of the subject. On the other hand, if the outcome is factual, gamified quizzes and rewards could be suitable options.

It is worth noting that many game elements in gamification are already aligned with traditional educational strategies. For instance, gamification's points and reward system shares the same principle as the grade and marks system in the traditional classroom, and storytelling and role-play is similar to the traditional case study and problem-solving activities. Gamification of online courses only enhances the existing teaching strategies by adding some positive emotions, better experiences and more fun. Many participants in this research commented that they did not notice the gamification elements while studying the course. For them, the gamification design is part of their holistic course experience. As McGonigal explained in her book Reality Is Broken (2011), "We can no longer afford to view games as separate from our real lives, and our real work… Games don't distract us from our real lives. They fill our real life."

5.2.3 Technical Considerations

The third discipline at the foundational level of the gamification strategy framework is technology. The rapid advances in technology, both in the field of education and the gaming industry, create great opportunities for gamification designers and developers to create instructions with innovative delivery methods. Technical considerations in gamification design reside at both the course content and structural levels. At the content level, technological improvement can be utilised through multimedia, animations, graphics, programming and course authoring. In the researched online courses, game elements such as challenges, quests, Easter eggs, role-play, storytelling, choice and content unlocking are all applied at the course content level. At the system level, technological improvement can be achieved through the use of LMS, programming, and gamification applications. In the researched online courses, game

elements such as points, badges, progress and avatars are applied at the structural level.

In gamification for adult learners, accessibility is an essential technical consideration. In this research, about 9.30% of the participants are 56 years and older. Ageing related challenges, such as vision, hearing and mobility, all have an impact on learner experience when interacting with the game elements. Although no participant in this research self-identified as an individual with a disability, participants in this research have commented on how the accessibility features such as subtitles and larger font size have improved their learning experience.

Another technology-related consideration is mobile compatibility. Although the researched courses are not specifically designed for mobile learning, many participants mentioned that they used mobile devices to access the courses. Data analytics revealed that about 71% of the participants accessed the courses using desktops or laptops, 22% of them used smartphones and 7% of them used tablets. As the mobile device user base continues to grow (Taylor & Silver, 2019), designing gamification solutions compatible with various devices becomes an increasingly relevant consideration. It is necessary to point out that accessing eLearning courses on a mobile device is not the same as mobile learning or mLearning. The differences between the two deployment paths are so significant that they require entirely different instructional, graphic and user experience designs (Feser, 2014). As such, it must be made clear that this current research only focuses on developing online courses that are compatible with mobile devices.

When designing mobile compatible gamification solutions, gamification designers need to consider the differences between various devices and adjust the design and strategies accordingly. For example, with the absence of a mouse, the action of a "mouseover" or hovering the pointer over an object using a mouse becomes impossible on a touchscreen mobile device. When designing a game activity, instead of using the "hover to reveal" action, "click/tap to reveal" would be more appropriate. Also, to fit the course layout into small-sized screens, responsive design techniques (W3Schools, n.d.) should be considered. To enable learners' access to course content on the go, we should allow the learners to download the courseware to be played offline. The use of mobile devices also offers some additional advantage for

gamification. For instance, the online courses can work along with other mobile apps on the smartphone, generating an enhanced communication and social connection opportunity for the learners.

There is another essential technical consideration that is often missed by academic researchers. Technology is usually associated with a cost and could be expensive to adopt. When designing the gamification solution, project managers need to be realistic about the project's scope, being mindful of time, resources and budget restrictions. Some gamification solutions may require the purchase of software, scripts or cloud-based software as a service (SaaS), while other customisd solutions may require high in-house or outsourced development costs. Although some free or open-source gamification solutions are available, they still require personnel with adequate technical skills and resources to be set up. The resource needs for different gamification solutions may vary considerably. For example, the PBL (points, badges and levels) system can be quickly applied if the LMS has such a function built-in. On the other hand, a game-based multi-branching role-play design may require a much larger development effort and longer development time.

The ongoing maintenance and upgrade is another consideration when selecting technology in gamification. Technology evolves quickly, and old technology needs to be updated or replaced; otherwise, online courses will encounter compatibility, security or even playability issues. For example, the Flash was popular in eLearning only a few years ago. It was especially popular when designing multimedia-rich, interactive or game-based online courses. However, Adobe, the developer of the Flash Player, officially ended its support of the player on December 31, 2020 (Adobe Inc., 2021). Online courses built with Flash technology would need to be redeveloped using an alternative technology, such as HTML5. When starting a gamification project, the game designers and developers need to be aware of the technology trends, avoiding using systems and software on the path of sunsetting.

5.2.4 Instructional Design Considerations

The middle layer of the gamification strategy framework consists of three practical and often intricately linked disciplines: instructional design, user experience design and game design. As introduced in the literature review, the instructional design

"Incorporates known and verified learning strategies into instructional experiences which make the acquisition of knowledge and skill more efficient, effective and appealing" (Merrill et al., 1996).

The instructional design process is intricately linked with the gamification design process when creating a gamified online course. As detailed in Chapter 3, a few instructional design models are often used as roadmaps in creating online training, such as the ADDIE model and the SAM model. ADDIE stands for the five phases of Analysis, Design, Development, Implementation and Evaluation, and it is a traditional waterfall course development approach with the five instructional design processes in sequential order (Carliner, 2015). The SAM model, short for the Successive Approximation Model, is an alternative instructional design model that takes an agile approach to creating online courses. It uses an iterative approach to refine the product while it is being produced (Allen & Sites, 2012). Although not gamification specific, these instructional design models can also be used as guidelines for gamification related projects with an additional layer of consideration. For example, designers need to ensure the gamification design is compliant with the eLearning standards if points are used in a gamified assessment within a SCORM (Shareable Content Object Reference Model) package. The game results then need to be passed back to the LMS correctly.

Findings in this study indicate that the participants' views about game elements are mostly similar between various demographic backgrounds. This finding is consistent with previous studies such as one conducted by Cheosupportsal (2014) that surveyed 51 undergraduate IT students and found no statistically significant preferences for particular game elements and between different learner groups. Similarly, Chapman and Rich (2018) found that being a member of any measured demographic (e.g., gender, age, student status) was not a barrier to finding gamification motivating. This lack of discernible differences between demographic groups suggests that designers can create a single implementation that, in theory, is effective for most learners, instead of creating tailored learning paths for various demographic groups, which would likely result in a much more complex set up and higher development costs.

Another instructional design-related consideration when designing a gamification solution is learner privacy. This is crucial if the course topic is sensitive or if the

training outcome is associated with learners' job performance or professional growth. For example, the leaderboards are known for promoting competition among learners by publicly displaying the top achievers' records. This could become a privacy concern if the learners do not want their names or points publicly displayed. Although leaderboards were not implemented in the researched courses, in a study conducted by Ding et al. (2017), the researchers discovered that the leaderboards raised some unpleasant competitions among peers and privacy related complaints since it was associated with students' final grades.

5.2.5 User Experience Design Considerations

The user experience (UX) design is another discipline associated with the practical considerations of gamification design. The UX design is a user-centred design approach when designing digital products that require some human interaction (Allanwood & Beare, 2019). It focuses on the users' experiences in particular situations and aims to provide a good experience for the intended users.

The UX design is user-centric. It uses knowledge about the users, their motivations, expectations and experiences, to create an interactive design that fits the users' needs. This research indicates that many participants are intrinsically motivated to learn so that they can better support individuals with autism. For them, game elements that promote primarily extrinsic motivation, such as badges and points, would not be very effective. Another finding from this research showed that participants in different age groups perceived the progress game element differently. Younger participants rated higher on the progress element than their older classmates. To improve the user experience, if a course is designed for young audiences, the use of visual progress should be emphasised.

The UX design is also experience focused as it requires designers to be aware of the learners' contextual situation and life experience (Allanwood & Beare, 2019). When designing a gamified online course, the designer needs to learn more about the learners' attitudes and expectations and fit the design accordingly. In this study, most participants accessed the courses in their spare time, in the evening or on the weekend. When designing gamified online courses for busy adults, the course content needs to be divided into smaller sections and the system needs to provide frequent celebrations

of progress by offering positive acknowledgement and rewards. In this research, many participants commented on the positive feeling of the visual progress bar. Their progress is reflected in the progress bar immediately after they completed a task, providing them with a sense of accomplishment.

5.2.6 Game Design Considerations

Game design is another discipline listed in the practical layer of the gamification strategy framework. Game design is a multidisciplinary approach, including the design of gameplay, creation of the storyline and characters and planning of the rules and mechanics of the game (Fullerton, 2019). Gamification is essentially the application of game design in non-game contexts (Deterding, Khaled et al., 2011). Games are popular because they encourage problem-solving, keep the player's interests at the optimum level, break down big quests into smaller manageable steps, promote teamwork, offer players a sense of control, reward exploration and reduce the fear of failure with chances of replay. Game thinking, game elements and game strategies are the building blocks of game design, and they form the foundation of gamification in online courses.

When designing gamified online courses, the game design strategies need to be in line with the training objectives. For example, many of the research participants praised the use of badges, rewards and game activities and believed they lightened the course's seriousness and made the learning more fun. However, not all rewards are fun and not all fun is rewarding. When a badge is awarded for completing a simple task, it takes away the enjoyment of winning and makes the badge meaningless. Similarly, if a game activity primarily focuses on fun rather than learning, it misses its educational purpose and the fun is not rewarding anymore.

Another game thinking concept that can be borrowed from game design is game balance. Schell (2014) demonstrated the art of game balance through the simple rock, paper and scissors game. She explained that every game element has both strengths and weaknesses. To balance the elements for fairness, we need to make sure that, if there is one element that has an advantage over something else, another element has an advantage over that. This balanced design can be observed in the researched courses. For example, all the researched courses are self-paced online courses with

limited social elements. The courses provide the learner with a high level of flexibility and autonomy to balance the weakness of the absence of social interaction. Participants in this study seem to value this flexibility and accept the design limitation in social interaction.

The balance of the game design also concerns the non-engaged learners. As Charnock (2019) explained, not everyone plays or is playful in the same way. When designing gamified online courses, designers should make sure there is something for everyone and strike a balance between being gameful and becoming an annoyance for non-engagers (Whitton & Moseley, 2019). It is evident through this research that not all participants appreciate the gamification approach. Balancing the game design with traditional course delivery methods is another important consideration when designing and developing an online course.

5.3 Answering Research Question 5

The development of the Gamification Strategy Framework in this section provides answers to the final research question, RQ5: What are the considerations when designing and implementing gamification in self-paced online courses for adult audiences?

The gamification design in adult-focused self-paced online courses is a multidisciplinary approach. It requires designers and developers to utilise knowledge from many different but related fields. The understanding of psychological and andragogical theories and the knowledge about available technologies provide them with a solid theoretical foundation on which a gamification solution is built. The integration of instructional design, user experience design and game design empowered the designers and developers with practical techniques and strategies that can be utilised in the gamification design process.

In reality, it would be unusual to have one individual with the eye of a designer, the skills of a computer programmer, the wisdom of a philosopher and the knowledge of an education scholar. Creating gamified self-paced online courses is likely to demand teamwork. It requires the collaboration of a team with various skills in subject matter, education, design, technology and project management by in-house staff, through outsourcing or working with external vendors. Thus, an understanding of gamification

design and its considerations by all team members could be beneficial when collaborating on a gamification project.

5.4 My Pragmatic Worldview and the Gamification Strategy Framework

The Gamification Strategy Framework is shaped by my pragmatic worldview that has been guiding this research project. As introduced in Chapter 3, pragmatism focuses on the consequences of research rather than the methods. It draws on many ideas, including employing "what works", using diverse approaches and valuing both objective and subjective knowledge (Creswell & Clark, 2017).

My pragmatism has guided this study to focus on the practical strategies of gamification design. Although rooted in the psychological and andragogical theories, the Gamification Strategy Framework is not a theoretical framework, but a practical one focusing on the design principles and strategies from instructional design, user experience design and game design.

My worldview is reflected in the three-level pyramid-shape of the framework. The fundamental level considerations are placed at the bottom of the diagram. They are the foundational knowledge drawn from the psychology, andragogy and technology disciplines. The middle of the diagram is the practical layer that links the foundational knowledge with practical knowledge. The pyramid-shaped diagram indicates a vast amount of knowledge at the foundational level as compared to gamification design at the top of the pyramid. However, the theoretical knowledge needs to be linked through and translated into practical level design principles and strategies to be effectively applied in gamification design.

Furthermore, my pragmatism has guided my knowledge acquisition process. It helped me identify gamification design strategies from both existing literature and through quantitative and qualitative data analysis. The existing knowledge mentioned in the literature review formed the preliminary answers to the research questions. Through the quantitative and qualitative data analysis, answers to the research questions were tested and refined. Through this process, new knowledge about the gamification design and implementation was constructed. Finally, the Gamification Strategy Framework is the outcome of this pragmatistic knowledge acquisition process.

5.5 Significance of the Study

This research strives to complement the existing research and enrich the knowledge about the gamification design in self-paced online courses for adult learners. The findings of this research provided a pragmatic view about the dynamics of gamification design and implementations. When considering the results of this study, the significance appears to be in three main areas:

1. This study's results have added to the existing knowledge about the effectiveness of gamification implementation in education, especially in self-paced online courses.
2. This study's results have added to the existing knowledge regarding adult learners' perspectives about gamification implementation.
3. This research extended the existing knowledge about gamification design by developing the Gamification Strategy Framework in self-paced online training for adult learners.

Such findings might be beneficial to online education stakeholders such as instructional designers, eLearning developers, subject matter experts (SMEs), LMS administrators, school or organisation management teams, educators and researchers.

5.5.1 Contribution to Gamification Implementation Literature

Gamification in education is gaining much attention in recent years with a growing number of empirical studies about gamification with a wide range of implementation focuses, such as knowledge acquisition, perceptual, engagement, motivational and social focuses (Dichev & Dicheva, 2017). However, few studies have focused on the gamification implementation's perceptual outcomes (Cheong et al., 2014; Christy & Fox, 2014; Codish & Ravid, 2014; Davis & Klein, 2015; Kocadere & Çağlar, 2018; Pedro et al., 2015). Of these studies, there are even fewer studies focusing on the perceptual differences among different game elements and between various demographic learner groups (Cheong et al., 2014; Kocadere & Çağlar, 2018).

This study further breaks down the perceptual outcome comparison into a matrix of categories by comparing the learners' perspective differences on each game element among various demographic groups and between different course types. Hence, it is

reasonable to suggest that this study provides an original contribution to the existing literature with a matrix of perceptual comparisons about gamification in the context of self-paced online training for adult learners.

5.5.2 Contribution to Self-Paced Adult Online Learning Literature

This study provided a unique empirical example of implementing gamification in self-paced online courses for adult learners. Existing knowledge about gamification in education has been primarily confined within the formal education setting, focusing on children, adolescents or young adults with teachers' facilitation (Nacke & Deterding, 2017). This is the first study focusing on gamification implementation in self-paced online courses in the adult professional development context where there is no tutor's role. While a few empirical studies focus on gamification solution for older learners (Charlier et al., 2012; Popescu et al., 2012; Telner et al., 2010), they are related to the context of formal post-secondary education or face-to-face workshops in the community, and not self-paced online learning.

The self-paced format places some restraints on the gamification design. This study examined the adaptation of gamification design with the absence of course teachers and the limited social interaction among peers.

This study was also carried out through the andragogical lens as adult learners have unique learning needs and preferences that are different to those of children and young adults in schools, universities and colleges. Data analysis in this study identified some tensions and disagreements between several popular gamification strategies and the adult learners' preferences. The results of this study solidify the notion that adult learners learn differently from children. When designing a gamification solution for adult audiences, the designers should place the andragogical considerations at the centre of the design process and not simply copy examples from formal education settings.

5.5.3 Contribution to Gamification Design

While analysing and interpreting the data in this study, I developed an original Gamification Strategy Framework. It illustrated the relationship of multiple disciplines

involved in the gamification design process including psychology, andragogy, technology, instructional design, user experience design and game design.

In previous literature, the empirical study's focus was primarily on students' engagement, performance, participation or retention (Dichev & Dicheva, 2017), from the viewpoint of educators and researchers in universities or K-12 schools. However, this study is from the perspective of an instructional designer and developer whose design consideration not only regards the educational outcomes, but also the instructional techniques, available technology and the associated project management.

Mora et al. (2017) conducted a systematic review of the design framework used in gamification studies. They identified 40 different design frameworks and approaches. Between them there are 24 user-centred, seven game-centred and nine technology-centred approaches. However, there is no integrated framework that focus on implementation strategies that brings various disciplines together. This study attempts to close this research gap and extend our knowledge about the gamification frameworks with a multi-discipline gamification strategy framework that focuses on the self-paced online course design for adult learners.

5.6 Limitations of the Study

As discussed in the section 5.5, this study contributed in multiple ways to gamification design knowledge. Despite this contribution, there were a few limitations to the study.

The first limitation deals with the sampling design in both quantitative and qualitative research. Although the sampling strategy used in this research was considered acceptable, as detailed in the methodology chapter (Chapter 3), it also exhibits some limitations. The survey invitation was sent to course participants who had completed at least 50% of the course content. It excluded the learners who dropped out of the course shortly after enrolment. Even though these leaners may not have fully experienced gamification design, their opinions would still have been valuable, especially if the dropping off factors were related to the gamification design. Also, the survey respondent rate in this study was 27.0%. Although this is considered acceptable for a non-incentive email survey, a higher response rate would be better to reduce the sampling error and provide a more accurate understanding of the population.

A second limitation of this study is uneven distribution of sample size and variance. Participants enrolled in this study are primarily women, age 31-55, who live in Canada, work in the education system, are enrolled in online certificate courses and are sponsored by their workplace. Further data analysis also indicates unevenly distributed population variances in groups. Although the unequal distribution of group size also exists in the research population and this was not likely to be a sampling error, it affects the statistical power (Rusticus & Lovato, 2014) and limits the selection of appropriate statistical tests. In this study, all statistical tests carried out were nonparametric tests, which are generally considered to be less powerful than parametric tests (Lehmann & D'Abrera, 1975). This uneven distribution of sample size and variance also challenges the generalisation of the findings applying to other demographic populations.

This research is also contextual, situated in the context of the researched online courses. The game elements were selected based on each course's unique needs, and not all studied game elements are implemented in all courses. As a result, conclusions from this study are closely associated with the researched course context and need to be justified when being applied to different course settings.

While this study was not without limitations, these limitations were carefully considered, discussed and justified throughout the thesis. Hence, they did not negatively impact the value of the study. Furthermore, the limitations identified in this study could serve as areas for further research.

5.7 Recommendations for Future Research

This study's findings provided valuable insights into the gamification design and implementation considerations in self-paced online courses for adult learners. There are several possible directions for future research emerging from this research.

In terms of methodology, the research was conducted after the participants completed their course. It captured the participants' perception of gamification at a particular moment. It would be noteworthy to conduct an ethnography study about the participants' perspective throughout their learning journey, particularly whether and how their perceptions changed and progressed through the course.

In regards to the research focus, this study focused on the design and implementation of gamification. The goal of this study was to gain an understanding of the learner perception and provide insights and recommendations for the gamification designers and developers. Course learners, gamification designers and developers are the stakeholders of this project. As mentioned in the earlier section, creating a gamified self-paced online course is a team effort, requiring collaboration from various stakeholders. Research on other stakeholders' perspectives, such as project manager, school/organisation management and SMEs could help acquire a broader understanding of an online course gamification design and implementation.

One of the limitations identified for the research is the exclusion of participants who dropped out early from the courses. As existing literature states, learners tend to drop off an online course if it is open and free, with no penalty associated with drop out (Staubitz et al., 2017). However, it would be interesting to explore the role gamification has played in the non-finishers' departure and whether gamification has increased or reduced the course drop out rate.

Another area of interest that emerged from the research is gamification in mobile learning. Although this study did not focus on mobile learning, statistics from the course data indicated that about 29% of the participants studied their courses through mobile devices, including smartphones and tablets. Interview participants also commented on their experiences of accessing courses using mobile devices. Thus, mLearning could be an ideal solution for adult education as people often carry mobile devices with them and mobile learning could be better integrated with adult learners' busy daily schedule. Furthermore, mobile devices brought additional technology that could enhance the gamified learning experiences, such as advanced mobile gesture support, location-based information, built-in camera and seamless integration with social media apps (Wilden, 2017). Gamification design for mobile learning, especially in the self-paced adult education context, could be another area of interest.

A final area for future research that emerged from this work is studying gamification design for an ageing population. In this study, about 9.3% of the survey participants are 56 years old or older. There are also four interviewees in this age category. Although senior participants only consist of a small percentage of the research population, the findings have identified some unique views about gamification from

this age group. Senior participants tend to rate the game elements lower, are often intrinsically motivated, and are more likely to benefit from the accessibility features or be frustrated with the lack of such features. An investigation into gamification design for seniors in the self-paced online course context would be a valuable addition to existing knowledge.

5.8 Summary

This study aimed to examine the results of gamification implementation in several self-paced online courses for adult learners and to understand the effectiveness of various game elements and gamification design strategies as well as the participants' perception about them. Through this study, a practical gamification strategy framework was developed. It illustrates the various levels of considerations for instructional designers and developers when creating gamified self-paced online courses for adult learners.

This research was conducted utilising a convergent mixed methods research design, with 741 survey participants from seven different courses and 36 interview participants with various backgrounds. In this study, participants' quantitative course records, their quantitative survey responses and the quantitative interview and survey comments were mapped together. The analysis of the three sets of data provided a comprehensive understanding of the participants' course experiences.

It became apparent that the gamification design of the online courses has positively impacted the learners' course experiences. The participants' perceptions about the game elements do not seem to vary among most demographic groups. However, there were a few occasions where significant differences were identified. Data analysis also indicated that the participants' perceptions about the game elements did not correlate with their course engagement and performance data, albeit with a few exceptions.

Furthermore, this mixed methods research has revealed some valuable insights about gamification following adult learners' perceptions. Adult learners have a strong desire for competence, autonomy and social relatedness. They are motivated to learn and have problem-centred goals when taking the course. They have a busy life outside of their online courses and prefer the course design to fit their busy schedules. Adult learners want to be treated with respect, applauding a gamification design that offers

the feeling of achievement and competence, but frowning at childlike game designs. Adult learners also enjoy the fun and convenience technology brings to their gamified learning experiences, but expressed their frustration when technical glitches occur. Accessibility related considerations are also relevant to adult learners, especially senior learners. This study also revealed valuable insights at the practical level, including insights about instructional design, user experience design and game design.

A gamification strategy framework was developed based on the findings of this study. This framework demonstrated the interconnected, multilayer relationship among the various disciplines related to gamification design. I hope that findings from this research and the gamification strategy framework can provide instructional designers and developers with some insights and highlight some considerations when designing and implementing gamification in self-paced online courses for adult learners.

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7 Appendices

Appendix A: List of the Key Search Terms

Criteria A:	Title, subject, keyword or abstract contains the keyword of "gamification" or "gamify" or "gamif*"
Criteria B:	Title, subject, keyword or abstract contains the keywords "education" or "learn*" or "teach*" or "student*" or "course*" or "train*" or "instruct*"
Criteria C:	Title, subject, keyword or abstract contains the keywords of "online" or "online" or "internet*" or "web*" or "web-based" or "e-learning" or "elearning" or "cyber*" or "distance" or "courseware" or "remote" or "virtual*"
Criteria D:	Title, subject, keyword or abstract contains the keywords of "adult" or "continu*" or "profession*" or "vocation*" or "community" or "career" or "work" or "employ*" or "staff" or "further education" or "lifelong"
Criteria E:	Title, subject, keyword or abstract contains the keywords of "self-directed" or "self directed" or "self*paced" or "learner*paced" or "learner*led" or "self*managed" or "student*paced" or "student*led" or "instructor*less" or "web*based instruction"
Criteria F:	Title, subject, keyword or abstract contains the keywords of "Design" or "element*" or "dynamic*"

Appendix B: Survey Questions

The following survey, which comprised the quantitative section of the research, was administered online via SurveyMonkey.com. The print version reproduced here consists of the same content with a slightly different design.

Cover Page:

Dear participants,

Thank you for taking the time to fill out this survey. This survey is NOT a course evaluation, it mainly focuses on the **design** aspect of the course, especially your experiences with the **game-like** strategies and elements found in your online course. Please be honest and critical. Your feedback will help us to improve the course design in the future.

Below is some information about this survey. Please take the time to read the following information carefully. Feel free to ask me for any clarifications you may need or if you would like more information.

Who is conducting the research?

This is a PhD thesis research study being conducted by Lin Zhang, who is a full-time web administrator at Geneva Centre for Autism, and a part-time PhD student with the Centre for Technology Enhanced Learning in the Department of Educational Research at Lancaster University, UK. This research study has been approved by Geneva Centre for Autism and Lancaster University.

What is the purpose of the survey?

This survey focusses on your **experience using game-like elements (gamification)** during your study in the online courses offered by the Geneva Centre for Autism. We would like to know if these game elements have made any positive impacts on your

course engagement and output and/or have helped with your overall course experience.

Why have I been invited?

You have been invited because you have participated in one or more of the online courses offered through the Geneva Centre for Autism in the past two years.

Do I need to participate?

No, your participation is entirely voluntary.

How do I withdraw?

You can withdraw until up to **two weeks** after the survey is completed. There is absolutely no obligation for you to continue or penalty to be imposed upon withdrawing. Should you decide to withdraw, your related data will be destroyed, and all references removed.

How can I take part in the research?

You can take part in this research through participation in this online survey and by providing consent to access your course record. You can further participate in this research through a follow-up interview.

What will happen to the data?

In this research study, data refers to the researcher's notes, survey results, online course records, audio recordings, and any email exchanges you may have had with the researcher. The data will be securely stored for a minimum of 10 years after the successful completion of the PhD viva (an oral examination) as per Lancaster University requirements, and after such time any personal data will be destroyed.

You have the right to request that your data be destroyed until up to **two weeks** after the survey is completed. You also have full protection via the UK Data Protection Act. The completion of this study is estimated to be March 2019, although data collection will be completed by March 2017. The data may be used in the reporting of the research in the thesis, and then potentially in any related papers or conference presentations.

How will my identity be protected?

A pseudonym will be granted to protect your identity in the research report, and any identifying information about you will be removed from the report.

Contact Information

If you have any questions, please contact Lin Zhang at lzhang@autism.net or call (416) 322-7877 ext. 258.

Who to contact for further information or with any concerns?

If you would like further information about this project or the program within which the research is being conducted, or if you have any concerns about the project, participation, or conduct of the researcher, please contact:
Professor Paul Ashwin – Head of Department
Tel: +44 (0)1524 594443
Email: P.Ashwin@Lancaster.ac.uk
Room: County South, D32, Lancaster University, Lancaster, LA1 4YD, UK.

Consent

I give my consent to take part in the research study and understand that I can withdraw from the research study within **2 weeks** without penalty.

- ○ AGREE to participate in this survey (lead to the survey questions)
- ○ I DO NOT AGREE to participate in this survey (exit the survey)

Please tell us who you are

Your personal information will help us access your course information at the eLearning website. Your privacy and confidentiality is highly respected. Please check the previous page for methods we have put in place to protect your privacy and confidentiality.

First Name: _____ Last Name: _____

Email address associated with your eLearning account: _____

Please indicate your gender:

- ○ Male
- ○ Female
- ○ Other
- ○ Prefer not to say

What age category are you in?

- ○ 20 & under
- ○ 21–30
- ○ 31–40
- ○ 41–55
- ○ 56–65
- ○ 66 and over
- ○ Prefer not to say

Please select one of the choices that best describe how you feel about each statement.

My overall experience with the online course was positive.

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly agree

I found the way the content was presented engaging.

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly agree

I found the design of the course, e.g., graphics and sounds, appealing.

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly agree

(Conditional branch for courses with activities and games)

I found the game-like interactive activities included in the course useful in improving my understanding of the course content.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

(Conditional branch for courses with activities and games)

I found the game-like interactive activities included in the course engaging me in the course.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

(Conditional branch for courses with badges)

I found the badge(s) offered kept me motivated in completing tasks in the course.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree
- I did not know there were badges.

I did more than the course's passing requirements in order to earn the badge.

- Yes
- No
- I did not know there were badges.

(Conditional branch for courses with a checklist)

I used the progress checklist frequently to monitor my progress in the course.

- Strongly disagree
- Disagree
- Neutral

- Agree
- Strongly agree
- I did not know there was a checklist.

The progress checklist motivated me to complete the course.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree
- I did not know there was a checklist.

(Conditional branch for courses with role-selection)

I found having a choice of different roles (parents, service providers and educators) was a good way to keep me engaged in the course.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

I selected other roles rather than the one I belonged to.

- Yes
- No
- I cannot remember

(Conditional branch for courses with a reward system)

I found the reward system (points, coins and levels) motivated me to complete the course.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree
- I did not know there were rewards.

I did more than the course's passing requirements in order to collect more rewards.

- ○ Yes
- ○ No
- ○ I did not know there were rewards.

What improvements would you recommend for our future online courses?

Would you like to be contacted for a short (15 minutes) follow-up phone or face-to-face interview?

- ○ Yes
- ○ No

What is the best available phone number to reach you?

Thank you for taking the time to participate in our survey. I truly value the information you have provided. Your responses are vital in helping us improve the quality of our online courses. Findings from the research will be made available to all survey participants.

Appendix C: Cronbach's Alpha Test on Survey Questions

Question branch 1: Cronbach's alpha= .805

Case Processing Summary

		N	%
Cases	Valid	501	100.0
	Excluded[a]	0	.0
	Total	501	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.805	.819	7

Question branch 2: Cronbach's alpha= .867

Case Processing Summary

		N	%
Cases	Valid	114	100.0
	Excluded[a]	0	.0
	Total	114	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.867	.871	8

Question branch 3: Cronbach's alpha= .828

Case Processing Summary

		N	%
Cases	Valid	89	100.0
	Excluded[a]	0	.0
	Total	89	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.828	.830	5

Question branch 4: Cronbach's alpha= .959

Case Processing Summary

		N	%
Cases	Valid	37	100.0
	Excluded[a]	0	.0
	Total	37	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.959	.960	9

Appendix D: Detailed Results of the Shapiro-Wilk Normality Tests

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Badge	.217	652	.000	.907	652	.000
Avatar	.225	37	.000	.880	37	.001
Quest	.264	37	.000	.825	37	.000
Reward	.376	151	.000	.730	151	.000
Storytelling	.345	89	.000	.793	89	.000
Progress	.237	652	.000	.857	652	.000
Role Play	.295	89	.000	.772	89	.000
Multimedia Design	.333	741	.000	.782	741	.000
Game Design	.289	652	.000	.823	652	.000
Instructional Design	.304	741	.000	.772	741	.000

a. Lilliefors Significance Correction

Appendix E: Levene's Test of Homogeneity of Variance

Levene's Test by Course

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Badge	Based on Mean	1.672	5	646	.139
	Based on Median	1.342	5	646	.245
	Based on Median and with adjusted df	1.342	5	638.133	.245
	Based on trimmed mean	1.807	5	646	.109
Avatar	Based on Mean	.[a]			
Quest	Based on Mean	.[a]			
Reward	Based on Mean	28.013	1	149	.000
	Based on Median	18.508	1	149	.000
	Based on Median and with adjusted df	18.508	1	119.835	.000
	Based on trimmed mean	26.520	1	149	.000
Storytelling	Based on Mean	.[a]			
Progress	Based on Mean	1.687	5	646	.135
	Based on Median	.961	5	646	.441
	Based on Median and with adjusted df	.961	5	623.408	.441
	Based on trimmed mean	1.245	5	646	.287
Role Play	Based on Mean	.[a]			
Multimedia Design	Based on Mean	5.991	6	734	.000
	Based on Median	4.365	6	734	.000
	Based on Median and with adjusted df	4.365	6	661.732	.000
	Based on trimmed mean	4.373	6	734	.000
Gameful Design	Based on Mean	1.194	5	646	.311
	Based on Median	.715	5	646	.612
	Based on Median and with adjusted df	.715	5	614.371	.612
	Based on trimmed mean	.478	5	646	.793
Instructional Design	Based on Mean	1.515	6	734	.170
	Based on Median	1.171	6	734	.320
	Based on Median and with adjusted df	1.171	6	672.258	.320
	Based on trimmed mean	1.303	6	734	.253

a. Levene's Test of Equality of Error Variances is not computed because there are less than two nonempty groups.

Levene's Test by Course Type

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Badge	Based on Mean	.447	1	650	.504
	Based on Median	1.147	1	650	.285
	Based on Median and with adjusted df	1.147	1	649.435	.285
	Based on trimmed mean	.378	1	650	.539
Avatar	Based on Mean	.[a]			
Quest	Based on Mean	.[a]			
Reward	Based on Mean	.[a]			
Storytelling	Based on Mean	.[a]			
Progress	Based on Mean	7.320	1	650	.007
	Based on Median	3.528	1	650	.061
	Based on Median and with adjusted df	3.528	1	636.223	.061
	Based on trimmed mean	7.009	1	650	.008
Role Play	Based on Mean	.[a]			
Multimedia Design	Based on Mean	5.681	1	739	.017
	Based on Median	3.637	1	739	.057
	Based on Median and with adjusted df	3.637	1	738.531	.057
	Based on trimmed mean	1.091	1	739	.297
Gameful Design	Based on Mean	.504	1	650	.478
	Based on Median	.672	1	650	.413
	Based on Median and with adjusted df	.672	1	646.979	.413
	Based on trimmed mean	2.703	1	650	.101
Instructional Design	Based on Mean	5.116	1	739	.024
	Based on Median	3.489	1	739	.062
	Based on Median and with adjusted df	3.489	1	725.247	.062
	Based on trimmed mean	6.264	1	739	.013

a. Levene's Test of Equality of Error Variances is not computed because there are less than two nonempty groups.

Levene's Test by Funding Source

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Badge	Based on Mean	.805	2	649	.448
	Based on Median	1.343	2	649	.262
	Based on Median and with adjusted df	1.343	2	648.225	.262
	Based on trimmed mean	.798	2	649	.451
Avatar	Based on Mean	.[a]			
Quest	Based on Mean	.[a]			
Reward	Based on Mean	.[a]			
Storytelling	Based on Mean	.[a]			
Progress	Based on Mean	5.479	2	649	.004
	Based on Median	2.827	2	649	.060
	Based on Median and with adjusted df	2.827	2	633.864	.060
	Based on trimmed mean	4.839	2	649	.008
Role Play	Based on Mean	.[a]			
Multimedia Design	Based on Mean	3.348	2	738	.036
	Based on Median	2.049	2	738	.130
	Based on Median and with adjusted df	2.049	2	737.344	.130
	Based on trimmed mean	1.385	2	738	.251
Gameful Design	Based on Mean	.139	2	649	.870
	Based on Median	.409	2	649	.664
	Based on Median and with adjusted df	.409	2	642.292	.664
	Based on trimmed mean	1.273	2	649	.281
Instructional Design	Based on Mean	4.952	2	738	.007
	Based on Median	3.867	2	738	.021
	Based on Median and with adjusted df	3.867	2	721.445	.021
	Based on trimmed mean	5.260	2	738	.005

a. Levene's Test of Equality of Error Variances is not computed because there are less than two nonempty groups.

Levene's Test by Gender

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Badge	Based on Mean	.082	1	640	.775
	Based on Median	.242	1	640	.623
	Based on Median and with adjusted df	.242	1	639.930	.623
	Based on trimmed mean	.064	1	640	.800
Avatar	Based on Mean	.083	1	29	.776
	Based on Median	.040	1	29	.843
	Based on Median and with adjusted df	.040	1	28.760	.843
	Based on trimmed mean	.071	1	29	.792
Quest	Based on Mean	.423	1	29	.520
	Based on Median	.023	1	29	.880
	Based on Median and with adjusted df	.023	1	26.723	.880
	Based on trimmed mean	.297	1	29	.590
Reward	Based on Mean	.114	1	143	.736
	Based on Median	.416	1	143	.520
	Based on Median and with adjusted df	.416	1	141.714	.520
	Based on trimmed mean	.264	1	143	.608
Storytelling	Based on Mean	.663	1	86	.418
	Based on Median	.324	1	86	.571
	Based on Median and with adjusted df	.324	1	84.925	.571
	Based on trimmed mean	.707	1	86	.403
Progress	Based on Mean	2.402	1	640	.122
	Based on Median	1.111	1	640	.292
	Based on Median and with adjusted df	1.111	1	636.355	.292
	Based on trimmed mean	1.144	1	640	.285
Role Play	Based on Mean	.044	1	86	.834
	Based on Median	.083	1	86	.774
	Based on Median and with adjusted df	.083	1	85.440	.774
	Based on trimmed mean	.097	1	86	.756
Multimedia Design	Based on Mean	3.290	1	728	.070
	Based on Median	1.986	1	728	.159
	Based on Median and with adjusted df	1.986	1	725.309	.159
	Based on trimmed mean	2.002	1	728	.158
Gameful Design	Based on Mean	.087	1	640	.768
	Based on Median	.122	1	640	.727
	Based on Median and with adjusted df	.122	1	635.812	.727
	Based on trimmed mean	.315	1	640	.575
Instructional Design	Based on Mean	.120	1	728	.730
	Based on Median	.023	1	728	.878
	Based on Median and with adjusted df	.023	1	727.481	.878
	Based on trimmed mean	.086	1	728	.769

Levene's Test by Job Profile

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Badge	Based on Mean	.587	2	649	.556
	Based on Median	.703	2	649	.496
	Based on Median and with adjusted df	.703	2	648.530	.496
	Based on trimmed mean	.572	2	649	.564
Avatar	Based on Mean	.652	2	34	.527
	Based on Median	.879	2	34	.424
	Based on Median and with adjusted df	.879	2	33.836	.424
	Based on trimmed mean	.943	2	34	.399
Quest	Based on Mean	2.253	2	34	.121
	Based on Median	2.287	2	34	.117
	Based on Median and with adjusted df	2.287	2	29.665	.119
	Based on trimmed mean	2.106	2	34	.137
Reward	Based on Mean	9.237	2	148	.000
	Based on Median	8.496	2	148	.000
	Based on Median and with adjusted df	8.496	2	124.596	.000
	Based on trimmed mean	9.242	2	148	.000
Storytelling	Based on Mean	1.400	2	86	.252
	Based on Median	1.338	2	86	.268
	Based on Median and with adjusted df	1.338	2	83.436	.268
	Based on trimmed mean	1.424	2	86	.246
Progress	Based on Mean	1.493	2	649	.226
	Based on Median	1.455	2	649	.234
	Based on Median and with adjusted df	1.455	2	645.948	.234
	Based on trimmed mean	1.749	2	649	.175
Role Play	Based on Mean	.871	2	86	.422
	Based on Median	.229	2	86	.796
	Based on Median and with adjusted df	.229	2	84.254	.796
	Based on trimmed mean	.963	2	86	.386
Multimedia Design	Based on Mean	.826	2	738	.438
	Based on Median	.957	2	738	.385
	Based on Median and with adjusted df	.957	2	729.396	.385
	Based on trimmed mean	1.802	2	738	.166
Gameful Design	Based on Mean	3.418	2	649	.033
	Based on Median	3.624	2	649	.027
	Based on Median and with adjusted df	3.624	2	590.335	.027
	Based on trimmed mean	2.325	2	649	.099
Instructional Design	Based on Mean	5.919	2	738	.003
	Based on Median	5.114	2	738	.006
	Based on Median and with adjusted df	5.114	2	726.626	.006
	Based on trimmed mean	6.135	2	738	.002

Levene's Test by Country

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Badge	Based on Mean	.008	1	650	.929
	Based on Median	.014	1	650	.905
	Based on Median and with adjusted df	.014	1	649.859	.905
	Based on trimmed mean	.000	1	650	.998
Avatar	Based on Mean	.036	1	35	.850
	Based on Median	.080	1	35	.778
	Based on Median and with adjusted df	.080	1	34.777	.778
	Based on trimmed mean	.043	1	35	.838
Quest	Based on Mean	.571	1	35	.455
	Based on Median	.204	1	35	.655
	Based on Median and with adjusted df	.204	1	32.505	.655
	Based on trimmed mean	.490	1	35	.488
Reward	Based on Mean	1.672	1	149	.198
	Based on Median	2.198	1	149	.140
	Based on Median and with adjusted df	2.198	1	148.059	.140
	Based on trimmed mean	1.925	1	149	.167
Storytelling	Based on Mean	.073	1	87	.788
	Based on Median	.017	1	87	.898
	Based on Median and with adjusted df	.017	1	85.733	.898
	Based on trimmed mean	.004	1	87	.952
Progress	Based on Mean	.611	1	650	.435
	Based on Median	.184	1	650	.668
	Based on Median and with adjusted df	.184	1	648.095	.668
	Based on trimmed mean	.714	1	650	.399
Role Play	Based on Mean	1.552	1	87	.216
	Based on Median	2.294	1	87	.134
	Based on Median and with adjusted df	2.294	1	84.695	.134
	Based on trimmed mean	2.337	1	87	.130
Multimedia Design	Based on Mean	.453	1	739	.501
	Based on Median	.264	1	739	.607
	Based on Median and with adjusted df	.264	1	737.635	.607
	Based on trimmed mean	.461	1	739	.497
Gameful Design	Based on Mean	1.061	1	650	.303
	Based on Median	1.972	1	650	.161
	Based on Median and with adjusted df	1.972	1	647.713	.161
	Based on trimmed mean	.630	1	650	.427
Instructional Design	Based on Mean	.297	1	739	.586
	Based on Median	.663	1	739	.416
	Based on Median and with adjusted df	.663	1	738.905	.416
	Based on trimmed mean	.288	1	739	.592

Levene's Test by Age

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Badge	Based on Mean	1.443	3	635	.229
	Based on Median	.687	3	635	.560
	Based on Median and with adjusted df	.687	3	632.318	.560
	Based on trimmed mean	1.547	3	635	.201
Avatar	Based on Mean	.084	3	28	.968
	Based on Median	.227	3	28	.877
	Based on Median and with adjusted df	.227	3	26.191	.877
	Based on trimmed mean	.099	3	28	.960
Quest	Based on Mean	.948	3	28	.431
	Based on Median	.745	3	28	.534
	Based on Median and with adjusted df	.745	3	22.877	.536
	Based on trimmed mean	.849	3	28	.479
Reward	Based on Mean	.416	3	137	.742
	Based on Median	.254	3	137	.858
	Based on Median and with adjusted df	.254	3	127.061	.858
	Based on trimmed mean	.205	3	137	.892
Storytelling	Based on Mean	2.460	3	85	.068
	Based on Median	1.108	3	85	.350
	Based on Median and with adjusted df	1.108	3	78.774	.351
	Based on trimmed mean	1.926	3	85	.131
Progress	Based on Mean	.747	3	635	.524
	Based on Median	.379	3	635	.768
	Based on Median and with adjusted df	.379	3	629.604	.768
	Based on trimmed mean	.313	3	635	.816
Role Play	Based on Mean	.663	3	85	.577
	Based on Median	.648	3	85	.587
	Based on Median and with adjusted df	.648	3	80.890	.587
	Based on trimmed mean	.839	3	85	.476
Multimedia Design	Based on Mean	.821	3	724	.482
	Based on Median	.690	3	724	.559
	Based on Median and with adjusted df	.690	3	706.506	.559
	Based on trimmed mean	.404	3	724	.750
Gameful Design	Based on Mean	.756	3	635	.519
	Based on Median	.585	3	635	.625
	Based on Median and with adjusted df	.585	3	632.215	.625
	Based on trimmed mean	.254	3	635	.859
Instructional Design	Based on Mean	.819	3	724	.483
	Based on Median	.552	3	724	.647
	Based on Median and with adjusted df	.552	3	719.524	.647
	Based on trimmed mean	1.460	3	724	.224

Levene's test by Course Completion Status

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Badge	Based on Mean	2.930	1	637	.087
	Based on Median	1.993	1	637	.159
	Based on Median and with adjusted df	1.993	1	636.467	.159
	Based on trimmed mean	3.261	1	637	.071
Avatar	Based on Mean	.182	1	34	.672
	Based on Median	.093	1	34	.762
	Based on Median and with adjusted df	.093	1	32.927	.762
	Based on trimmed mean	.192	1	34	.664
Quest	Based on Mean	.905	1	34	.348
	Based on Median	.302	1	34	.586
	Based on Median and with adjusted df	.302	1	33.044	.586
	Based on trimmed mean	.802	1	34	.377
Reward	Based on Mean	.341	1	141	.560
	Based on Median	.070	1	141	.792
	Based on Median and with adjusted df	.070	1	139.365	.792
	Based on trimmed mean	.187	1	141	.666
Storytelling	Based on Mean	5.087	1	84	.027
	Based on Median	1.708	1	84	.195
	Based on Median and with adjusted df	1.708	1	81.148	.195
	Based on trimmed mean	4.236	1	84	.043
Progress	Based on Mean	1.966	1	637	.161
	Based on Median	1.879	1	637	.171
	Based on Median and with adjusted df	1.879	1	636.800	.171
	Based on trimmed mean	2.434	1	637	.119
Role Play	Based on Mean	1.417	1	84	.237
	Based on Median	1.225	1	84	.272
	Based on Median and with adjusted df	1.225	1	82.652	.272
	Based on trimmed mean	1.781	1	84	.186
Multimedia Design	Based on Mean	2.919	1	723	.088
	Based on Median	3.162	1	723	.076
	Based on Median and with adjusted df	3.162	1	714.969	.076
	Based on trimmed mean	2.198	1	723	.139
Gameful Design	Based on Mean	.160	1	637	.690
	Based on Median	.000	1	637	.999
	Based on Median and with adjusted df	.000	1	635.396	.999
	Based on trimmed mean	.071	1	637	.790
Instructional Design	Based on Mean	.990	1	723	.320
	Based on Median	.702	1	723	.402
	Based on Median and with adjusted df	.702	1	721.803	.402
	Based on trimmed mean	1.187	1	723	.276

Levene's Test by Course Logs

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Badge	Based on Mean	3.561	3	628	.014
	Based on Median	2.142	3	628	.094
	Based on Median and with adjusted df	2.142	3	624.234	.094
	Based on trimmed mean	3.740	3	628	.011
Avatar	Based on Mean	1.014	3	30	.400
	Based on Median	.377	3	30	.771
	Based on Median and with adjusted df	.377	3	22.480	.771
	Based on trimmed mean	1.000	3	30	.406
Quest	Based on Mean	1.202	3	30	.326
	Based on Median	.945	3	30	.431
	Based on Median and with adjusted df	.945	3	25.697	.433
	Based on trimmed mean	1.102	3	30	.364
Reward	Based on Mean	1.388	3	133	.249
	Based on Median	.336	3	133	.799
	Based on Median and with adjusted df	.336	3	110.545	.799
	Based on trimmed mean	.714	3	133	.545
Storytelling	Based on Mean	5.517	3	79	.002
	Based on Median	3.164	3	79	.029
	Based on Median and with adjusted df	3.164	3	62.423	.031
	Based on trimmed mean	5.608	3	79	.002
Progress	Based on Mean	1.018	3	628	.384
	Based on Median	.314	3	628	.815
	Based on Median and with adjusted df	.314	3	624.326	.815
	Based on trimmed mean	.752	3	628	.522
Role Play	Based on Mean	1.045	3	79	.377
	Based on Median	.980	3	79	.407
	Based on Median and with adjusted df	.980	3	69.442	.407
	Based on trimmed mean	1.331	3	79	.270
Multimedia Design	Based on Mean	1.566	3	711	.196
	Based on Median	1.381	3	711	.247
	Based on Median and with adjusted df	1.381	3	689.450	.247
	Based on trimmed mean	1.133	3	711	.335
Gameful Design	Based on Mean	3.610	3	628	.013
	Based on Median	3.006	3	628	.030
	Based on Median and with adjusted df	3.006	3	596.566	.030
	Based on trimmed mean	2.910	3	628	.034
Instructional Design	Based on Mean	3.889	3	711	.009
	Based on Median	3.666	3	711	.012
	Based on Median and with adjusted df	3.666	3	676.066	.012
	Based on trimmed mean	5.324	3	711	.001

Appendix F: Detailed Kruskal-Wallis H Test Results

Kruskal-Wallis H test by Age

Test Statistics[a,b]

	Badge	Avatar	Quest	Reward	Storytelling	Progress	Role Play	Multimedia Design	Gameful Design	Instructional Design
Kruskal-Wallis H	4.795	.359	.608	1.964	8.749	16.517	.657	1.481	6.089	4.493
df	3	3	3	3	3	3	3	3	3	3
Asymp. Sig.	.187	.949	.895	.580	.033	.001	.883	.687	.107	.213

a. Kruskal Wallis Test

b. Grouping Variable: Age

Kruskal-Wallis H test by Gender

Test Statistics[a,b]

	Badge	Avatar	Quest	Reward	Storytelling	Progress	Role Play	Multimedia Design	Game Design	Instructional Design
Kruskal-Wallis H	2.863	.638	.558	9.214	.190	.800	.010	.184	.640	.391
df	1	1	1	1	1	1	1	1	1	1
Asymp. Sig.	.091	.424	.455	.002	.663	.371	.920	.668	.424	.532

a. Kruskal Wallis Test

b. Grouping Variable: Gender

Kruskal-Wallis H test by Course Type

Test Statistics[a,b]

	Badge	Progress	Multimedia Design	Game Design	Instructional Design
Kruskal-Wallis H	4.385	11.686	4.859	3.828	5.127
df	1	1	1	1	1
Asymp. Sig.	.036	.001	.027	.050	.024

a. Kruskal Wallis Test

b. Grouping Variable: Course Type

Kruskal-Wallis H test by Funding Source

Test Statistics[a,b]

	Badge	Progress	Multimedia Design	Game Design	Instructional Design
Kruskal-Wallis H	4.822	11.842	7.502	17.561	8.109
df	2	2	2	2	2
Asymp. Sig.	.090	.003	.023	.000	.017

a. Kruskal Wallis Test

b. Grouping Variable: Funding Source

Kruskal-Wallis H test by Job Profile

Test Statistics[a,b]

	Badge	Avatar	Quest	Reward	Storytelling	Progress	Role Play	Multimedia Design	Gameful Design	Instructiona l Design
Kruskal-Wallis H	1.026	3.815	.263	1.042	.018	.278	2.965	3.536	11.196	3.041
df	1	1	1	1	1	1	1	1	1	1
Asymp. Sig.	.311	.051	.608	.307	.895	.598	.085	.060	.001	.081

a. Kruskal Wallis Test

b. Grouping Variable: Job Profile

Kruskal-Wallis H test by Location

Test Statistics[a,b]

	Badge	Avatar	Quest	Reward	Storytelling	Progress	Role Play	Multimedia Design	Game Design	Instructiona l Design
Kruskal-Wallis H	.279	3.205	4.054	.001	.216	1.130	.015	.316	1.286	.354
df	1	1	1	1	1	1	1	1	1	1
Asymp. Sig.	.597	.073	.044	.976	.642	.288	.904	.574	.257	.552

a. Kruskal Wallis Test

b. Grouping Variable: Country

Kruskal-Wallis H test by Course Completion Status

Test Statistics[a,b]

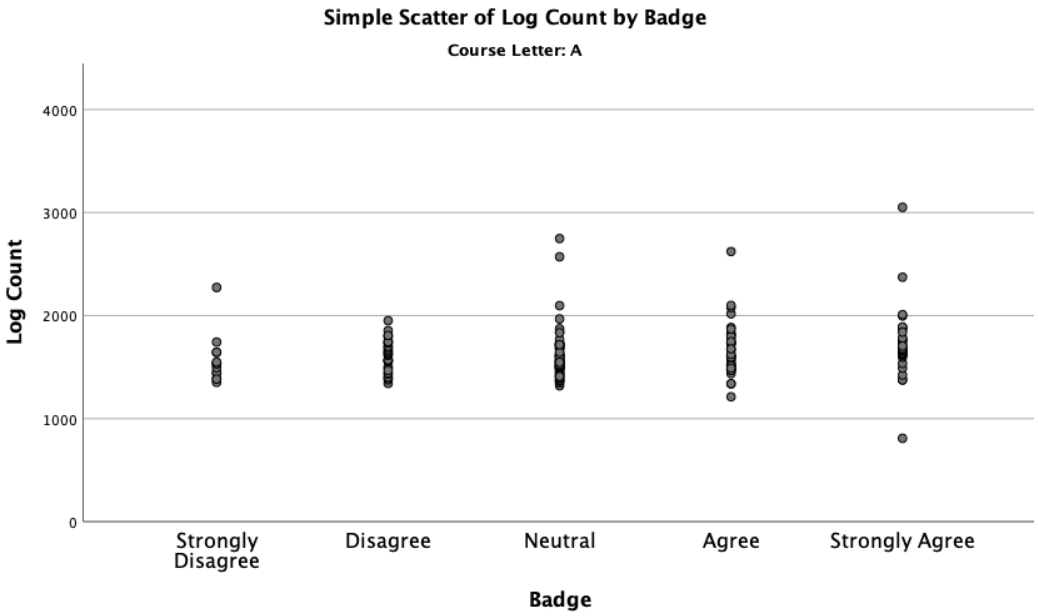
	Badge	Avatar	Quest	Reward	Storytelling	Progress	Role Play	Multimedia Design	Gameful Design	Instructional Design
Kruskal-Wallis H	.412	.471	.525	.089	.881	7.281	.318	.174	2.455	.358
df	1	1	1	1	1	1	1	1	1	1
Asymp. Sig.	.521	.493	.469	.765	.348	.007	.573	.676	.117	.550

a. Kruskal Wallis Test

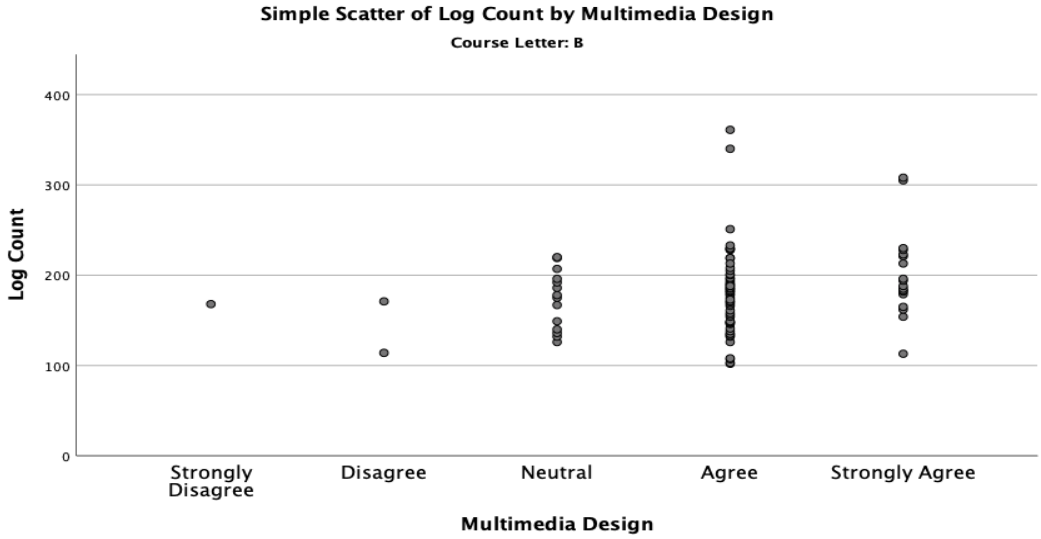
b. Grouping Variable: Course Completion Status

Appendix G: Scatterplot of the Log Count and Game Elements

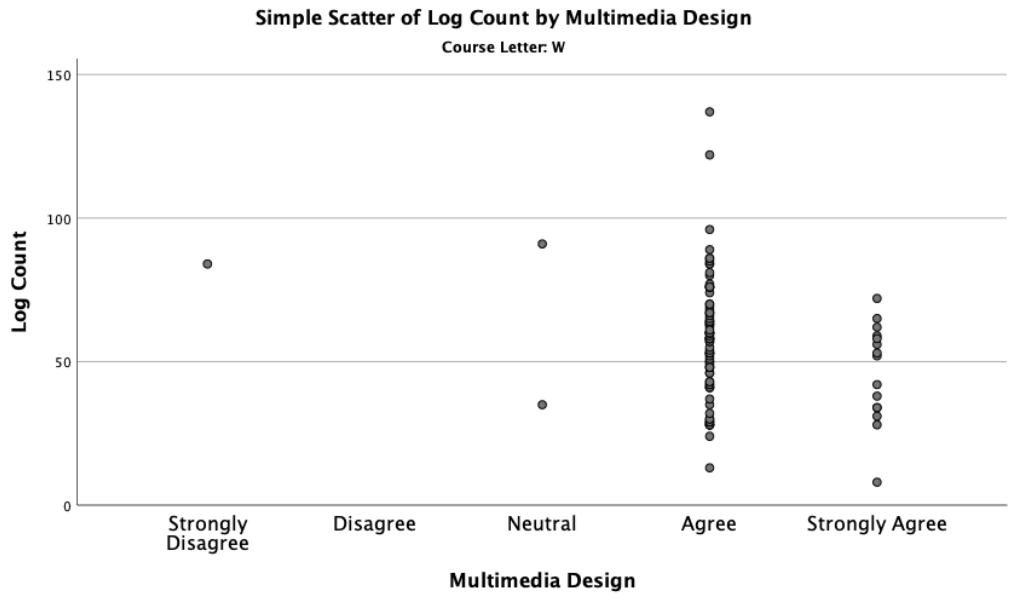
Scatterplot of the Log Count and Badge in Course A



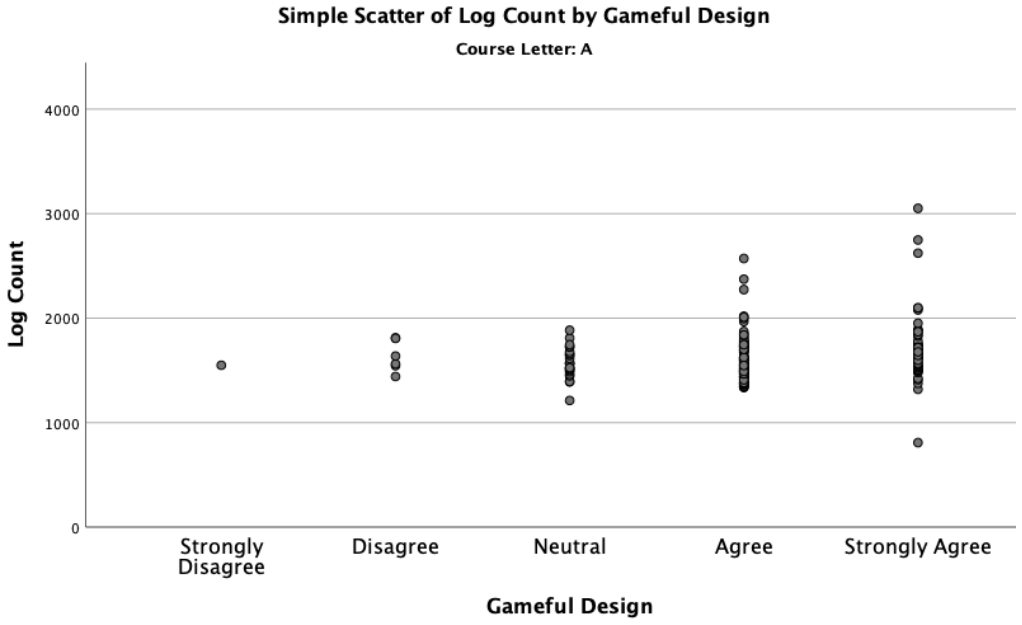
Scatterplot of the Log Count and Multimedia Design in Course B



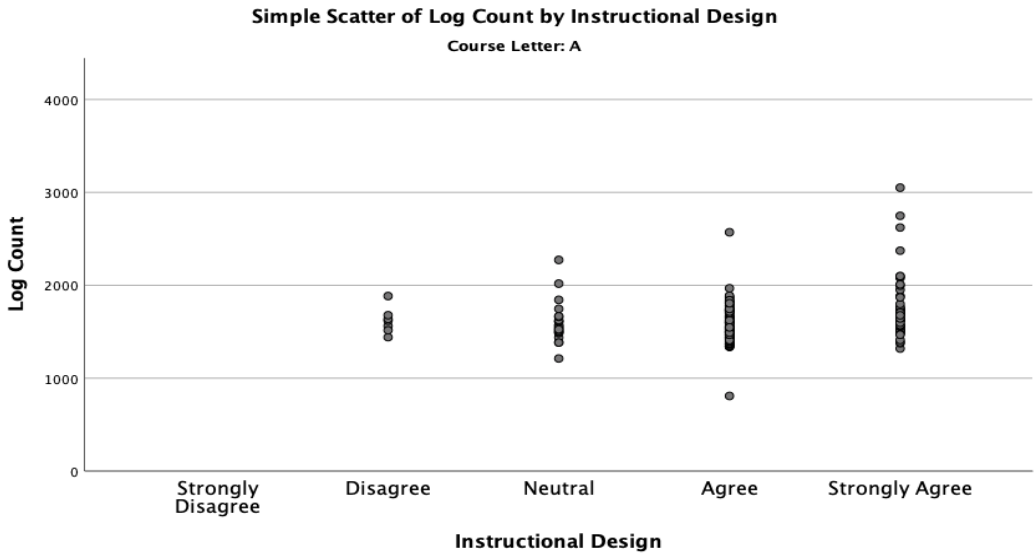
Scatterplot of the Log Count and Multimedia Design in Course W



Scatterplot of the Log Count and Gameful Design in Course A



Scatterplot of the Log Count and Instructional Design in Course A



Appendix H: Course Completion Rate by Course

Course Letter	Uncompleted	Completed	Completion Rate (Research Participants)	Completion Rate (All enrolled students)
A	1	186	99%	74%
C	5	124	96%	79%
B	0	92	100%	83%
W	18	89	83%	54%
S	0	88	100%	94%
O	10	76	88%	60%
R	4	32	89%	32%
Total	**38**	**687**	**95%**	**62%**