Lappeenranta-Lahti University of Technology LUT

LUT School of Engineering Science

Industrial Engineering and Management

Master's Program in Global Management of Innovation and Technology

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# Co-designing campus teaching: exploring the role of gamification in education and gamified course

Master's Thesis

Date: 29.04.2022

Supervisor: Assistant Professor Annika Wolff

# ABSTRACT

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## Co-designing campus teaching: exploring the role of gamification in education and gamified course

Master's Thesis

April 2022

100 Pages, 46 Figures, 18 Tables and 02 Appendixes

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**Abstract**

The Covid-19 pandemic has caused a variety of consequences for education systems around the world. To tackle this challenge, educators around the globe are trying to adopt different strategies for ensuring optimum knowledge gain of the learners through the online/blended courses. Different research studies illustrate that students learn most from a course via active engagement. Gamification as an active engagement tool has caught the interest of educators, who have been investigating how to improve students' learning over the years. It is getting popular as a main strategic aspect of pedagogical approaches that can be used to boost students' motivation and active engagement in education, especially in online learning. However, the users' perception of adopting as well as designing gamified courses needs to be addressed. In this master's thesis work, teachers' and students' perspectives toward gamified teaching have been studied by using co-design and survey methods.

**Keywords**: Gamification, Game elements, Gamified course, Co-design, Living Lab

## Acknowledgment

There have been various factors that influenced the hard work of this research. I would like to express my deep gratitude to my supervisors Annika Wolff and Md Tanvir Hasan who has always been a great source of motivation, inspiration, and knowledge since the beginning of my research. I would like to pay my special regard to the professors, classmates, staff, and others who selflessly joined the interview, survey, and co-design sessions which helped me to gather meaningful information for the research.

I would like to express my heartfelt gratitude to my parents and my younger brother for their unending support and blessings. As a part of an extended family, selfless love and support from my late grandparents, uncles, aunties, and cousins, is still inspiring me to be a better person every day. I want to express my heartfelt appreciation to my husband for his unconditional support. Finally, I want to express my gratitude to the faculty members, my friends at LUT, or outside for making me enjoy campus life even in this pandemic situation.

*Tamara Tasnim Ahmed*

*Lappeenranta 29.04.2022*

# Table of Contents

1 Introduction ..... 10
1.1 Goals and Objectives ..... 11
1.2 Research Question ..... 12
1.3 Structure of the Thesis ..... 12
2 Methodology and Research Design ..... 13
2.1 Systematic Literature Review ..... 13
2.1.1 Search string ..... 13
2.1.2 Data source ..... 14
2.1.3 Inclusion and Exclusion Criteria ..... 15
2.1.4 Study selection ..... 15
2.1.5 Data extraction ..... 16
2.1.6 Data synthesis ..... 17
3 Results of SLR ..... 18
3.1 Gamification in Education ..... 19
3.2 Game elements ..... 20
3.3 Gamification as Enjoyable Learning ..... 22
3.4 Gamification in Student Engagement ..... 23
3.5 Gamification in Adult Learning ..... 23
3.6 Living lab approach in Gamification ..... 24
3.7 Co-design Approach in Gamification ..... 25
3.8 Background on Living Lab and Co-design Methodologies ..... 26
4 Results and Analysis of Co-design ..... 30
4.1 Expert Interview ..... 30
4.1.1 Participants ..... 30
4.1.2 Procedure ..... 31
4.1.3 Data analysis ..... 31
4.1.4 Findings ..... 36
4.2 Survey ..... 37
4.2.1 Participants ..... 37
4.2.2 Procedure ..... 38
4.2.3 Data Analysis ..... 38

4.2.3 Findings ..... 57
4.3 Co-design Workshop ..... 59
4.3.1 Participants ..... 59
4.3.2 Procedure ..... 60
4.3.3 Data Analysis ..... 67
4.3.4 Findings ..... 79
5 Discussion and conclusion ..... 88
5.1 Answering Research Question 1 ..... 88
5.2 Answering Research Question 2 ..... 90
5.3 Limitations and Future Work ..... 91
5.4 Conclusion ..... 92
Reference ..... 93
Appendix 1: Interview Questions ..... 97
Appendix 2: Survey Questions ..... 98

## List of Figures

Figure 1: Dale's cone of Experience, figure adapted from (Davis and Summers, 2015)..... 10
Figure 2: Process of selecting papers, figure adapted from (Hasan, 2020) ..... 16
Figure 3: Gamification framework: surface elements, underlying dynamics, and game effects, figure adapted from (Langendahl, Per-Anders Cook and Mark-Herbert, 2016) ..... 21
Figure 4: Gamification between play and games, whole and parts, figure adapted from (Tondello, 2016) ..... 22
Figure 5: Causal path model of the theory of gamified learning, figure adapted from (Landers, 2014) ..... 24
Figure 6: Phases of the design process over a timeline; the first dot symbolizes the identification of the design opportunity, and the second dot symbolizes the completed "product", figure adapted from (Sanders and Stappers, 2014) ..... 28
Figure 7: Flowchart of research design..... 29
Figure 8: Design phase used in research..... 30
Figure 9: Participant's key role inside the university ..... 38
Figure 10: Participant's basic knowledge about gamification..... 39
Figure 11: Participants' any types of experience in gamification practices ..... 39
Figure 12: Survey participants' experiences of using gamified APPs or performing online courses, training, and others..... 40
Figure 13: Survey participant's different answers on if gamification can provide an enjoyable learning experience during the pandemic ..... 41
Figure 14: Survey participants' answers on if gamification can increase active participation..... 42
Figure 15: Survey participants' answers on whether the university should use gamification to increase the active engagement of the students ..... 42
Figure 16: Survey participants' answers on if students can be encouraged with a gamification system to collaborate online..... 43
Figure 17: Survey participants answer on if gamification can make study more enjoyable so that students will concentrate more on coursework than before..... 43
Figure 18: Survey participants answer on if gamification can improve communication efficiency when working with others..... 44
Figure 19: Survey participants answer on does gamified courses have a positive influence on students' intrinsic motivation..... 44
Figure 20: Survey participants' answers on gamification have a positive effect on students' overall performance ..... 45
Figure 21: survey participants' answers on if gamification facilitates a better understanding of course materials ..... 45
Figure 22: Survey participants' answers on if they see any potential problems with gamification ..... 46
Figure 23: Survey participants' answers on if there are any barriers when implementing gamification in a course..... 49
Figure 24: Some photos of co-design workshop..... 59
Figure 25: All four group members during co-design workshop activities..... 60

Figure 26: Gamification in the education market, figure adapted and edited from (Statista, Education Gamification Market Value Worldwide, 2016; Marketsandmarkets, Gamification Education Market, 2020) ..... 61
Figure 27: Gamification example in education, figure adapted from (Kvartalnyi, 2022) ..... 61
Figure 28: Efficacy in Duolingo, figure adapted and edited from (Duolingo, Efficacy, no date) 62
Figure 29: Nine areas used in activity 2 ..... 64
Figure 30: Few game elements (templates) used in activity 2 ..... 65
Figure 31: Word cloud in Mentimeter made by participants during the co-design workshop ..... 66
Figure 32: Group A's activity 2 during the co-design workshop ..... 67
Figure 33: Group B's activity 2 during the co-design workshop ..... 69
Figure 34: Group C's activity 2 during the co-design workshop ..... 71
Figure 35: Group D's activity 2 during the co-design workshop ..... 73
Figure 36: Group A's activity 3 during the co-design workshop ..... 75
Figure 37: Group B's activity 3 during co-design workshop ..... 76
Figure 38: Group C's activity 3 during the co-design workshop ..... 77
Figure 39: Group D's activity 3 during co-design workshop ..... 78
Figure 40: Chart bar shows game elements used in different areas ..... 81
Figure 41: Pie chart shows the percentage of game elements used in activity 2 ..... 82
Figure 42: Mockup of Moodle login page and course summary page ..... 83
Figure 43: Mockup of the course "Research Methods" ..... 84
Figure 44: Mockup of the course "LUT introduction course" ..... 85
Figure 45: Mockup of the course "Mathematics" ..... 86
Figure 46: Mockup of the course "Introduction to Waste Management" ..... 87

## List of Tables

Table 1: Different areas for the search strings ..... 14
Table 2: Initial results from the databases ..... 14
Table 3: Gamification related descriptions ..... 18
Table 4: Game elements (Langendahl, Per-Anders Cook and Mark-Herbert, 2016 ..... 21
Table 5: Living lab approach in Gamification ..... 24
Table 6: Co-design approach in gamification ..... 26
Table 7: Thematic analysis of the expert feedbacks from the interviews ..... 31
Table 8: Explanations of potential problems in Gamification ..... 46
Table 9: Explanations of barriers in Gamification ..... 49
Table 10: Responses from the open feedback section in the survey ..... 50
Table 11: Explanation of the participant's feedback about the survey and gamification ..... 51
Table 12: Thematic analysis of all feedback from the survey ..... 53
Table 13: Group A's feedback in activity 2 ..... 67
Table 14: Group B's feedback in activity 2 ..... 69
Table 15: Group C's feedback in activity 2 ..... 71
Table 16: Group D's feedback in activity 2 ..... 73
Table 17: Points of all groups regarding activity 2 ..... 80
Table 18: Explaining the areas depending on the highest to lowest points they gain from activity 2 ..... 81

## List of Abbreviations

**APP** Application

**CAGR** Compounded Annual Growth Rate

**CEFR** Common European Framework of Reference

**ENoLL** The European Network of Living Labs

**HCL** Human-Computer Interaction

**KPI** Key Performance Indicators

**LMS** Learning Management System

**RM** Research Methods

**SLR** Systematic Literature Review

**STEM** Science, Technology, Engineering, and Mathematics

**TA** Thematic Analysis

# 1 Introduction

There has never been a pandemic like COVID-19, which has affected more than 1.6 billion students in 190 countries and on all seven continents. (*UNSDG, Policy-brief-education-during-covid-19-and-beyond*, 2020) Universities were impacted by this situation because some countries shuttered facilities, pressuring instruction to shift to an online mode almost immediately. The pandemic's abrupt changes have had a significant impact on students at all levels of education. To overcome the academic lag caused by the pandemic, educators must create the best educational environments possible for meaningful learning. Virtual teaching modalities, which were urgently implemented during such situations, necessarily require strategies to encourage students to actively participate in higher education. (Rincon-Flores and Santos-Guevara, 2021) While technology provides students with increased access to information and encourages the development and sharing of knowledge, educators must endeavor to increase students' motivation and active engagement. Considerable effort has been expended on developing novel teaching methodologies that increase students' commitment and motivation while maximizing their information acquisition. (Nieto-Escamez and Roldán-Tapia, 2021)

The Cone of Experience, introduced by Edgar Dale, is a diagram that illustrates the evolution of experiences from the most concrete (at the cone's bottom) to the most conceptual (at the cone's top). The diagram illustrated in **figure 1** is intended to teach readers about how much information people recall based on how they encounter it. (Davis and Summers, 2015)

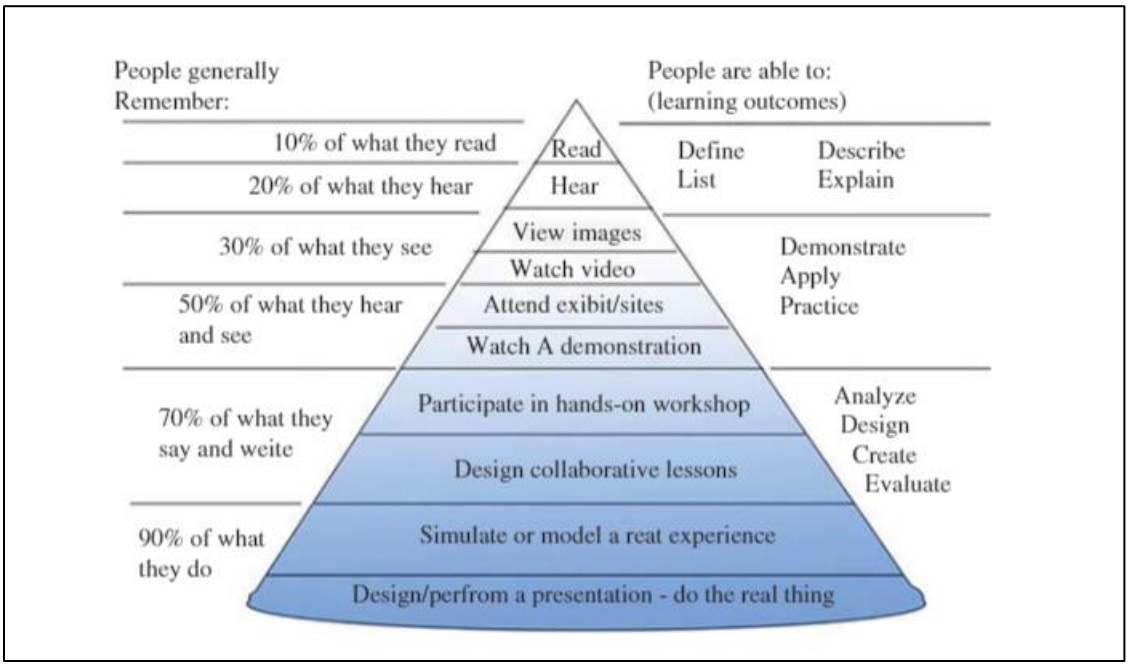



*Figure 1: Dale's cone of Experience, figure adapted from* (Davis and Summers, 2015)

The cone shows, people generally remember only 10% and 20% of what they read and hear. But surprisingly, people can remember 70% of what they write and say, for example, participating in a hands-on workshop and designing some collaborative lessons. Also, people can remember 90% of what they do, for example, modeling or simulating a real-life experience. Also performing or designing a presentation.

Gamification aims to engage learners in an interactive environment, resulting in increased memorization. It is commonly used in education to promote desired behaviors and to increase engagement and motivation. It has previously been utilized in the classroom to assist educators in expanding their repertoire of teaching strategies to motivate students. (Putz and Treiblmaier, 2019) In theory, any activity, not just educational ones, can be gamified. Indeed, anything from fitness applications to LinkedIn profile pages can and has been gamified to promote user engagement and involvement (Khaleel *et al.*, 2015). Additionally, more than 80% of learners feel they would be more productive if their university/institution or place of employment were more game-like. Leaderboards and increased rivalry among students would encourage over 60% of learners. 89% of respondents indicated that they would be more engaged with an e-learning program if it had a point system. (Apostolopoulos, 2019)

Before we look more deeply, it is necessary to understand digital games, serious games, and game-based learning, all of which are connected to gamification in a certain way. Digital games are played on digital devices and include a wide range of games played on gaming consoles, mobile phones, tablets, the internet, and even arcades (Alvarez and Damien, 2011). Serious games are a type of digital game in which the concealed or serious purposes are well combined within the digital application, with fun, entertainment, and enjoyment serving as strategies to achieve the real purposes of the application, such as education, training, or basic knowledge in a specific area. Game-based learning is distinct from gamification in that it provides fully-fledged games, whereas gamification integrates game elements into non-game environments without integrating fully-fledged games into exercises. (Al Fatta, Maksom and Zakaria, 2018)

There is already a lot of research into gamification or gamified learning merging with e-learning, micro learning, flipped learning and so on. On the other hand, co-design is an excellent method for creating designs with mixed teams that include both students and professors. It is convenient to obtain research requirements, increase student engagement as well as learning by combining gamification with a co-design approach. (Dodero *et al.*, 2014) We are primarily integrating gamification and co-design workshop activities in this research study to better understand the role of gamification and game elements on student engagement and collaboration. Additionally, this session provided us with significant ideas for developing new gamified courses for students during co-design session. The concept for co-design came after conducting expert interviews and conducting a survey to evaluate the potential of gamification in education.

## 1.1 Goals and Objectives

The goal of this study is to is to see how gamification affects student motivation, engagement, and collaboration when taking a course or conducting a regular task. In summary, the goal is to understand how the process of using co-design approach to gamification may result in better suited solutions to both teachers and students.

The objective of this study is to organize a co-design workshop on the university campus (living lab) in which participants may build their own gamified course and provide feedback on how their course design could be more effective in terms of student engagement.

## 1.2 Research Question

Using co-design and living lab approach, this project intends to provide an engaging and collaborative gamified learning solution for university students. By the end of the investigation, the LUT campus will have been transformed into a living laboratory. The outcome will then be determined if a similar strategy can be applied on a larger scale, for example, throughout all of Lappeenranta city's institutions. The following research questions will be the focus of this comprehensive study:

- How can we develop gamified courses that are more engaging to students by utilizing co-design and living lab approach?
- How effective is gamification in increasing student engagement, collaboration, and creating an enjoyable learning environment?

## 1.3 Structure of the Thesis

This thesis paper will include seven distinct and informative chapters. The chapter is summarized below.

**Chapter 1** is an introduction that will provide context for the research and relevant data about the subject area. Additionally, it will discuss the purpose and constraints of the research work.

**Chapter 2** is named "Methodology and Research Design", and it summarizes the systematic literature review. This chapter will justify the entire data collection and analysis procedure

**Chapter 3** will discuss the study's "result of SLR", including the theory of data collection and analysis. Sub chapters will describe the role and necessity of gamification in education, living lab, co-design approach and so on.

**Chapter 4** will illustrate the "Results and analysis of a co-design". The subchapters are "Expert interview", "Survey" and "Co-design workshop". We described each subchapter with participants, procedures, data analysis, and findings.

**Chapter 5** is about "Discussion and Conclusion". We answered two research questions in the sub-chapters. Also, it includes limitations, future work and a brief conclusion of the research work.

# 2 Methodology and Research Design

This chapter describes the systematic literature review as a basic methodology. Sub chapters include search string, data source, inclusion and exclusion criteria, study selection, data extraction and data synthesis which helped us to establish the results of SLR in 3rd chapter.

## 2.1 Systematic Literature Review

To perform the research, a systematic literature review (SLR) was employed as the primary methodology. Thousands of fresh articles, reports and other resources are released on a daily basis. It becomes more difficult to keep the pace of new advancements (even for specialists in their respective industries) due to the sheer volume of information and the time required to review and evaluate new material, including whether any particular study is presented in a respectable venue. A SLR can assist in overcoming these limitations and assisting with several phases of the research process, including establishing a framework and classifying a research problem, trying to seek theoretical support, rationalizing a problem, identifying new lines of inquiry, and so on. (Linnenluecke, Marrone and Singh, 2020)

### 2.1.1 Search string

We constructed our search string based on our research questions and the four areas mentioned in **table 1**. We used numerous search strings in various databases rather than a single search phrase because a single search can be quite prolonged and complicated.

The final search strings we utilized for this study are given below:

**A.** ((“Gamification”) OR (“Gamified”) OR (“Gamified learning”) OR (“Game elements”)) AND ((“Gamified course”) OR (“Gamified curriculum”) OR (“Gamified session”)) AND ((“Co-design”) OR (“Co-creation”) OR (“User-centered design”) OR (“Participatory design”) OR (“Design research”))

**B**. ((“Gamification”) OR (“Gamified”) OR (“Gamified learning”) OR (“Game elements”)) AND ((“Gamified course”) OR (“Gamified curriculum”) OR (“Gamified session”))

**C**. ((“Gamification”) OR (“Gamified”) OR (“Gamified learning”) OR (“Game elements”)) AND ((“Co-design”) OR (“Co-creation”) OR (“User-centered design”) OR (“Participatory design”) OR (“Design research”))

**D**. ((“Gamification”) OR (“Gamified”) OR (“Gamified learning”) OR (“Game elements”)) AND ((“Living labs”) OR (“Living laboratory”) OR (“User-driven innovation”))

**E**. ((“Co-design”) OR (“Co-creation”) OR (“User-centered design”) OR (“Participatory design”) OR (“Design research”)) AND ((“Living labs”) OR (“Living laboratory”) OR (“User-driven innovation”))

*Table 1: Different areas for the search strings*

| | |
|---|---|
| **Research area 1** | Living Lab & all synonyms |
| **Research area 2** | Co-design and all synonyms |
| **Research area 3** | Gamification and all synonyms |
| **Research area 4** | Gamified course and all synonyms |

### 2.1.2 Data source

We ran our search strings into several databases for reviewing related papers and articles. We used all four strings in every database and the results were different. For the same string in some databases, the results were too many and, in some databases, there were no results at all. Here we skipped those. We used 5 databases to gather more visible results about the strings.

The following are the selected databases and their results:

- Scopus
- IEEE
- Science Direct
- Web of Science
- Springer

After an initial search of the five strings, we found the following results (see **table 2)**:

*Table 2: Initial results from the databases*

| Databases | String A | String B | String C | String D | String E |
|---|---|---|---|---|---|
| **Scopus** | 2 | 65 | 404 (Year: 2015-2022) | 19 | 414 |
| **IEEE** | 29 | 141 | 480 (Year: 2015-2022) | 9 | 458 (Year: 2015-2022) |
| **Science Direct** | Too many Boolean connectors | 48 | 65 (Section: Engineering) | 67 | 107 (Section: Engineering) |
| **Web of Science** | Too many Boolean connectors | 286 | Too many results | 23 (Section: Engineering) | Too many results |
| **Springer** | 383 (Section: Engineering) | 393 (Section: Engineering, Year: 2015-2021) | Too many results | Too many results | Too many results |

### 2.1.3 Inclusion and Exclusion Criteria

Inclusion and exclusion criteria assist us in identifying suitable research articles depending on our research topic. It functions similarly to a standard that we must adhere to for each article. The criteria for inclusion and exclusion in this literature review are listed below. This was done for all the research that we obtained from various databases.

**Inclusion**:

- To apply gamification and gamified, we will examine relevant articles on "gamified courses" and the ways that have been taken thus far to alleviate the boredom and repetition of courses using gamification.
- Using the terms "gamification" and "gamified", we search for previously employed strategies to make studying more enjoyable.
- In a living lab approach, we will focus less on the definition of a living lab and more on how this method might be used in university course contexts to improve the ongoing educational system.
- Our attention should be on the approaches and methods employed in co-design in our connected field when determining the results for co-design.

**Exclusion**:

- Papers that do not relate to "gamified" or "gamified courses" but to other types of education systems should be excluded from the term Gamification.
- Results about gamification in business, healthcare, industry, or any other sort of organization should be excluded.
- Approaches to living laboratories that have been implemented over a whole city, village, or domestic family and are not focused on "gamification in education" or "gamified courses" should be excluded.
- Co-design in other domains, such as economics, hardware, or software, should be excluded.
- Outdated research papers (for example, those published before 1998) should be excluded.
- Panel discussions, tutorial summaries, and articles with a page count of fewer than three should be excluded.

### 2.1.4 Study selection

After applying the inclusion/exclusion criteria to all the resulting papers, many further processes were taken to determine the final paper selection.

- Reading the titles of the articles to filter them.
- Read the abstract to determine the paper's objective.
- Following these three phases, manuscripts will be chosen for additional evaluation.
- If the complete text is not accessible, it will be discarded.
- As specified in the exclusion criteria, papers with fewer than three pages will be disqualified.
- Duplicate studies discovered across multiple databases should be eliminated.
- After completing the preceding phases, the remaining papers will be read.
- Carry out snowballing by examining the references.

After applying inclusion-exclusion criteria and selecting studies, we identified a total of almost 30 publications for additional assessment and snowballing across all databases. For snowballing, we evaluated all the selected studies' references and searched for related publications. We employed the same study selection and inclusion/exclusion criteria that we did previously when selecting papers. From the snowballing process, we picked a total of 18 papers. **Figure 2** illustrates the entire paper selection procedure.

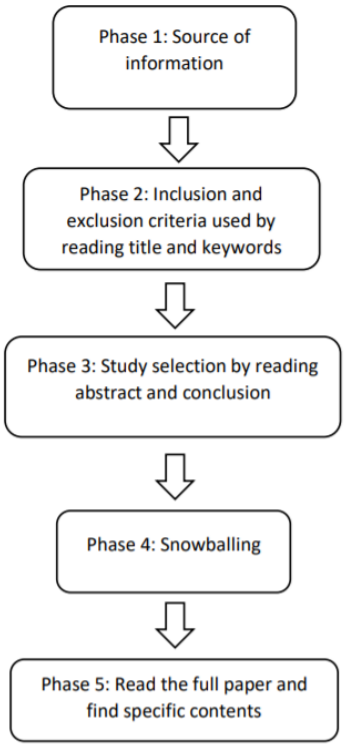



*Figure 2: Process of selecting papers, figure adapted from* (Hasan, 2020)

### 2.1.5 Data extraction

In a "SLR", data extraction aids in determining what information should be extracted from the publications to answer the research questions. The data was collected using a pre-designed data extraction form. For further study, all extracted data from the studies was saved in a Google spreadsheet. The data elements that were utilized in the predesigned form are listed below.

- Title of the paper/article
- Author/publisher name
- Publication year
- Database
- Keywords and topic of the paper/article
- Objective/goal of the paper/article

- User interaction/involvement
- Snowballing

### 2.1.6 Data synthesis

We classified the retrieved data into two groups before synthesizing them.

- Corresponding work utilizing a similar approach
- Techniques and methods employed in literature to address certain domains

The first collection of data was evaluated by looking for comparable types of works given in all of the selected articles. The outcome of the initial batch of data (or related work) is described in Section 3. The second set of data was assessed by looking for methodologies and techniques utilized incomparable types of study in the literature.

Sections 3.8 “background of living lab and co-design methodology” include the necessary results. Later in our study, we applied these strategies and created a simple flowchart of research design from SLR which is also illustrated in sub chapter 3.8.

# 3 Results of SLR

In this chapter, the brief definition of gamification is given. We describe few useful game elements which we used in co-design workshops. We also describe gamification from different perspectives, such as gamification as enjoyable learning, as student engagement and in adult learning. We conducted few tables showing some important papers written on living lab approach and co-design approach combining with gamification. In the end, we described background on living lab and co-design methodologies to gather some clear idea of this chapter.

According to Kapp gamification is "using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems." (Karl M. Kapp, 2012). Research about gamification is a vast area but not a new concept as it has been strongly explored since the 80s. It is a progressive technology that includes games and game-based methods in the educational field. Gamification implications and application has become an attractive area to the researchers, (Santti, Happonen and Auvinen, 2020) purposes, teaching, and education tasks and as a tool to add motivation towards participatory activities (Palacin *et al.*, 2020) because during the development of learning, it is offering an option to make student participating and getting motivated to being engaged in the learning enthusiastically. (De Sousa Borges *et al.*, 2014). The technology, gamification is not so new but there are some lacking when it is implemented in education (Surendeleg *et al.*, 2014). Cheong et al. recommend that "Student's participation in gamified activities should be voluntary" based on empirical study. This concept highlights the reason why this technology is not very popular worldwide (Cheong, Cheong and Filippou, 2013).

Gamification has been described in a wide range of studies. The definition and description of gamification are shown in **table 3** below.

*Table 3: Gamification related descriptions*

| Research | Context | Definition and description |
|---|---|---|
| "Gamification: Toward a definition" (Deterding *et al.*, 2011) | Non-game context | "The implementation of video game aspects into non-game systems in order to improve user experience and engagement" |
| "Gamification: Using Game Mechanics to Enhance eLearning" (Raymer, 2011) | Education | "These aspects are not at the core of the process but serve to entice individuals to use it" |
| "Using Badges for Shaping Interactions in Online Learning Environments" (McDaniel, Lindgren and Friskics, 2012) | Education | "Gamification has a minor impact on user performance" |
| "Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps" (Zichermann and Cunningham, 2011) | User engagement | "The game thinking and game mechanics method for engaging users and solving challenges" |
| "Exploring micro-incentive strategies for participant compensation in high-burden studies" (Musthag *et al.*, 2011) | Research | Encourage participants to get incentives and better performance |

From the descriptions and definitions in **table 3**, it is clear that gamification requires creating game-like experiences within a non-game framework. Gamification is used in a variety of units with the goal of engaging students. This context has been utilized to interest students and boost their rate of completion in online education.

The notion of gamification emphasizes the importance of engaging users in specific areas. Though several other facts influence the way this encounter is conducted and the extent to which it has an effect. The term "gamification" itself emphasizes the value of gamification in terms of engaging individuals in certain activities and expanding value creation.

## 3.1 Gamification in Education

Gamification is an educational method and practice that has been shown to boost learners' motivation and engagement (Kiryakova, Angelova and Yordanova, 2014). The utilization of game mechanics increases the ability to master new skills by 40%. Game-based approaches increase users' commitment and motivation to the activities and processes in which they participate. Consumers are familiar with gaming mechanics, as the majority of them have played or continue to play a variety of games. While this conclusion holds true for businesses and their employees, it is unquestionably true for education. (Giang, 2013)

Gamification in education is the process of incorporating game mechanics and components into a learning environment. E-learning, which is based on modern ICT, presents good conditions for gamification deployment. The data processing and tracking of students' progress are automated, and software tools can generate detailed reports. (Kiryakova, Angelova and Yordanova, 2014) The incorporation of gaming components into education is sensible, as certain facts are inherent in games and training. In games, users' activities are directed toward accomplishing a certain goal (win) in the face of difficulties. There is a learning objective in education that must be met by the completion of specified learning activities or engagement with educational resources. Tracking players' progress through games is critical, as subsequent steps and actions are determined by their performance. Tracking learners' progress is critical in education to achieve the learning objective. (Kiryakova, Angelova and Yordanova, 2014)

Developing an efficient approach for gamification in e-learning requires an in-depth examination of existing conditions and accessible software solutions. The strategy's primary steps are as follows:

- **Determination of learners' characteristics**: When teachers introduce new approaches to the learning process, it is critical to describe the characteristics of their learners (profiles) in order to determine whether the new tools and techniques are appropriate. The critical and determining criteria are the students' proclivity for interaction with the learning content and participation in competitive learning events. (Kiryakova, Angelova and Yordanova, 2014)

- **Definition of learning objectives**: Specific and well-defined learning objectives are required. Education's purpose is to accomplish learning objectives; else, all activities (even gamification activities) will appear meaningless. The objectives define the educational content and activities that will be incorporated into the learning process, as well as the game mechanics and strategies that will be used to accomplish them. (Kiryakova, Angelova and Yordanova, 2014)

- **Creation of educational content and activities for gamification**: The educational content should be dynamic, engaging, and multimedia rich. Several performances, feasibility, increasing difficulty level, and multiple paths are some examples of instructional content and activities for gamification. (Kiryakova, Angelova and Yordanova, 2014)

- **Adding game elements and mechanisms**: To build different skills in students, they must be able to achieve their goals through a variety of means. This allows learners to develop their unique strategies, which is a critical feature of active learning. (Kiryakova, Angelova and Yordanova, 2014)

Working to find out how to close the gap can be a great opportunity for researchers. There are some factors or possibilities that can be beneficial to turning the developed countries from developing countries. As an evolving trend, mobile phones have simple learning features that can easily collaborate with gamification technologies. However, the developers should focus on the main factors like safety and security design. (Yoo and Kim, 2014)

Gamification is becoming more popular in the area of e-learning (Urh *et al.*, 2015). The most often utilized objects in e-learning include points, levels, leaderboards, rewards, feedback, and challenges, as well as the findings from each research. The purpose of incorporating gamification into e-learning was to increase awareness by motivating students to engage and study classroom content. (Saleem, Noori and Ozdamli, 2022). The benefits of gamification in e-learning were that it increased communication and added a playful element to academic work (Dicheva *et al.*, 2015). Additionally, gamification is used in e-learning to encourage educators and present the playing environment, connect with colleagues, increase flexibility, and motivate students. It also enhances the educational process while meeting the needs of the present generation. (Saleem, Noori and Ozdamli, 2022)

## 3.2 Game elements

Game elements are qualities that are distinctive to games (Langendahl, Per-Anders Cook and Mark-Herbert, 2016). Implementing such elements influences the way people act when learning, exercising, or shopping. This means gamification could be used to push people to get involved in such activities that they used to avoid. (Mont, Lehner and Heiskanen, 2014) For example, some studies have confirmed the positive effects of gamification e.g., in a sustainability context (Santti, Happonen and Auvinen, 2020), and to make people use more time to be part of citizen science projects too (Palacin *et al.*, 2020).

Various game elements are used in non-game contexts, which are- corporate events, education, health, sustainable programs, and so on. There are many elements used in gamification. Such as points, badges, feedback, progression, multiple-choice, role play, challenges, and many more. To cover all elements, game elements are divided into 3 categories, such as “surface elements”, “underlying dynamics”, and “gaming experience”. Types of game elements and their short description are given below in **table 4**. (Langendahl, Per-Anders Cook and Mark-Herbert, 2016)

*Table 4: Game elements (Langendahl, Per-Anders Cook and Mark-Herbert, 2016*

| Type of game element | Meaning |
|---|---|
| Surface elements | Game characteristics are visual and tangible, e.g., a badge. |
| Underlying dynamics | Game characteristics (elements) that encapsulate the underlying dynamic or conditions for a game, e.g., narrative |
| Gaming experience | A game-like experience created in a gamified activity, e.g., competition |

Surface elements include leaderboards, badges, and point systems. These elements are implemented in games to visualize and quantify the achievements or performance of a specific player. Underlying dynamics include role play, narrative/storytelling, progression, multiple-choice, freedom to fail, and feedback. Gaming experience includes challenges, competitiveness, and enjoyment. Typically, most of the games are challenging as there are some missions and difficult tasks. Competitions of the game motivate players to engage and compete with different players which provides enjoyment. **Figure 3** shows the clear view of different game elements connected to "surface elements", "underlying dynamics" and "gaming experience". (Langendahl, Per-Anders Cook and Mark-Herbert, 2016)

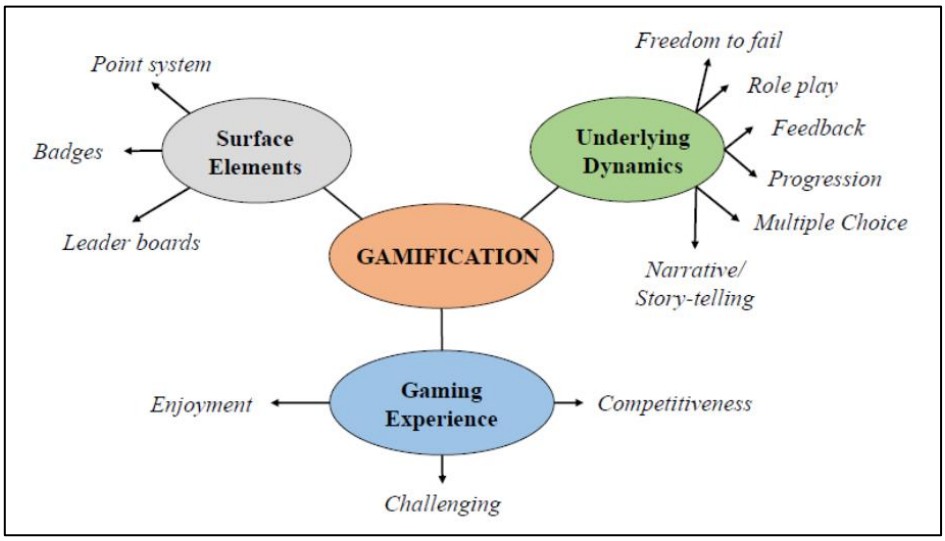



*Figure 3: Gamification framework: surface elements, underlying dynamics, and game effects, figure adapted from* (Langendahl, Per-Anders Cook and Mark-Herbert, 2016)

Gamification is the process of incorporating game elements into a system that cannot be a complete game. This is in contrast to serious games, which are likewise utilized in non-game circumstances but are approached differently. Additionally, the gameful design varies from playful design in that the former emphasizes goal-oriented activities that are regulated by rules, whilst the latter emphasizes spontaneous and free-form activities. Even though both gameful and fun designs may be used for the same products. **Figure 4** below illustrates the relationship between gameful design and the axis of play and games, whole and parts. (Tondello, 2016)

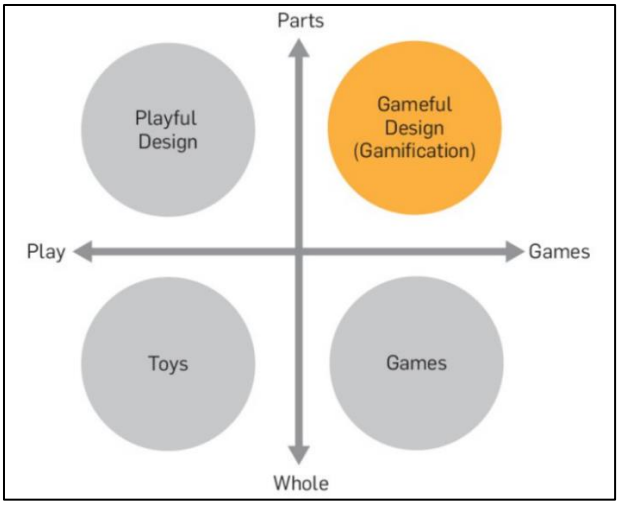



*Figure 4: Gamification between play and games, whole and parts, figure adapted from* (Tondello, 2016)

## 3.3 Gamification as Enjoyable Learning

The importance of fun in a user's experience has long been recognized. "A feeling of pleasure caused by doing or experiencing something you enjoy" is how the term "enjoyment" is defined (Noor *et al.*, 2018). Students want to learn, but they also want to enjoy the process; in fact, it could be said that they need to enjoy learning (Lumby, 2011). Enjoyment implies participation in a proposed or constructed environment or product. Enjoyment is linked to the human physiological-affective-cognitive state and is closely related to experience (Deterding, 2015).

Gamification in the area of human-computer interaction (HCI) has a new meaning (Deterding, 2012). Elevated levels of HCIs may be achieved by the use of gamification, which stimulates attentiveness through gamefulness. As a result, gamification and gamefulness and gamification are both opposed to the notion of serious games, even if the latter may be utilized to facilitate gamification via extraction. A few serious gaming concepts that are examples of gamification features include game mechanics (progress bar and dashboard), game design (applying a badge as a reward), and game strategies (leaderboards displaying scores marks, or scores). Because gamification incorporates game elements, which makes the games engaging also serves as optimal learning environments. This has resulted in gamification elevating the learning environment to one that is entertaining and enjoyable. (Khaleel *et al.*, 2015)

The study revealed that, in terms of learning and realizing complicated subjects, games can be used as an effective and appealing tool. Gamification brings the learning condition or situation in such a way that the students can be capable of creating their understandings across instructive and instant feedback loops. (Karl M. Kapp, 2012; Domínguez *et al.*, 2013) Gamification makes it easier to achieve "practical competencies" but hampers "theoretical concepts" as it is not clear proof that gamification is the best possible practice for examinations and assessments (Cheong, Cheong and Filippou, 2013)

## 3.4 Gamification in Student Engagement

Gamification enables students to obtain immediate feedback on their progress in the classroom and recognition for completing a task in the educational context (Karl M Kapp, 2012). Additionally, it has the potential to increase student engagement and motivation in the classroom (Simoes *et al.*, 2012). Student engagement in academic activities is connected to contextual changes. With it, the assistance provided to students, their interactions with classmates, the classroom structure, the support provided for autonomy, and the characteristics of the activities all serve as context variables that influence the relationship students to establish with the proposed activities. (Da Rocha Seixas, Gomes and De Melo Filho, 2016)

The highlight of engagement is students' actual attitude and behavior when starting schoolwork. Strategies of gamification keep the students active and engaged when it comes to cooperative learning and interaction between students and teachers. (Surendeleg *et al.*, 2014) Students' engagement in gamification learning content helps to achieve a positive attitude for learning and enhance learning productivity. We cannot avoid the success made by gamification in the marketplace which also requires quality learning and its results. In summary, gamification not only ensures active engagement of students but also plays a vital role in increasing their motivation level. (Surendeleg *et al.*, 2014)

## 3.5 Gamification in Adult Learning

Gamification is frequently used and applied in the context of adult learning but sometimes its effects are not very visible. Because significant evaluation gamification is accepted and implemented by many of us as it is primarily trendy. Gamification is used to benefit learning from the perspective of training and education which includes government, military, healthcare, businesses, and so on. Gamification includes game elements that help the players to gain pointed skill and knowledge. Learners can get important instructions virtually through online training. Gamification functionally improves the learning system by helping learners get rid of some psychological barriers. For example, putting a "progress bar" in an employee training slide for leadership would not upgrade the training but the feedback from the bar will improve their learning indirectly by motivating them. Game elements contain assessments, rules/objectives, human interactions, and challenges which are known as instructional materials. Such elements are purposefully implemented in games to increase the motivation level of users to enhance time spent on study materials to finish some elective training examinations. Learners' motivation level often depends on the progress of learning outcomes. (Landers *et al.*, 2019)

Adult's or students' involvement and motivation mostly depend on various game elements such as game fiction, immersion, assessment, points, leaderboards, badges, quests, progress bars, avatars, meaningful stories, language, challenge or conflict, environment, control, human interaction and so on. In the restraint procedure, game elements can weaken or strengthen the current connection between learning outcomes and study-related behaviors. **Figure 5** shown below reflects the "causal path model" which includes connection among game elements, learner's behaviors or attitude, existing instructional content or method, and learning outcomes in gamified learning theory. (Landers *et al.*, 2019)

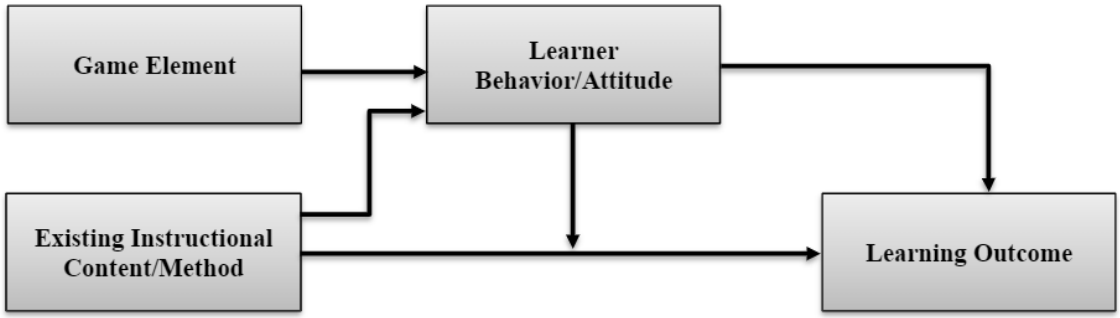



*Figure 5: Causal path model of the theory of gamified learning, figure adapted from* (Landers, 2014)

To determine players' success Gamification has a goal or aim setting function which helps the player to be active in a competition. Avatars as a game element provide multiple choices to players which increase the motivation level and sense of autonomy. Adding assessments to games to track players' scores and reward system also makes them motivated to be present in the game for a long time and make progress. (Landers *et al.*, 2019)

## 3.6 Living lab approach in Gamification

Living Labs first appeared in the early 2000s, with an initial focus on testing new technologies in home-like surroundings designed for innovation. Since then, the idea has evolved; now, one need for Living lab Practice rounds is that they take place in a real-world environment. (Kareborn and Stahlbrost, 2009)

Living Labs are a new and effective technique for fostering social innovation and improving quality of life by engaging participants in the process. They are a valuable tool for detecting community needs and addressing contemporary social issues in local communities by enlisting the participation of important actors who are the performers of the process of innovation. (Pietrapertosa *et al.*, 2021) Living Labs have become an established element of local and national innovation systems over the last decade, employing a variety of methodologies and technologies and concentrating on a diverse range of domains and topics. However, the Living Lab's experimental, learning-by-doing setup within diverse application domains, as well as the Living Lab's detachment, has resulted in a wide range of methods, outcomes, and consequences. (Eschenbaecher, Turkama and Thoben, 2010)

The living lab approach along with gamification has been used in many articles, projects, blogs, and so on. Two relevant research papers, one blog post is described briefly in **table 5** below:

*Table 5: Living lab approach in Gamification*

| Research paper/ Blog post | Author | Description |
|---|---|---|
| Gamification in a Living Lab: Energy saving challenges in student halls | Regine Sønderland Saga and Rachel Dunk | In the paper, Manchester Metropolitan University was used as a living lab. The purpose of this study is to use a user-centric, cross-sectional, collaborative Living Lab approach to co-create and test the success of behavior change initiatives, including application-based |

| | | |
|---|---|---|
| | | gamification, to achieve energy savings and thus reduce carbon emissions in multi-occupancy housing with a split-incentive scenario. (Saga and Dunk, 2017) |
| A Living Lab approach to gamification of an open source Q&A for tertiary education | Fredré Hattingh, Carel van Rooyen and Albertus A. K. Buitendag | The purpose of this study is to examine the feasibility of using an open-source web-based Question and Answer system (OSQA) in undergraduate university topics to facilitate learning on many cognitive levels and to foster cooperation between students and lecturers. Gamification techniques are frequently used to increase user engagement in content evaluation to generate interesting user experiences that result in the development of high-quality content. (Hattingh, Van Rooyen and Buitendag, 2013) |
| Living Labs: An Intersection of Scientific Innovation (Blog) | Talia Lewis | The European Network of Living Labs' (ENoLL) project "MyNeighbourhood" aspires to build an even smarter Smart City by emphasizing people and their connections, ideas, and interactions. The process of re-creating the "neighborhood" is being created via the use of a living lab approach to disseminate new approaches for strengthening bonds through the use of information and communication technologies. The initiative employs strategies such as gamification, which is the application of game design components and ideas to non-game environments, to address community concerns. (Lewis, 2017) |

Living labs maximize their effect through the use of serious games. When we refer to a "serious game", we are referring to the use of a gaming platform as an instructional tool. Though games have already been criticized in a variety of domains, they are utilized to provide meaning in research contexts in living labs. Games may be used to increase engagement, and game mechanics can be utilized to create answers to real-world problems. While gamification is a contentious phrase, it is employed in Living Labs to ensure maximum engagement, involvement, and reach. (Lewis, 2017)

## 3.7 Co-design Approach in Gamification

Nowadays, designers are confronted with several design challenges. There has been a significant shift as a result of the user-centered philosophy. They now need to prioritize users. Co-design is a collaborative design process that involves individuals with varying perspectives and backgrounds. Historically, solving design challenges was often done linearly. To begin, discuss cultural considerations; then, designers will finalize their designs; and finally, technical issues will be addressed. There is no place for discussion in this type of approach, and as a result, the original design criteria are lost. Co-design becomes more prevalent as the design sector evolves. (Cutler *et al.*, 2010)

Gamification of learning is becoming increasingly popular as a means of developing and accessing engagement, entertaining activities for students. Apart from being a trendy buzzword, gamification

may be an effective method of engaging learners provided the gamified learning activities have clear objectives and assume participants' prior knowledge. Gamification of co-design for cooperative learning situations should start with an understanding of the different categories of learners. Then it should structure the co-design activity around tasks presented as missions, complete with game-based aspects that are appropriate for its users. (Dodero *et al.*, 2014)

The co-design approach along with gamification has been used in many articles, projects, blogs, and so on. Two relevant research papers are described briefly in **table 6** below:

*Table 6: Co-design approach in gamification*

| Research paper/ Blog post | Author | Description |
|---|---|---|
| Gamified Co-design with cooperative learning | Gabriella Dodero, Alessandra Melonio, Rosella Gennari and Santina Torello | In current education systems, both learning and engagement are critical goals, which presents several challenges for co-design. This article utilizes challenges to generate needs for co-design and demonstrates how to achieve those requirements while also promoting engagement and learning through the use of co-design, gamification, and cooperative learning. It concludes by highlighting research that used a mixed co-design method and describing how this approach resulted in fresh difficulties and effort. (Dodero *et al.*, 2014) |
| Embrace gamification for co-designing new solutions: a framework of "game principles" | Ziheng Zhang, Francesco Zurlo and Rui Patricio | This article uses a case study to illustrate a framework of "game principles" and how gamification as a multi-principles system aids the process of co-designing new solutions. Additionally, via the case study, information was given to managers and organizers on how to facilitate co-design sections for innovation. (Zhang, Zurlo and Patricio, 2021) |
| Innotin game supporting collective creativity in innovation activities | Parjanen Satu and Hyypiä Mirva | Interdisciplinary strategies are essential to enable communal creativity into innovation. The Innotin game is introduced in this study to help with collective creativity. This case study contains three co-design workshops in which the game has been played. The findings of this study suggest that low-tech based (board) games may be evolved into a tool for increasing collaboration and creativity among participants in innovation activities. (Parjanen and Hyypiä, 2019) |

## 3.8 Background on Living Lab and Co-design Methodologies

We used the campus of Lappeenranta University of Science and Technology as a living laboratory for our research and study purposes. Five fundamental concepts were proposed, and we followed those throughout the process (Kareborn and Stahlbrost, 2009).

- **Continuity**: This notion is critical because effective cross-border collaboration fosters creativity and innovation by establishing trust, which takes time to create.

- **Openness**: The process of innovation should be as transparent as possible, as it is critical to gather diverse viewpoints and sufficient power to make quick progress. Additionally, the open method enables the process of user-driven innovation to be supported, regardless of the location or identity of the users.
- **Realism**: To develop results that apply to real-world markets, it is vital to encourage the occurrence of as many actual usage scenarios and behaviors as feasible. This idea is especially significant since it separates Living Laboratories from other types of open co-creation platforms, such as Second Life, by focusing on actual people in real-world scenarios.
- **Empowerment of user**: User involvement is critical for steering innovation processes in the right direction, one that is based on human wants and aspirations. Because the effectiveness of Living Labs is contingent upon the creative capacity of user communities, it becomes critical to incentivize and empower users to participate in these activities.
- **Spontaneity**: To be successful with new technologies, it is critical to encourage usage, satisfy personal aspirations, and meet society and social demands. Here, the capacity to detect, gather, and analyze spontaneous user emotions and ideas across time becomes critical. (Kareborn and Stahlbrost, 2009)

Three of these five ideas stand out as being fundamental to Living Labs. The first one is "empowerment of user" since Living Labs' primary mission is "to engage and empower people to contribute to the development of sustainable and valuable assets in support of the objectives established by its partners and clients". (CoreLabs, 2007) The second one is "openness," which can be linked to things like open innovation, having lead users, and crowdsourcing. The third one is realism, with an emphasis on real-world surroundings. Additionally, this notion is the main distinctive feature of Living Labs when compared to both user-centric and open approaches. (Kareborn and Stahlbrost, 2009)

It is critical to clarify the words we used to describe the co-design activities in this research. The ideas that characterize the co-design method are as follows (Sanders, Brandt and Binder, 2010):

- Tool: The term "tool" refers to the materials used in co-design activities.
- Toolkit: A collection of tools that are used to accomplish a given aim.
- Technique: Instructions on how to use the various tools and toolkits available.
- Method: A collection of a tool, a toolkit, and a method that is used to accomplish a goal.
- Approach: A framework for directing the implementation of the study strategy.

The approach of co-design is divided into four different phases. These are:

- Pre-design phase
- Generative phase
- Evaluative phase
- Post design phase

The timeline for these four phases is visualized in **Figure 6** below.

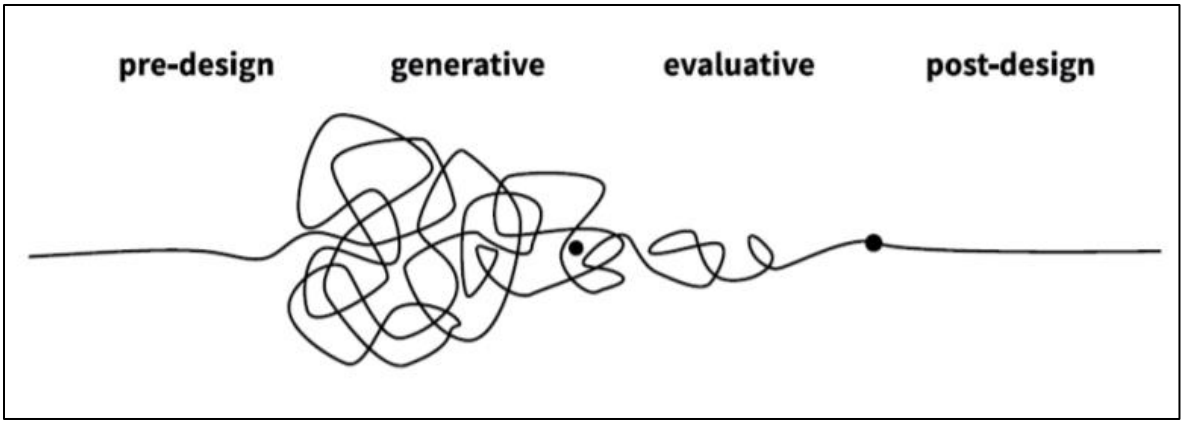



*Figure 6: Phases of the design process over a timeline; the first dot symbolizes the identification of the design opportunity, and the second dot symbolizes the completed "product", figure adapted from* (Sanders and Stappers, 2014)

Pre-design refers to the study conducted before the generative process. The post-design phase occurs after the design has been developed. The pre-design phase is primarily concerned with the background of the experience, whereas the post-design phase is entirely concerned with how consumers experience the product. In the generative phase, design possibilities and decisions are made, while design development occurs in the evaluative phase. **Figure 6** contains two black dots. The first black dot (on the left) signifies that design opportunities have been identified, while the second black dot (on the right) indicates that the primary outcome has been achieved. During the pre-design phase, co-designers and designers get an understanding of the user experience. The second step is the creative phase, in which participants in co-design collaborate and develop ideas. This phase makes a design recommendation. The third step is used to validate the design solution that was generated during the generative phase using prototypes and assessments. The post-design phase is mostly concerned with how the product is used. This may be accomplished by releasing the product into the market and monitoring consumer feedback.

While collecting data for the SLR chapter, we felt the necessity to conduct an expert interview and survey. Continuing data collection via an interview session and a survey, we organized a co-design workshop. Thus, the final results and constructive conclusion of the thesis were included at the end, which incorporates ideas from the interview, survey, and co-design workshop. The basic flow chart of the complete research design is shown below in **figure 7**.

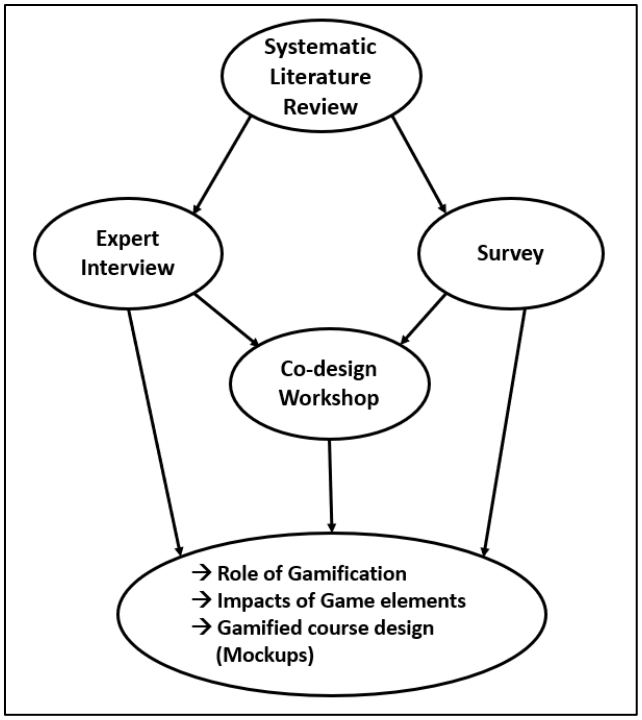



*Figure 7: Flowchart of research design*

# 4 Results and Analysis of Co-design

We developed our study stages by focusing on co-design methodologies, which consist of four phases: pre-design, generative, evaluative, and post-design. All of these phases are interconnected. The only difference between this design and the original co-design phase is that during the third phase, we conducted prototyping rather than evaluation (See **figure 8**). In subchapter 4.3.4, we provided four gamified course designs as mockups.

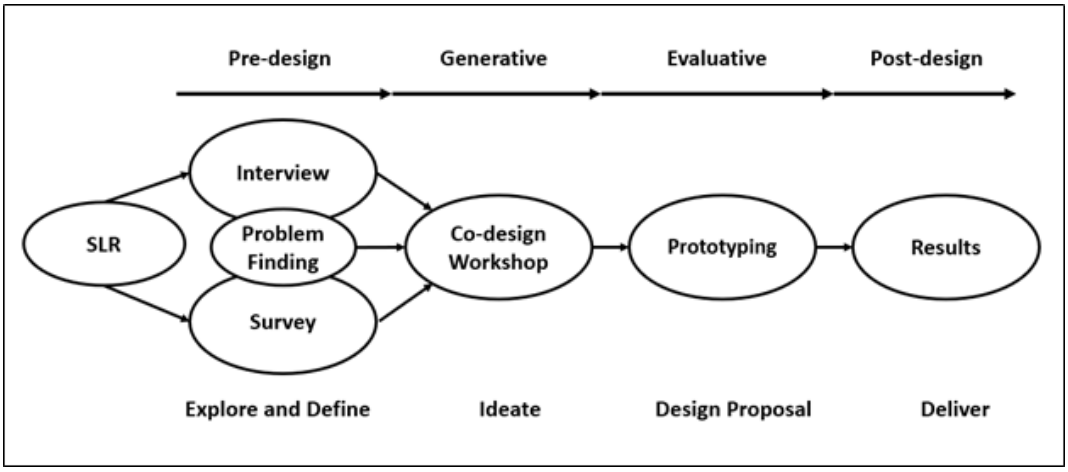



*Figure 8: Design phase used in research*

## 4.1 Expert Interview

We performed five expert interviews with LUT university professors who have extensive knowledge about gamification and previous experience in the field. The interview questions are introduced in "4.1.2 Procedure" section.

Through the expert interview, we learn about the value of gamification in terms of student engagement and collaboration. The experts ensured that gamification might be used to motivate students to collaborate on coursework. Additionally, it can establish an engaging learning atmosphere and keep students engaged for a longer amount of time. Additionally, experts shared their useful insights on the success rates of intrinsic and extrinsic motivation in terms of motivating students. Additionally, we obtained professional opinions on the potential drawbacks of gamification. Moreover, they explored the general barriers to gamification whether used in a course or other source.

### 4.1.1 Participants

Seven experts were asked to participate in the interview. Regrettably, we were only able to interview five of them. Four of our professors were from the department of "software engineering", while another was from the department of "industrial engineering and management". Every single person has extensive knowledge and work experience in the relevant topic. Some of them have published research articles on gamification, gamified learning, and other related topics. Additionally, several instructors included gamification and gamified learning into their Moodle-based courses and classroom activities through the practice of gamified applications.

### 4.1.2 Procedure

Due to the pandemic, four interviews were held online and one by video clip, in which questions were provided in advance and the professor answered via video clip. For video conferencing, we used the "Microsoft Teams" online conference platform. Session durations were set at 40 minutes. Participants received interview questions, consent forms, and other material through email before the interview. The first 10 minutes were devoted to introductions. The interviewer (The Author) introduced herself and discussed the project and interview goals. Following an explanation of the research's goal, consent was obtained from the interviewee to record the whole interview for analytical purposes.

Following the introduction, the main interview began. The interviews were semi-structured and focused on gamification, gamified learning, student engagement, collaboration communication efficiency, potential problems and barriers of gamification and so on. All the questions are listed in appendix 1.

### 4.1.3 Data analysis

All interviews were audio-recorded and transcribed using a software named Otter. Following each interview, the data were originally classified. All audio and written materials were evaluated. To acquire a sense of the entire picture, notes were studied, and a few audios were listened to numerous times. All interview discussions were given a specific interpretation and then documented.

After collecting all the meaningful feedback from the interviews, we conducted thematic analysis (TA) and gathered transcripts (actual interview dialogues from experts), codes (precise meaning), subthemes, and themes illustrated in **table 7**. In short, TA is a technique for methodically detecting, categorizing, and providing insight into meaningful patterns (themes) in a data collection (data set). TA enables researchers to see and make sense of communal or shared concepts and experiences by concentrating on meaning along with data collection. (Braun and Clarke, 2012)

*Table 7: Thematic analysis of the expert feedbacks from the interviews*

| Transcripts | Codes | Subthemes | Themes |
|---|---|---|---|
| "if it is designed in such a way that the student's interaction can be increased"-Respondent D | Gamification can be responsible for students' interaction | Gamification can help students to collaborate | **Effective collaboration** |
| "Definitely yes, it's not only my experience it's a general recommendation of, let's say, of teachers"-Respondent A | Educators recommended gamification as a collaborative tool | | |
| "If we talk about collaboration between students and teachers that is needed. Yes, it definitely | Collaboration between students and teachers | Motivation of collaboration | |

| | | | |
|---|---|---|---|
| because, again, when we run the quiz and then we discuss the result of the quiz with a student”- Respondent A | | | |
| “Yes, for sure. If we log in a broad view, GitHub, Stack Overflow, and others have very basic point-based gamification features, which do seem to motivate people to collaborate”- Respondent E | Few gamified features motivate people to collaborate | | |
| “collaborative activities are what is being encouraged so you collaborate, you get a point if you collaborate, you can get the hang of your avatar, then I think, in that situation, gamification can encourage collaboration online”-Respondent C | Game elements (points, avatars, and so on) encourage online collaboration of the students | | |
| “it probably only works for certain students, not for everybody”-Respondent C | Gamification includes collaboration but it depends on the students | | |
| “to build better communication or cooperation between students, but could interpret it like this, it definitely improves communication and collaboration with teaching materials”- Respondent A | Improves communication and collaboration with teaching materials | Improves communication and collaboration | |
| “students would like to interact more, so any solution that provides them the possibility to interact more, or, or to socialize more will be helpful”- Respondent D | Possibility to interact more | Gamification makes study fun in various ways | **Interesting way of learning** |
| “It really depends on the type of students”- Respondent D | Gamification makes learning fun, but it depends on the students | | |
| “maybe not too much not is there is always some reasonable amount of games | Gamification could make learning fun if it used sufficiently | | |

| | | | |
|---|---|---|---|
| because as a course shouldn't be seen as like a quest to go from one game to another, not too much but it has to be…used wisely when you feel that"-Respondent A | | | |
| "it's a very good instrument in the pocket of teacher, games to make a domain. To make learning more diverse, more exciting"-Respondent A | Gamification makes learning more diverse | | |
| "they would like to attend a course through the stealth mode…either recorded lectures, or…zoom lessons, but then, some students are asking for, face to face and more interactive sessions. So, it really depends on the students"-Respondent D | Gamification ensures engagement, but it depends on the students | Active engagement is possible when students are interested | **Active engagement** |
| "gamification, a good change, or engage people better, of course, people need to be interested in those things, otherwise it won't happen"-Respondent B | Engagement is possible if students are interested | | |
| "students can be encouraged, they can have a better learning experience, they can be more engaged"-Respondent A | A better learning experience can lead to student engagement | | |
| "through participation in the game, you can immediately see like a kind of landscape, who's following you, who is not, who is just switched on the computer and left or something like this"-Respondent A | Visible landscapes in gamified shown students' participation | Different phases of gamification help students to get engaged | |
| "I think it can even increase student engagement with online forums and increased | Engagement can be possible with online forums and increasing activities | | |

| | | | |
|---|---|---|---|
| peer to peer activity”- Respondent E | | | |
| “self-study quizzes and automated feedback has been shown to help with engagement and self-regulation”- Respondent E | Quizzes, feedbacks have positive effects on student’s engagement and self-regulation | | |
| “I think not only software engineering students, but all students can be motivated through gamified experiences”-Respondent D | Students can be motivated through gamification | Gamification motivates students | **Motivation & Encouragement** |
| “weaker students or more novice students ask more questions or be more active onboard. So, at least, it encouraged people who needed help to ask for help on the forums” - Respondent E | It encourages people who need help | | |
| “based on the personal characteristics of the students are really seeing those as motivation. If there are extra points, maybe that’s a way of gamifying”- Respondent B | Students can find it motivating | | |
| “they’re using gamification everywhere…it seems that this is the solution to all problems”-Respondent D | Gamification can’t be a solution to all problems | Overuse of gamification | **Potential problems and Barriers** |
| “they do something short term, so they take something which wasn’t gamified they add a gamified layer on top, they try to identify whether this was better than whatever was there before”- Respondent C | Adding gamification label on anything which cannot be gamified | | |
| “I’ve already said that too many games are not good- Respondent A | Excessive use of games is not good | | |
| “There are some technological barriers and disappearing very fast…like high-speed internet | The technological barrier is present, but it is decreasing | Some technological barriers are present | |

| | | | |
|---|---|---|---|
| access…all learners ability to connect to the internet through let's say a smartphone or a personal communication device"- Respondent A | | | |
| "in some cultures, gaming, or if say to have competition is not a good thing. Maybe, for example, you can feel that in Finland games or competition among kids is not considered good stuff"- Respondent A | Competition through gamification is not a good factor in some culture | Sometimes competition is not reasonable | |
| "if you value being the best in a kind of competitive way, then an extrinsic motivator will work for you, but not everybody is that competitive so if you value actually learning as a kind of goal in itself"-Respondent C | Not everybody is competitive | | |
| "The potential problems with giving gamification I think oversimplifying and the lack of creativity"- Respondent E | Sometimes gamification lacks creativity | Loss of creativity | |
| "our real flaw is, or a potential danger is this point suffocation or oversimplification"- Respondent E | Oversimplifying gamification | Making it over simple | |
| "some people are more talkative than others. And I don't think that even if I would, kind of gamify this thing I could increase this actions of the students who are more introverted in a way"- Respondent B | Gamification does not have effects on some students | Results from gamification are unpredictable | |
| "you have different people all that you need to serve, and then how to find out the best possible ones"- Respondent B | Depends on the students | | |

| | | | |
|---|---|---|---|
| “finding out the proper ways of doing it. And what to gamify is still a challenge”- Respondent B | Applying gamification can be a challenge | | |

### 4.1.4 Findings

We identified five major themes and twelve connected subthemes because of the analysis. The interviewees discussed their perspectives on gamification and its positive and negative effects on students and the education system. According to the interactions we had with interviewees, we discovered some important facts concerning gamification that students should be aware of. We are outlining the themes to assist these in comprehending the interview questions.

**Effective collaboration**: This theme was chosen because the majority of teachers thought that gamification is responsible for students collaborating efficiently. It has been designed in such a way that interaction between students can be increased. Gamification not only increases communication and collaboration amongst students but also enhances communication and collaboration with educational materials. When we consider collaboration between students and teachers, gamification has a beneficial effect. Because when professors conduct the quiz, they frequently discuss the results with the students. One professor mentioned GitHub, Stack Overflow, and others as examples of platforms with very simple point-based gamification elements that appear to inspire individuals to interact. However, we must bear in mind that gamification does not work for all students in terms of constructive collaboration. Certain students may object to having their course or activities gamified, or they may just dislike collaborative activities.

**Interesting way of learning**: The benefit of gamification is that it offers an interesting way of learning. It is an excellent instrument to keep in the pocket of educators, games that help create a domain. Additionally, it increases the variety and pleasure of learning. However, we must bear in mind that gamification as a technique cannot be overused. There should be a sufficient number of games available, as a course should not be viewed as a quest to go from one game to another. Thus, gamified courses and activities must be used responsibly.

**Active engagement**: Gamification is a positive change that may help individuals become more engaged; however, people should be interested in those things for it to work. Participating in the game quickly creates an impression of a landscape. We can see who is following us, who is not, who has just turned on the computer and walked away, or anything similar. Students wishing to attend a course in stealth mode. either recorded lectures or zoom classes, but some students are requesting more participatory and face-to-face meetings. Thus, it is entirely dependent on them. A professor believes it has the potential to boost student participation through online forums and peer-to-peer activities. On the other hand, it has been demonstrated that self-study quizzes and automated feedback promote engagement and self-regulation.

**Motivation and encouragement**: Professors believe Gamified experiences may encourage students of all backgrounds. Depending on the students’ particular traits, if they truly find the gamified activities motivating, if there are more points, perhaps that is a manner of gamifying.

Students that are weaker or more inexperienced ask more questions or are more engaged on board. Thus, it encouraged individuals in need of assistance to seek support via forums.

**Potential problems and barriers**: All of the lecturers discussed the challenges to gamification use. Educators and anybody else who uses this tool should not view it as a solution for all situations. Additionally, adding a gamified overlay to anything and abusing this tool might create complications. Competition amongst students is disapproved of in certain societies. Thus, incorporating a leaderboard into a gamified course or activity is not always a wise decision. Occasionally, gamifying a course or activity lacks creativity and novelty. Additionally, such a tool is highly unpredictable, as it has different impacts on different students.

## 4.2 Survey

We conducted a gamification-related online survey. The goal of the survey is to find out how many people are aware of gamification and its useful applications in education, particularly in online and offline courses. Because we are using the LUT campus as a living lab for this research, the majority of the participants were LUT students and staff. The online survey's questions can be found in the appendix 2. The main theme of the survey is explained briefly in the following key areas:

- Effects of gamification during pandemic
- Impacts of gamification increasing students' active participation, collaboration, communication efficiency and engagement and overall performance
- Students' encouragement with gamification systems to collaborate online
- Students being attentive during coursework when gamification is implemented
- Gamified course's positive influence on students' intrinsic motivation
- Potential problems and barriers of gamification from participants' point of view

### 4.2.1 Participants

A survey was conducted in Webropol along with a proper introduction and survey details in October 2021. This popular survey tool is the most cost-effective choice in competitive settings, allowing users to construct multiple surveys rapidly and effortlessly (*Webropol, Survey and reporting*, no date). The participants were approached using a variety of methods. To begin, the Webropol survey link was posted in one of my social media accounts and in a private group for LUT students. Second, the link was directly sent to the participants personally. Finally, the invitation was sent to a few LUT professors and doctoral students by email. The survey was primarily aimed at people who work at or are affiliated with the university.

In total, 100 students and staff members aged 17-24 (10.1%), 25-34 (77.8%), 35-44 (10.1%), and 45-64 (2%) participated in the survey. Overall, there were almost 70% males and 28% females among the participants. 9% of the participants were university staff, 63% were students, including Ph.D., MSc, and BSc students, and almost 28% were other university personnel (see **figure 9**).

| | n | Percent |
|---|---|---|
| Staff | 9 | 9.2% |
| Bachelor's student | 10 | 10.2% |
| Master's student | 41 | 41.8% |
| Doctoral student | 11 | 11.2% |
| Other | 27 | 27.6% |

*Figure 9: Participant's key role inside the university*

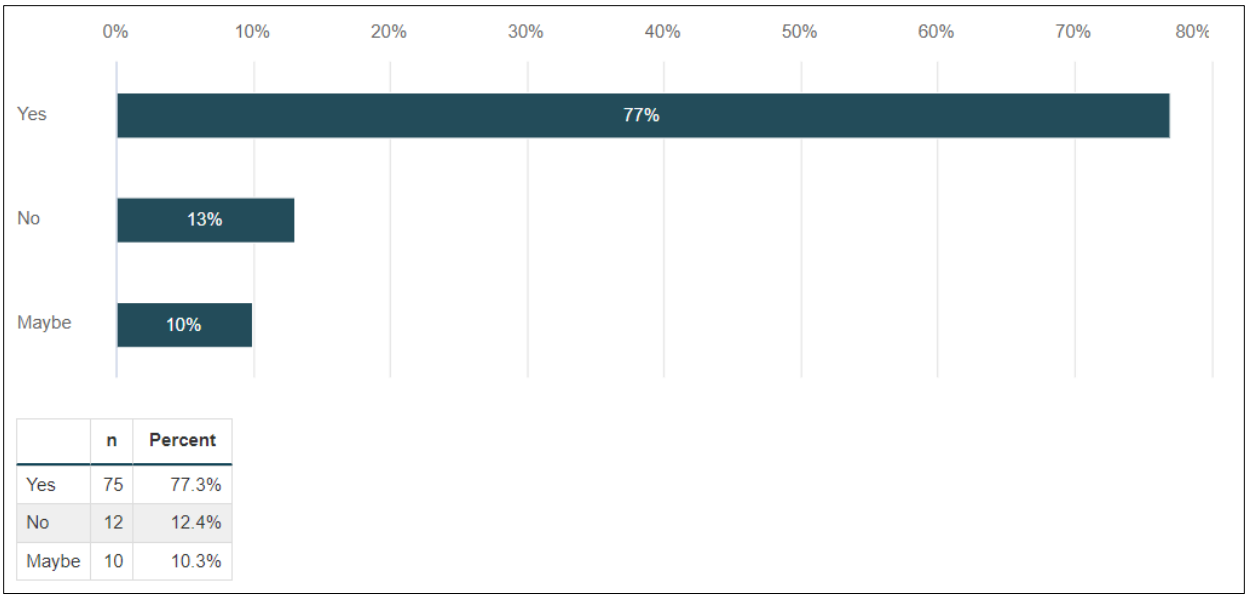
### .2.2 Procedure

As informed before, the full survey was conducted online. A link to the Webropol survey was sent to the participants by SMS, email, social media, and so on. Before doing the survey, we focused on a few following aspects:

- We care about participants' freedom and active participation in the survey, that's why we asked them if they want to participate in the study. For example, there were two options "I understand the purpose of research and volunteering" and "I do not want to participate in the research". Most of the participants chose the first option and willingly volunteered for the survey.
- Most of the survey questions were made to ask participants about their concerns about gamification in terms of active engagement, enjoyable learning environment, motivation, and so on. We were expecting to receive a mostly positive result from there.
- To keep a balance between positive and negative feedback be added two questions "Do you see any potential problems with gamification?" and "Do you think there are any barriers when implementing gamification in a course?".
  Here participants discuss the barriers and potential problems with gamification which they know or faced in their lifetime. After receiving much feedback, we explained almost 29 meaningful problems in the "4.2.3 Data analysis" section.
- We also keep an "open feedback section" at the end of the survey to get any types (positive and negative) of feedback from the participants about the whole survey or about gamification or its practices on a course. We received 16 meaningful feedbacks and we explained most of these in the "4.2.3 Data analysis" section.
- In the end, we collaborate on all the possible survey results and feedback to make a thematic analysis in the "4.2.3 Findings" section. After that, we described all the themes we found from the analysis.

### 4.2.3 Data Analysis

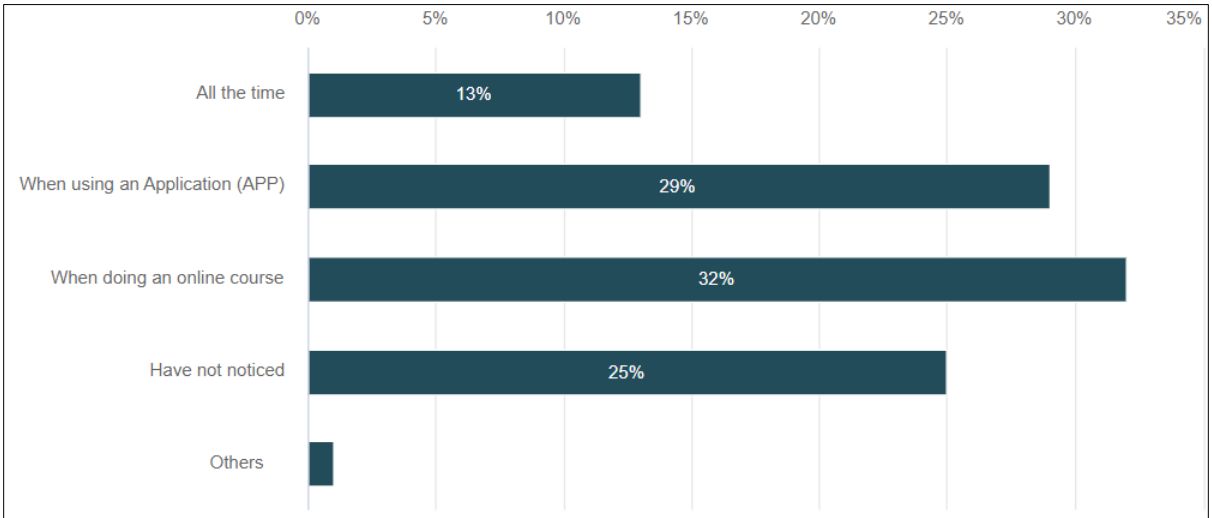
The number of people who are familiar with Gamification is shown in **Figure 10**. "Yes" was answered by 77% of participants, indicating that they have at least a basic understanding of gamification. 13% said they were unaware of the situation. 10% are unsure if they have heard about it in their daily lives.




| | n | Percent |
|---|---|---|
| Yes | 75 | 77.3% |
| No | 12 | 12.4% |
| Maybe | 10 | 10.3% |

*Figure 10: Participant's basic knowledge about gamification*

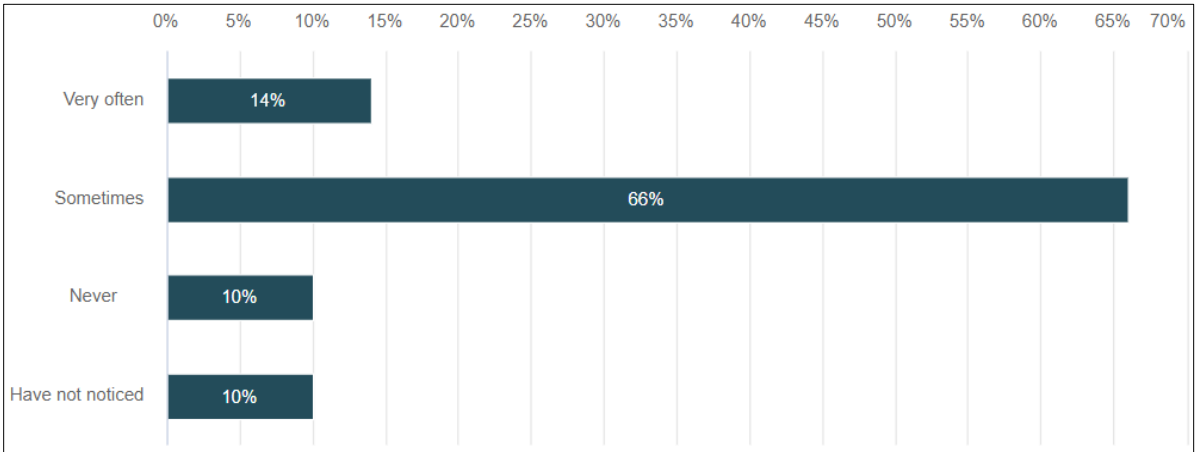
**Figure 11** summarizes the participants' experiences with various gamification techniques. 13% said they were constantly subjected to such practices. When asked if they had experienced it while using an app, 29% said they had. When taking an online course, 32% also said they experienced it. Only 1% of participants said they had never used gamification before, while 25% had not noticed it yet.




| | n | Percent |
|---|---|---|
| All the time | 13 | 13.3% |
| When using an Application (APP) | 28 | 28.6% |
| When doing an online course | 31 | 31.6% |
| Have not noticed | 25 | 25.5% |
| Others | 1 | 1.0% |

*Figure 11: Participants' any types of experience in gamification practices*

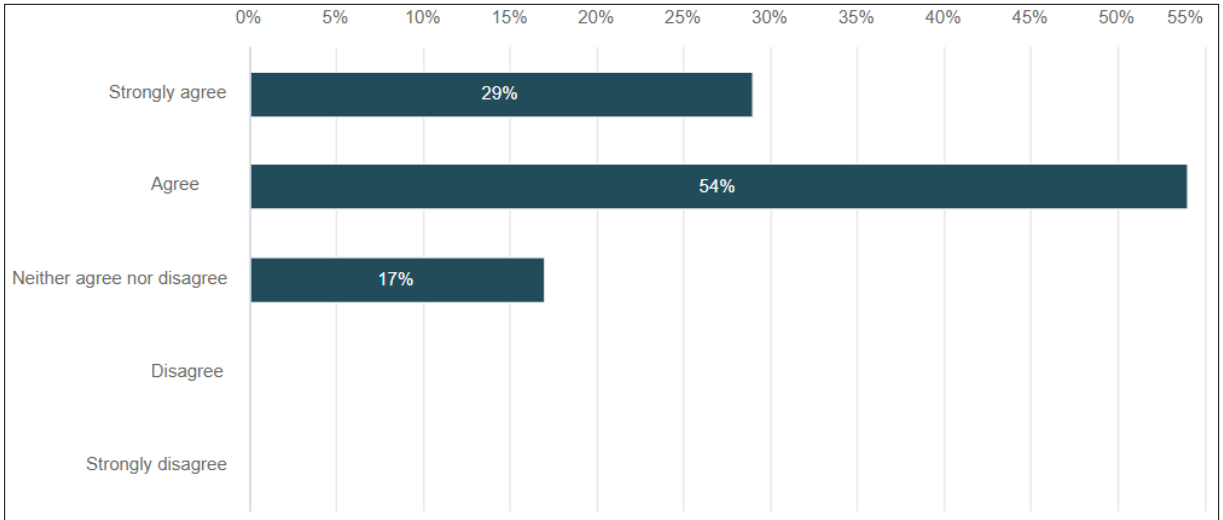
**Figure 12** summarizes the participants' experiences of using gamified APPs or performing online courses, training, and others. 14% of participants said they use these very often. 66% said they use these sometimes. Only 10% said they never experienced it. Another 10% said they have not noticed it yet.




| | n | Percent |
|---|---|---|
| Very often | 14 | 14.0% |
| Sometimes | 66 | 66.0% |
| Never | 10 | 10.0% |
| Have not noticed | 10 | 10.0% |

*Figure 12: Survey participants' experiences of using gamified APPs or performing online courses, training, and others*

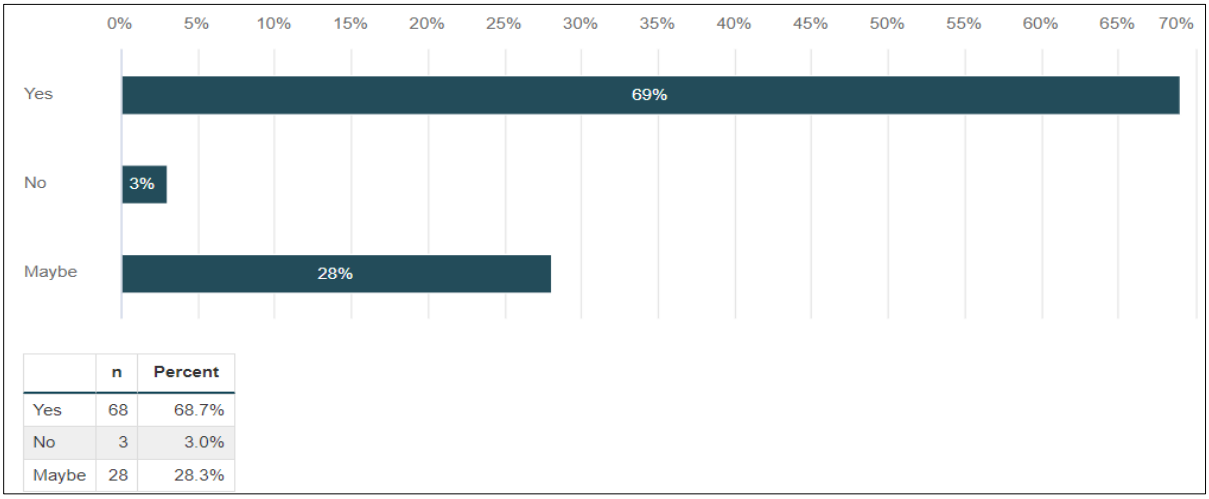
**Figure 13** Summarizes the participant's scale of agreeing or disagreeing on a question which is, "During covid situations do you think gamification can provide you an enjoyable learning experience when using an APP or doing a lengthy course?". 29% strongly agreed, 54% agreed and 17% neither agree nor disagree. No one answered "Disagree" and "Strongly Disagree".




| | n | Percent |
|---|---|---|
| Strongly agree | 28 | 28.9% |
| Agree | 52 | 53.6% |
| Neither agree nor disagree | 17 | 17.5% |
| Disagree | 0 | 0.0% |
| Strongly disagree | 0 | 0.0% |

*Figure 13: Survey participant's different answers on if gamification can provide an enjoyable learning experience during the pandemic*

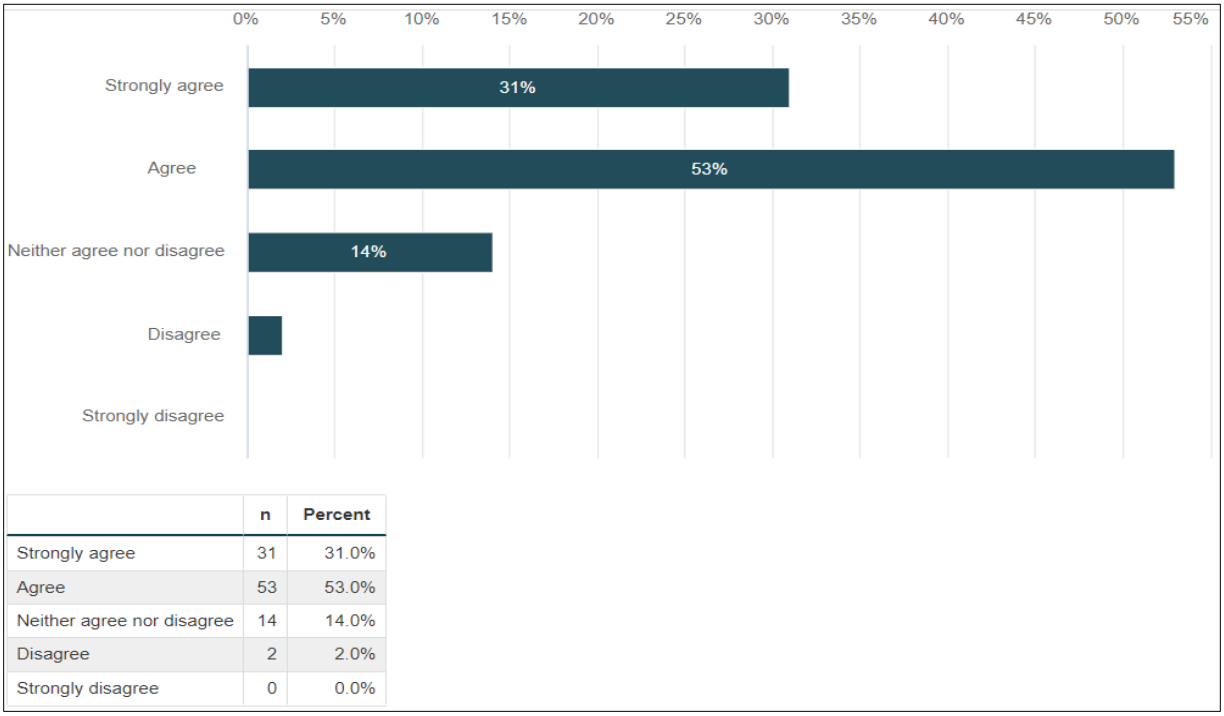
**Figure 14** summarizes the answers to the question "Do you think using gamification in a course/training/APP might increase your active participation?" from the participant's point of view. 69% of participants said yes, 3% said no and 28% said maybe.




| | n | Percent |
|---|---|---|
| Yes | 68 | 68.7% |
| No | 3 | 3.0% |
| Maybe | 28 | 28.3% |

*Figure 14: Survey participants' answers on if gamification can increase active participation*

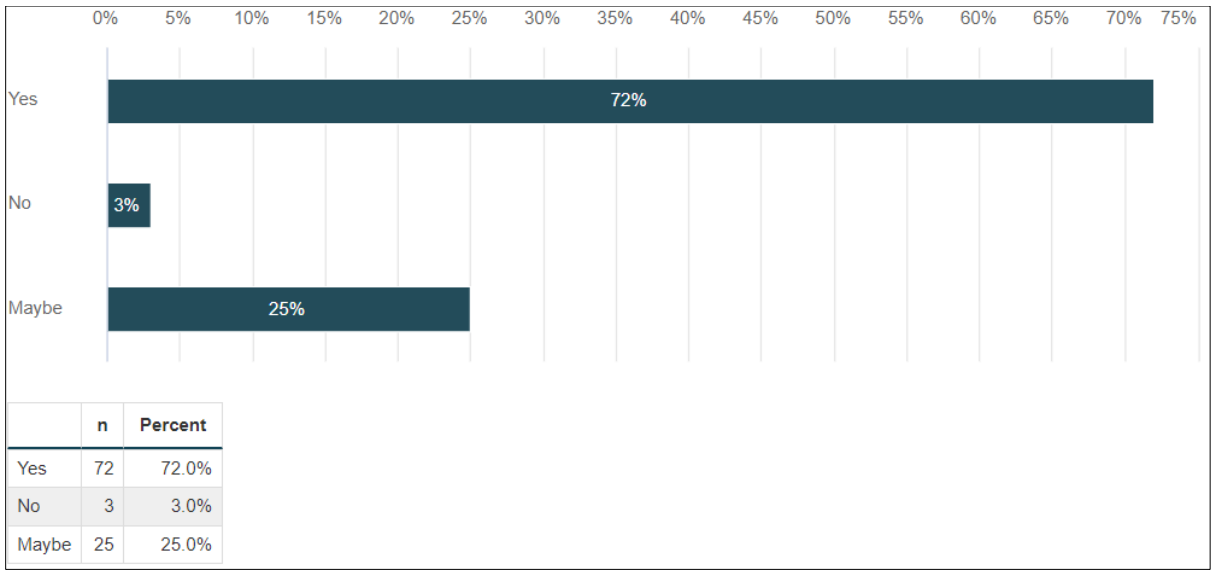
**Figure 15** showed the answers of the participants when they were asked if they think their university should use gamification in courses, seminars, and others to increase the active engagement of the students. On a point of strongly agree to strongly disagree, 31% of participants said they strongly agree with the question, 53% normally agree, 14% was neutral, only 2% disagreed and there was no answer for "strongly disagree".




| | n | Percent |
|---|---|---|
| Strongly agree | 31 | 31.0% |
| Agree | 53 | 53.0% |
| Neither agree nor disagree | 14 | 14.0% |
| Disagree | 2 | 2.0% |
| Strongly disagree | 0 | 0.0% |

*Figure 15: Survey participants' answers on whether the university should use gamification to increase the active engagement of the students*

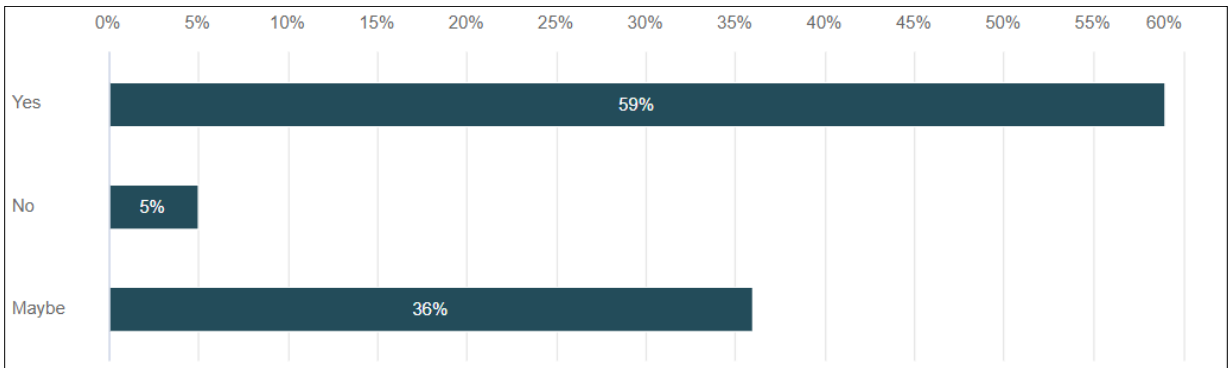
**Figure 16** shows the answer to the question "Do you think that students can be encouraged with a gamification system to collaborate online?". 72% of participants answered yes. 3% answered no and 25% answered maybe.




| | n | Percent |
|---|---|---|
| Yes | 72 | 72.0% |
| No | 3 | 3.0% |
| Maybe | 25 | 25.0% |

*Figure 16: Survey participants' answers on if students can be encouraged with a gamification system to collaborate online*

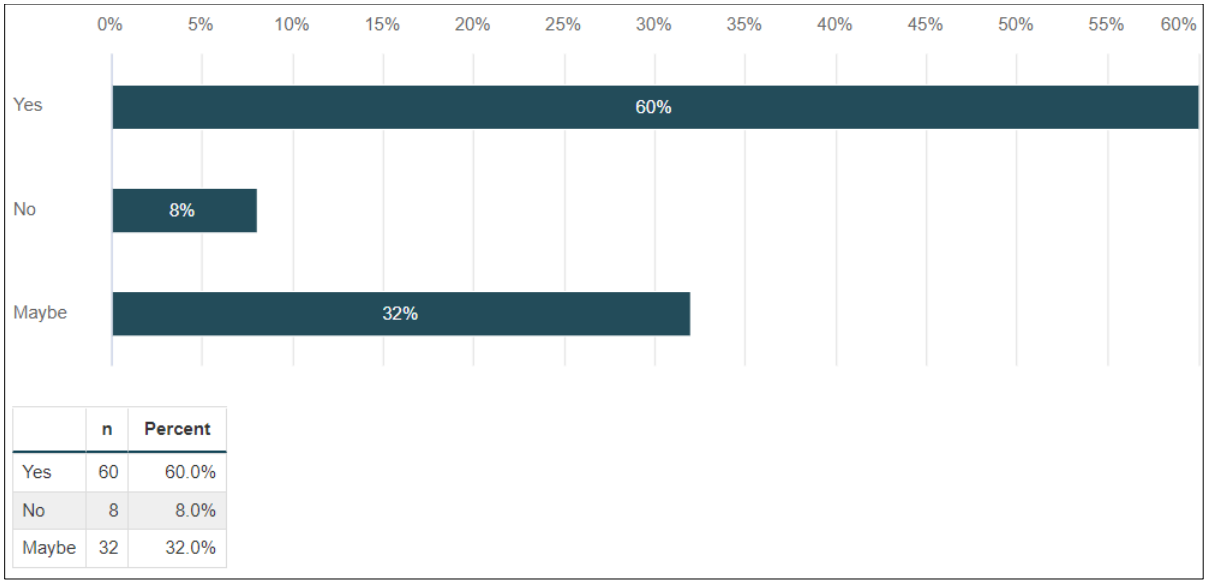
**Figure 17** shows the answer to the question "Do you think gamification can make study enjoyable so that students will concentrate more on coursework than before". 59% of participants answered yes. 5% answered no and 36% answered maybe.




| | n | Percent |
|---|---|---|
| Yes | 58 | 58.6% |
| No | 5 | 5.0% |
| Maybe | 36 | 36.4% |

*Figure 17: Survey participants answer on if gamification can make study more enjoyable so that students will concentrate more on coursework than before*

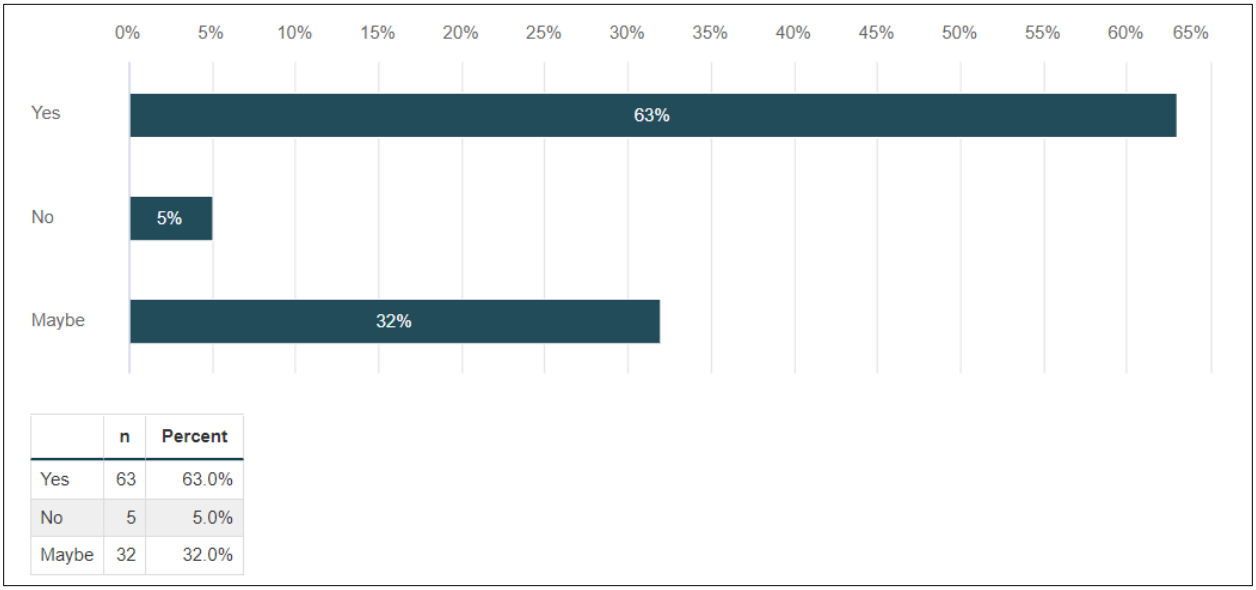
**Figure 18** shows the answer to the question "Do you think gamification can improve communication efficiency when working with others?". 60% of participants said yes, 8% said no and 32% said maybe.




| | n | Percent |
|---|---|---|
| Yes | 60 | 60.0% |
| No | 8 | 8.0% |
| Maybe | 32 | 32.0% |

*Figure 18: Survey participants answer on if gamification can improve communication efficiency when working with others*

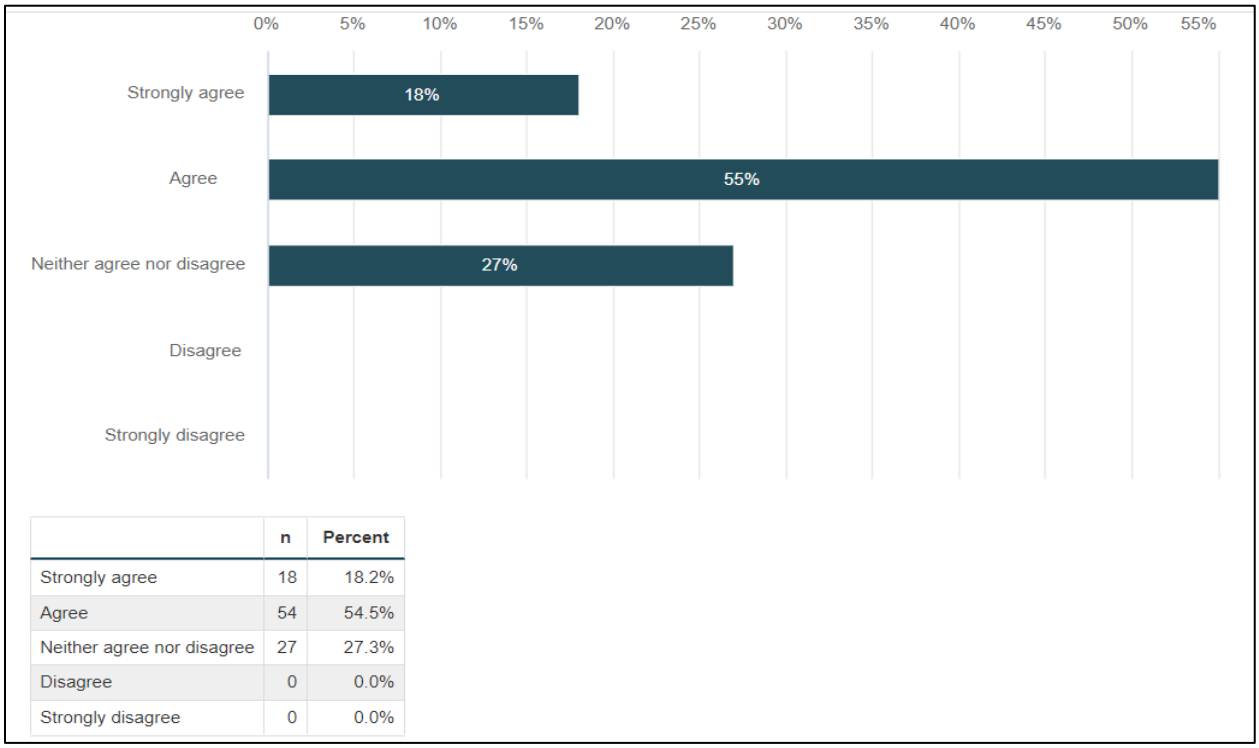
**Figure 19** shows the answer to the question "In your opinion, do gamified courses have a positive influence on students' intrinsic motivation?". 63% of participants said yes, 5% said no and 32% said maybe.




| | n | Percent |
|---|---|---|
| Yes | 63 | 63.0% |
| No | 5 | 5.0% |
| Maybe | 32 | 32.0% |

*Figure 19: Survey participants answer on does gamified courses have a positive influence on students' intrinsic motivation*

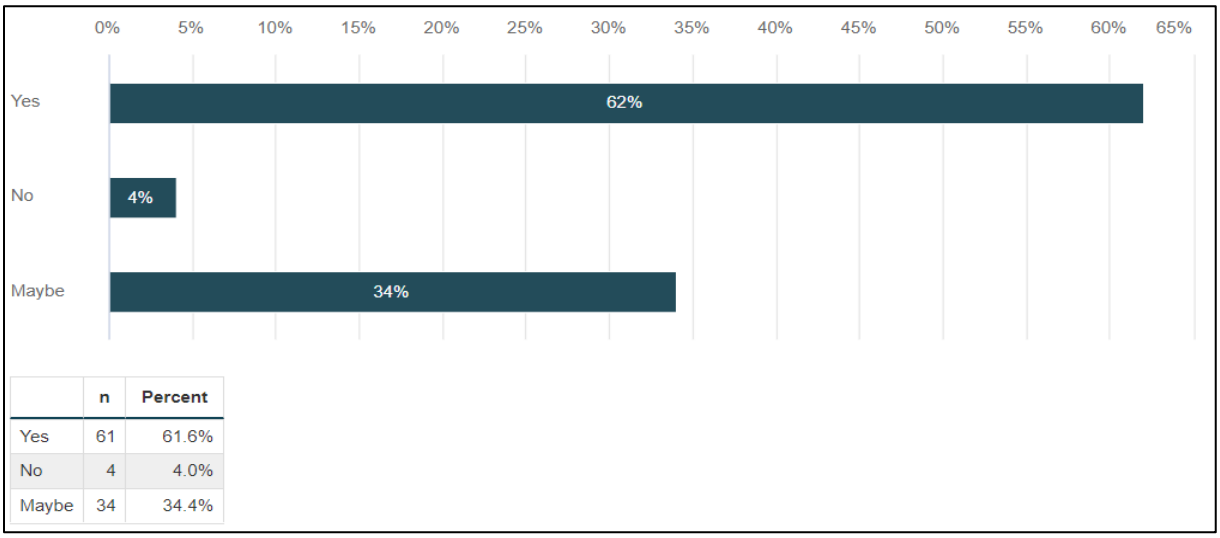
**Figure 20** shows the answer to the question "In your opinion, does gamification have a positive effect on students' overall performance?". 18% of participants said yes, 55% said no and 27% said maybe. No one answered for "Disagree" and "Strongly Disagree".




| | n | Percent |
|---|---|---|
| Strongly agree | 18 | 18.2% |
| Agree | 54 | 54.5% |
| Neither agree nor disagree | 27 | 27.3% |
| Disagree | 0 | 0.0% |
| Strongly disagree | 0 | 0.0% |

*Figure 20: Survey participants' answers on gamification have a positive effect on students' overall performance*

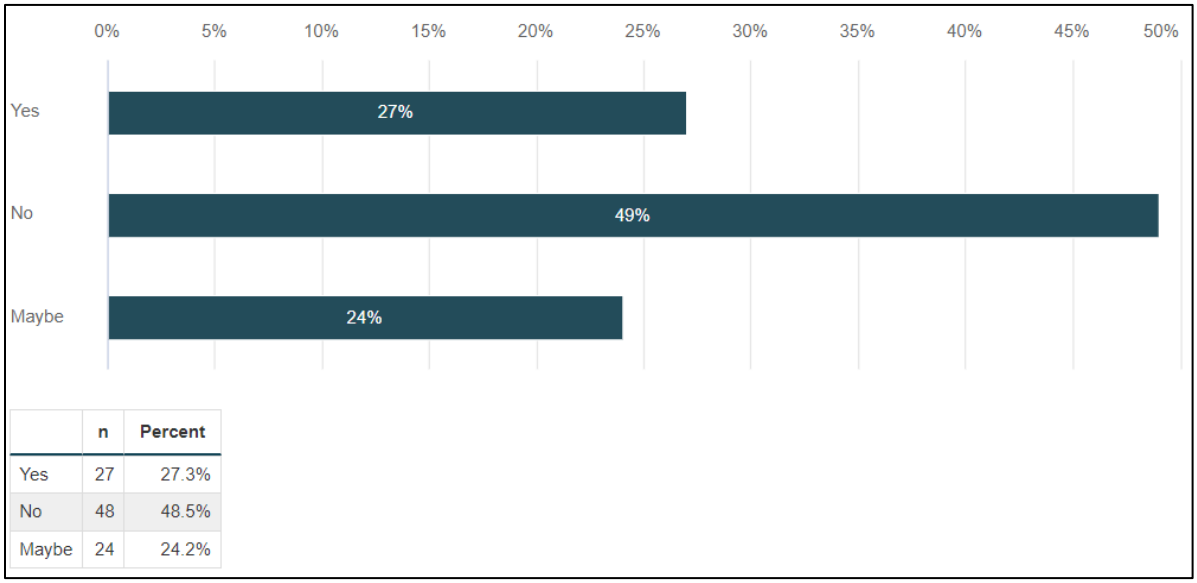
**Figure 21** shows the answer to the question "In your opinion, does gamification facilitate a better understanding of course materials?". 62% of participants said yes, 4% said no and 34% said maybe.




| | n | Percent |
|---|---|---|
| Yes | 61 | 61.6% |
| No | 4 | 4.0% |
| Maybe | 34 | 34.4% |

*Figure 21: survey participants' answers on if gamification facilitates a better understanding of course materials*

**Figure 22** shows the answer to the question "Do you see any potential problem with gamification?". 27% of participants said yes, 49% said no and 24% said maybe.




| | n | Percent |
|---|---|---|
| Yes | 27 | 27.3% |
| No | 48 | 48.5% |
| Maybe | 24 | 24.2% |

*Figure 22: Survey participants' answers on if they see any potential problems with gamification*

We have collected 18 individual answers from the participants who agreed that gamification has some potential problems. After that, we classified their responses into distinct difficulties and described the problems in the context of their responses in **table 8** below.

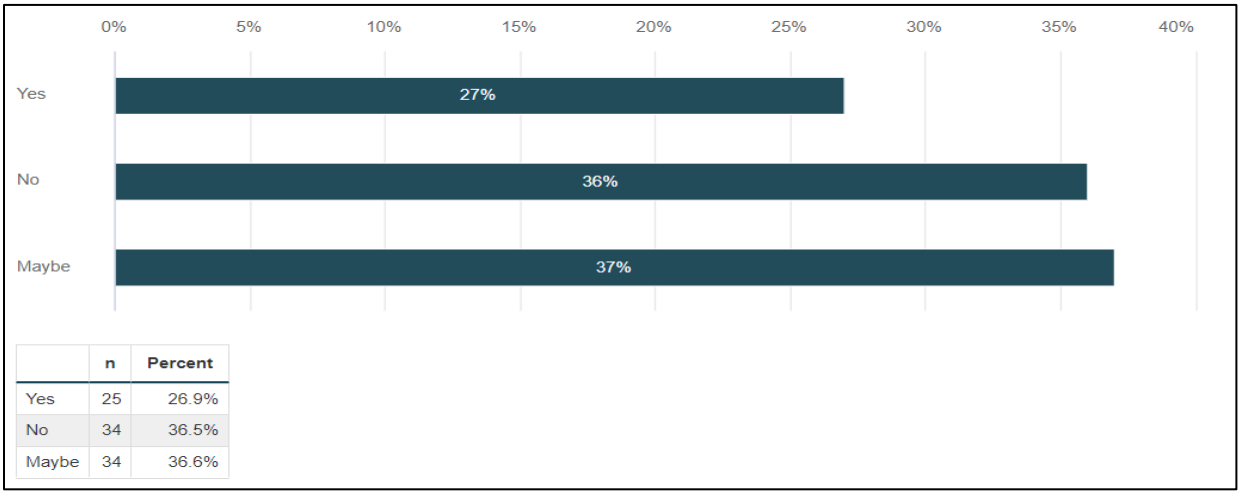
*Table 8: Explanations of potential problems in Gamification*

| Potential Problems | Explanation |
|---|---|
| If overused, it loses effectiveness | Gamification should be utilized wisely in education and other fields. Otherwise, its efficiency and functionality may be hampered. |
| The quality of the learning material can be decreased due to an additional focus on gamification of the course | If more importance is put on gamifying the course, there is a possibility that the quality of the learning materials might bear the consequences. |
| The same gamification approaches unfortunately don't suit everyone. Something that works for one group of students can completely discourage others. | Unfortunately, not all people respond well to the same gamification tactics. One item that works well for one set of students may be ineffective for another. Furthermore, there will always be a small percentage of students who will not be driven by anything, especially not by a new gamified system. |
| Distrust | Gamification in educational settings is a relatively recent trend. When it comes to adopting it in education, it may cause suspicion and uncertainty in the minds of teachers, students, and other users. |
| Decrease complexity level of materials | Introducing gamification into the educational system may decrease the complexity of the resources that are used to implement it in the first place. However, if the |

| | |
|---|---|
| | matter is handled appropriately by professionals, learning will be pleasurable and free of difficulties. |
| Playing for clicking and no learning | Quizzes and collaborative activities are required in gamified courses, and these activities can make studying more entertaining. As a result, it is difficult not to learn from a gamified course since one just has to study the bare minimum to pass the quizzes, and only after passing the first level of quizzes, will the next level be opened. However, there will always be a small number of students who are only concerned with enjoying the gamified portion of the study. |
| Professors to be retrained; course content's design to be assigned to a professional | Gamification has the potential to open up new educational possibilities in an interactive learning approach. Faculty members, as well as educators, should participate in specialized training sessions. Qualified specialists (instructional designers) should be appointed to the task of creating the gamified course materials. |
| Content and engagement | Not all content is ideal for creating gamified courses. Additionally, students may find a few gamified courses boring. Some of them might indeed dislike collaborative activities. |
| It is difficult to present the deep concept of the course | Overuse of gamification in a course might indeed cause educators and students to lose focus of the underlying concepts of the subject matter. A similar situation might arise if the course is not prepared by skilled professionals in the first place. |
| Multiple iterations of game development needed to have the necessary level of completeness - it would be a slow development process, taking feedback in each iteration and evaluating the gaps. | Multiple rounds of game development would be required to achieve the right training of completion - this would be a lengthy process involving gathering input from users in each iteration and identifying the gaps. |
| Can be addictive | Gamification offers a pleasurable collaborative learning experience, but it may also be addicting in some cases. When gamification is overused, a small percentage of students may lose interest in completing non-gamified courses. |
| Lack of attention | Implementing gamification in teaching may cause students to get distracted and bored. In addition, there is a possibility that a small percentage of students will not find the course engaging if the course design is changed significantly. |
| Students will mostly be using a smartphone, computer which is also not good for their health | It is true that if the activities of a gamified course were conducted entirely online, the use of electronic devices would expand significantly. Students who spend the |

| | |
|---|---|
| | majority of their time on their gadgets and sitting in front of them may develop health problems. Actually, because of the pandemic, online learning is the most practical solution we can think of. |
| Going off track | Implementing gamification in educational systems and in general is a new approach. That is why it might get complicated at times. |
| in use so far, there was just matching or card type in online courses. but there could be more options with vast and meaningful visualizations | So far, the only types of online courses that have been used were matching and card types in a few university courses. However, there should be more possibilities available, such as extensive and significant graphical visualization. For example, few technical, design-based, modeling courses can be gamified to understand the visual models and patterns clearly. |
| Gamification doesn't make sense in instances like critical thinking development, collaborating on multiple events, and inference development. | There will always be some courses where it is preferable not to integrate gamification. Otherwise, the course might lose its uniqueness. |
| Lack of technical skill | The use of gamification in education necessitates the use of highly competent and experienced professionals. It is possible to ruin the gamified course by including too many resources that aren"t essential. In addition, if it is not implemented appropriately, there will be certain technical errors. |
| Might be pressurizing for students, if implemented for each lecture/class | The overuse of gamification in the educational system can never be considered a beneficial development. If it is employed in every class lecture, students may feel under pressure and lose interest in the subject material. |

**Figure 23** shows the answer to the question "Do you see any barriers when implementing gamification in a course?". 27% of participants said yes, 36% said no and 37% said maybe.




| | n | Percent |
|---|---|---|
| Yes | 25 | 26.9% |
| No | 34 | 36.5% |
| Maybe | 34 | 36.6% |

*Figure 23: Survey participants' answers on if there are any barriers when implementing gamification in a course*

We have collected 13 individual answers from the participants who agreed that there are few barriers when implementing gamification in a course. We classified their responses into distinct difficulties and described the problems in the context of their responses in **table 9** below.

*Table 9: Explanations of barriers in Gamification*

| Barriers | Explanation |
|---|---|
| time-consuming | Creating a gamified course, as well as completing it, may be time demanding. Occasionally, it depends on how the educator and students approach the course in the first place. |
| to apply it when suitable | "Not understandable" |
| The variety of gamification approaches and how they affect the students | It should be noted that not all gamified techniques are effective for students. Additionally, only a few courses are so unique that they do not require gamification. |
| Not motivated team members, technical problems | A gamified course may encounter technological difficulties. Additionally, not all team members will be comfortable or have any desire to complete the gamified course. |
| cost can be an issue and proper knowledge to make the course | The implementation of a gamified course might be a cost-effective option for educators and the university. Professionals must be hired to develop the courses, or else the course will fail to achieve its true purpose. |
| Initial development iterations should be in a physical environment, before moving to the online environment. Gamification of online courses without physical experience is a bad choice IMO (in my opinion). | A terrible decision would be to implement Gamification in online classes without having a first-hand physical experience. To minimize any forms of unanticipated difficulty, first development iterations should be carried out in a physical setting before transferring to an online context. |

| | |
|---|---|
| To implement the correct balance in a course | A possible barrier in a gamified course is the fact that it might be difficult to maintain the proper balance at some points. |
| Implementing course with Gamification System | There are several (unpredicted) obstacles that professionals and educators must confront while implementing courses integrating Gamification Technology. |
| Re-creating all course materials | Creating all course content in a gamified format might be a significant load on the educator's time and resources. |
| old schoolers | It might be a significant challenge for old schoolers to re-create the course material in a gamified format because the majority of them may have little or no knowledge of the subject matter. Some of them may not be comfortable with technology in the first place. |
| Technical and the potential known or unknown effects | Technical issues, as well as the possibility of known or unknown consequences, can cause both educators and students to have difficulties while adopting new forms of courses. |
| 1) Maintaining consistent standards across international schools, 2) Technological know-how for both teachers and students, and 3) Establishing transformational Key Performance Indicators (KPI). | • One potential difficulty in successfully using gamification in a course is the ability to maintain consistent standards across all sorts of international institutes.<br>• There will be a great deal of uncertainty regarding how educators and students will adjust to the new learning system.<br>• In such a system, establishing transformative KPIs might be a difficult process for example. |

**Table 10** shows the open answers of the participants. They were requested to leave any comments or feedback they have about this survey. There were 19 responses. But 16 responses were useful and relevant to the survey.

*Table 10: Responses from the open feedback section in the survey*

| No. | Responses |
|---|---|
| 1 | I left too many questions at "maybe" or "don't know", because in my opinion university students are quite a diverse group with different approaches to studying, therefore not all of them may react similarly to the same gamification tools. For example, the badges and points usually work for me for a few weeks, but after some time their novelty wears off, and consequently the motivation, and the course isn't even over. Same for leaderboards, sometimes I just get annoyed at those and completely drop the course just because of them |
| 2 | It's a sustainable project and I hope students will be interested in it. |
| 3 | Gamification was a good solution for adopting a course for online teaching when contacts with real companies and case studies were not possible |

| | |
|---|---|
| 4 | Maybe the meaning of several questions is the same. And maybe using 1-5 like surveys would contribute a little bit to the result analysis. |
| 5 | I am considering the hardware support for the gamification experience, for example, students who use an old device might have not so pleasing experience during the game. hence the student might have a not so good impression about the course. |
| 6 | The gamification concept will be helpful if it is part of the course but in my opinion, it cannot be a full solution to describe a course |
| 7 | Gamification is a modern concept; it will improve potentiality. |
| 8 | Duolingo uses competition and leaderboards-based courses that make learning more interesting. It is a good example of gamification in a course. |
| 9 | Nothing special but the topic is very interesting. |
| 10 | This is very new but an important topic to the discussion as any kind of situation like covid can appear in future. |
| 11 | Good |
| 12 | The survey is quite interesting. |
| 13 | It will really create a positive effect if Gamification could be implemented. |
| 14 | It should be really useful |
| 15 | It will increase its popularity |
| 16 | The survey is good. The only problem with gamification is students will be using smartphones and computers for a long time and their interactions with outside people like family, friends, the world will be very limited, which is not good |

We classified participants' responses into distinct opinions and described only the useful ones in the context of their responses in **table 11** below.

*Table 11: Explanation of the participant's feedback about the survey and gamification*

| Response number | Feedback about survey | Feedback about Gamification |
|---|---|---|
| 1 | The participants answered too many questions with "maybe" or "don't know", according to him, because university students are a varied population with a variety of learning methods, and as a result, not all of them would react in the same way to the same gamification tools. | The participant wants to convey that when gamification is used in all aspects, its influence on him/her and certain students is temporary. For instance, "badges" and "points" normally work for him/her for a few weeks, but after that, their novelty wears off, and with it, motivation, and the course isn't even halfway over. Similarly, he/she may become irritated with "leaderboards" and abandon the course entirely. |
| 2 | The participant's opinion about the survey is, he/she thinks it is a component of a long-term project and that he/she hopes students would be intrigued by it. | |
| 3 | | When it was not feasible to make contact with real organizations and conduct case studies, one participant proposed that "gamification" was a |

| | | |
|---|---|---|
| | | useful alternative for implementing a course for online education. |
| 4 | One of the participants stated, “It is possible that the meaning of several questions is the same. Perhaps using a scale of 1-5, like in a survey, might help a little to get the result of the analysis effortlessly” | |
| 5 | | One participant is thinking about whether or not to include hardware support in the gamification experience. In the case of students who utilize an outdated gadget, they may have a less than satisfactory experience during the game. As a result, the student can have a negative opinion of the course. |
| 6 | | When used in collaboration with a course, the gamification approach will be beneficial; nonetheless, in the participant’s opinion, it will not be enough to adequately explain a course. |
| 7 | | Gamification is a relatively recent topic that is expanding day by day. It will increase the likelihood of success. |
| 8 | | One of the participants mentioned Duolingo, which is a gamified language learning tool. It makes studying more entertaining by including competitions and leaderboards into the curriculum. In his opinion, an ideal example of gamification can be used in a course or classroom environment. |
| 9 | | The participant is familiar with gamification approaches, which are applied in a variety of fields nowadays. As a result, he believes there is nothing particularly noteworthy about it, although he found the overall topic to be intriguing. |
| 10 | | The participant believes gamification is a unique concept, but it should be discussed in any type of circumstance. For example, if Covid may be expected to behave more aggressively in the future, gamification can be utilized to its maximum potential in such a situation. |
| 12 | The participant only finds the survey on gamification quite interesting. | |
| 13 | | The participant expressed his or her opinion on the effectiveness of gamification as a new type of learning technique. |

| | | |
|---|---|---|
| 14 | | The participant feels that if gamification is effectively used in some areas, it might have a beneficial impact. |
| 15 | Maybe the participants mention the overall popularity of gamification | |
| 16 | The overall survey seemed good to the participant | The participant expresses worry about the misuse of gamification in today's society. Since students will be utilizing their cellphones and laptops for an extended time. In addition, there will be fewer interactions with the rest of the family and the general public. |

After collecting all the feedback from the survey, we conducted TA again illustrated in **table 12**.

*Table 12: Thematic analysis of all feedback from the survey*

| Transcripts | Codes | Subthemes | Themes |
|---|---|---|---|
| 54% of participants agree that during covid situations gamification can provide them an enjoyable learning experience when using an APP or doing a lengthy course | Participants agreed about gamification's potential during a covid situation | Gamification encourages studying during a covid situation | **The learning experience during the pandemic** |
| "This is a very new but important topic for discussion as any kind of situation like covid can appear in the future" | Very latest but essential experience which can be useful if an aggressive side of covid occurs in future | | |
| 72% of participants said students can be encouraged with a gamification system to collaborate online | Gamification is an essential tool that motivates students in online collaboration | Any type of online collaboration is possible with the help of gamification | **Possibility of online learning** |
| "Gamification was a good solution for adopting a course for online teaching when contacts with real companies and case studies were not possible" | Gamification has multiple possibilities when it is used in an online course | | |
| "in use so far, there was just matching or card type in online courses. but there could be more options with vast and meaningful visualizations" | Online gamified courses should not be limited to matching or card games. Additional possibilities with meaningful visuals are possible | Gamification has the potential to make online courses more meaningful | |

| | | | |
|---|---|---|---|
| “The quality of the learning material can be decreased due to an additional focus on gamification of the course” | Course quality might decrease if educators pay extra attention to developing the gamified part of the course | Chance of missing the main concepts of the course materials | **Decreased quality of course material** |
| “It is difficult to present a deep concept of the course” | The main concept of a course can be missed when it is gamified | | |
| “To implement the correct balance in a course” | Sometimes it is tough to maintain the correct balance of materials in a course | | |
| “Re-creating all course materials” | Courses need to be done in a gamified way which can be a huge workload | Chance of missing the quality of the course materials | |
| “Content and engagement” | The problem may arise when making content for the gamified courses | | |
| “Implementing course with Gamification system” | It can be a primary barrier when designing a course with the gamified system | | |
| “Students will mostly be using a smartphone, computer which is also not good for their health” | Overuse of electronic devices can develop health issues | Excessive use of smart devices can be harmful to mental and physical health | **Can be addictive to a few students** |
| “The only problem with gamification is students will be using smartphones and computers for a long time” | Using devices for a long time is not good for students | | |
| “Playing for clicking and no learning” | Few students might focus on the only gamified part of the course | Few students may forget about other activities | |
| “Can be addictive” | Gamified courses can create addiction | | |
| “their interactions with outside people like family, friends, the world will be very limited, which is not good” | Students might miss a few interesting things in life | | |
| “If overused, it loses effectiveness” | Gamification cannot be overused in a course or anywhere, it might lose its uniqueness | Unable to acquire the main theme if the options are too many | **Need to be ready for unpredicted events** |

| | | | |
|---|---|---|---|
| “The gamification concept will be helpful if it is part of the course but in my opinion, it cannot be a full solution to describe a course” | Gamification cannot be enough to explain a course | | |
| “going off track” | If not designed properly, it might get complicated | | |
| “Multiple iterations of game development needed to have the necessary level of completeness - it would be a slow development process, taking feedback in each iteration and evaluating the gaps” | Iteratively obtaining user feedback and finding gaps would be a lengthy procedure | It can be time consuming | |
| “Initial development iterations should be in a physical environment, before moving to the online environment. Gamification of online courses without physical experience is a bad choice” | Before starting development, iterations should be carried out in a physical setting before transferring to an online setting | | |
| “the badges and points usually work for me for a few weeks, but after some time their novelty wears off, and consequently the motivation, and the course isn’t even over. Same for leaderboards, sometimes I just get annoyed at those and completely drop the course just because of them” | Few activities and reward systems of gamified courses are repetitive so students might lose interest | Some students might lose interest when it is used everywhere | **Not effective for all types of students** |
| “Might be pressurizing for students, if implemented for each lecture/class” | Students might feel the study pressure when gamification is used in every lecture or classroom activity. | | |
| “The same gamification approaches unfortunately don’t suit everyone. Something that works for one group of students can | The same type of gamified course cannot be encouraging for every student | Do not work well for all groups of students | |

| | | | |
|---|---|---|---|
| completely discourage others” | | | |
| “The variety of gamification approaches and how they affect the students” | Different gamification methods affect students differently, it can be a barrier | | |
| “Lack of attention” | Lack of focus can prevent students from getting the full experience of gamification | Lack of adaptability to the new types of learning system | |
| “Distrust” | Few people will find the new type of learning system unreliable | | |
| “Old schoolers” | It is naturally hard for old schoolers to accept modern technologies | | |
| “Gamification doesn’t make sense in instances like critical thinking development, collaborating on multiple events, and inference development” | Few courses, concepts, or activities are not made to be gamified | Few courses/ activities are so unique that they cannot or should not be gamified | **Some courses/ activities cannot be gamified properly** |
| “Establishing transformational Key Performance Indicators (KPI)” | Few courses, concepts, or activities cannot be created or presented by using gamification | | |
| “Cost can be an issue and proper knowledge to make the course” | Modern technology and proper knowledge are needed to implement gamification in a course | Proper knowledge and skill of professors and professionals are highly essential | **Proper knowledge and skill needed** |
| “Professors to be retrained; course content’s design to be assigned to a professional” | Professors should be trained, and professionals should be hired for the proper implementation of the course | | |
| “Technological know-how for both teachers and students” | In need of basic technical knowledge for both educators and students | Technical knowledge is essential for both | |
| “Maintaining consistent standards across international schools” | It is hard to keep stable principles among foreign institutes | School authority should develop knowledge in a specific field | |
| “Lack of technical skills” | Lack of technical skill of educators and students can be observed when | lack of technical knowledge | **Technical issues** |

| | | | |
|---|---|---|---|
| | implementing gamification in a course | | |
| "Technical and the potential known or unknown effects" | Other technology-related issues can appear | | |
| "Not motivated team members, technical problems" | not all team members will be motivated by gamified courses and the unpredictable technical problem might arise | lose motivation due to technical issues | |
| "Students who use an old device might have not so pleasing experience during the game. hence the student might have a not so good impression about the course" | The absence of necessary devices might make the students miss the main theme of gamified course | | |

### 4.2.3 Findings

We identified nine major themes and eighteen connected subthemes based on the analysis. The interviewees discussed their perspectives on gamification and its positive and negative effects on students and the education system.

We have found different types of feedback from all the survey results and the open comments section. We have found many unknown and positive feedback which we described in the data analytics chapter. Some of those are:

- "It's a sustainable project and I hope students will be interested in it"
- "Decrease complexity level of materials"
- "Gamification is a modern concept; it will improve potentiality"
- "Nothing special but the topic is very interesting"
- "It will really create a positive effect if Gamification could be implemented"
- "It will increase its popularity"

We also discovered some important facts concerning gamification that students should be aware of. We are outlining the themes to assist these in comprehending the feedback questions

- **The learning experience during the pandemic**: We selected this theme since the majority of respondents agreed in the study that gamification may give a pleasant learning experience during a pandemic. According to one participant, gamification is a very new yet important aspect for discussions because in the future any type of circumstance similar to covid might arise. Educators, students, and others are already utilizing this technique to minimize boredom and repetition of the material to draw greater attention to it.

- **Possibility of online learning**: 72% of participants expressed that student may be motivated to cooperate online through the use of a gamification system. It can be applied in both online

and traditional classroom settings. However, it has several applications when employed in an online course, and the best thing is that anybody can participate from anywhere.

- **Decreased quality of course material**: Educators must construct course materials from scratch. They must ensure that the course's material and deeper concepts are adequately delivered to preserve the course's overall balance. Course quality may decrease if instructors concentrate only on developing the gamified portion of the course.

- **Can be addictive to a few students**: Not only are some students addicted to gamified courses or activities, but excessive usage of smart gadgets can be harmful to their mental and physical health. Few students may focus only on the gamified part of the course, ignoring the other (non-gamified) parts. Few students may overlook some fascinating aspects of life.

- **Need to be ready for unpredicted events**: Institutes, educators, and even students need to be concerned about the unpredictability of gamification-related occurrences. It cannot be utilized excessively in a course or elsewhere for fear of losing its uniqueness. Keep in mind that gamification alone cannot adequately explain a course. If not correctly planned, it may become complex and incapable of serving the primary objective. Obtaining user input and identifying gaps iteratively would be a lengthy process. Before beginning development, iterations should be conducted in a physical environment before migrating to an online environment, which is a reasonable recommendation but time-consuming.

- **Not effective for all types of students**: Utilizing gamification in a course or activity does not work well for all groups of students. Because a particular gamified course cannot be motivating for all students. Due to the repetitive nature of the activities and reward system in gamified courses, students may lose interest. They will feel the pressure of studying if gamification is included in every lecture or classroom activity. Students may be unable to fully enjoy gamification due to a lack of focus. Few students may find the new method of education untrustworthy. It's natural for old schoolers to have difficulty accepting the latest technologies.

- **Some courses/ activities cannot be gamified properly**: Everyone should embrace the reality that not all courses, concepts, or activities are gamified. Few courses/activities are sufficiently unique that they cannot or should not be gamified, and students want to experience them in their original state.

- **Proper knowledge and skill needed**: To incorporate gamification in a course, modern technology and appropriate understanding are required. Professors should be trained, and specialists should be employed to ensure that the course is implemented properly. At times, it might be difficult to maintain consistent norms among international institutes. That is why instructors and students equally require basic technological expertise.

- **Technical issues**: When new technology is introduced, technical issues develop. "Lack of technical understanding" is included in this section as a technical concern. When educators and students employ gamification in a course, they demonstrate a lack of technical ability. Not all team members will be motivated by gamified training, and unplanned technological

difficulties may occur. The absence of essential gadgets may cause students to miss the gamified course's core concept.

## 4.3 Co-design Workshop

In December 2021, we organized a co-design workshop on gamification at LUT University. This university was working as a living lab for the workshop. We needed special permissions to hold the workshop inside the university because of the COVID-19 situation. Some photos of the co-design workshop are shared below in **figure 24**.

*Figure 24: Some photos of co-design workshop*

### 4.3.1 Participants

There were 15 participants including my first and second supervisor. All are related to LUT university but from a different departments. Some participants were professors, Ph.D. students, staff, alumni, newcomers, and so on. Later, during the activity session, 15 participants were divided into 4 groups. Four group members' photos are shared in **figure 25**.

*Figure 25: All four group members during co-design workshop activities*

### 4.3.2 Procedure

The entire session was divided into the sections below.

- Conversation starters (20 mins)
- Sharing some quotes from interviews (5 mins)
- Sharing Survey Results (5 mins)
- Workshop activities (30 mins)
- Peer review and feedback (10 mins)
- Finishing up

The sessions are vastly described below to get a few ideas about the co-design workshop activities.

- **Conversation starters**: We began the event with a brief introduction and greetings to create a

comfortable and relaxed atmosphere. Then we began to discuss our topic, our goal, and why we were holding this workshop. We made a presentation slide and shared it with the participants so that they can have visual ideas about the whole workshop goals and activities.

**Introduction**: We began this section with a brief overview of gamification and its value in education. Gamification in education is the process of incorporating game-based aspects such as point scoring, peer rivalry, teamwork, and score tables to increase student engagement, aid in the assimilation of new material and assess students' understanding. Additionally, we discussed

gamification's global market worth to demonstrate its continued appeal throughout the year which is illustrated in **figure 26** below.

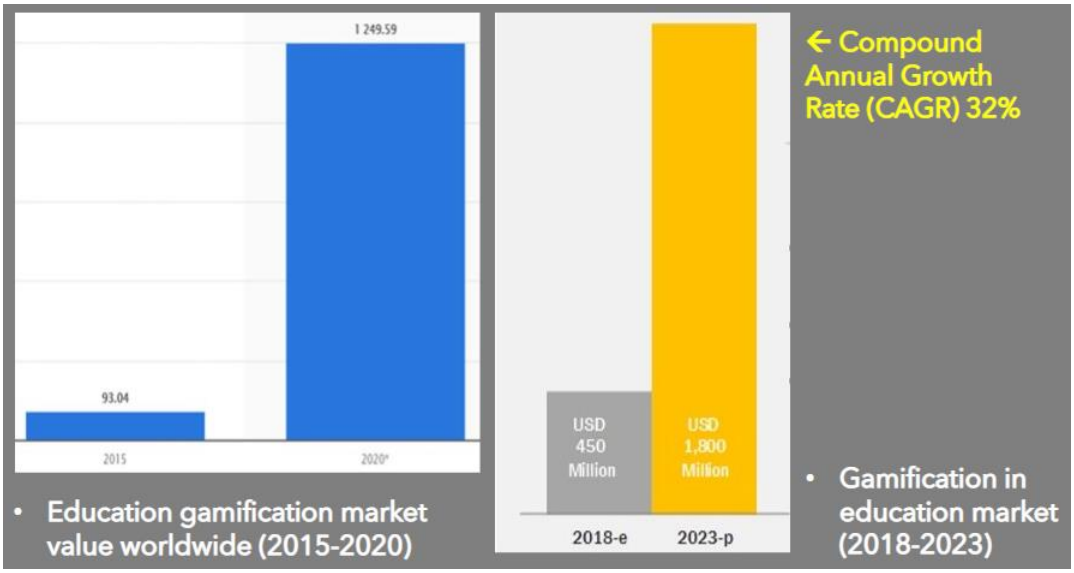



*Figure 26: Gamification in the education market, figure adapted and edited from* (*Statista, Education Gamification Market Value Worldwide*, 2016; *Marketsandmarkets, Gamification Education Market*, 2020)

**Gamification in education, with an example**: To engage people, motivate action, promote learning, and solve problems, game-based mechanics, aesthetics, and game thinking is used. We gave a vast description of a few popular gamified apps, such as Kickstarter, Quizlet, Khan Academy, Duolingo, ClassDojo, and Kahoot (**See figure 27**).

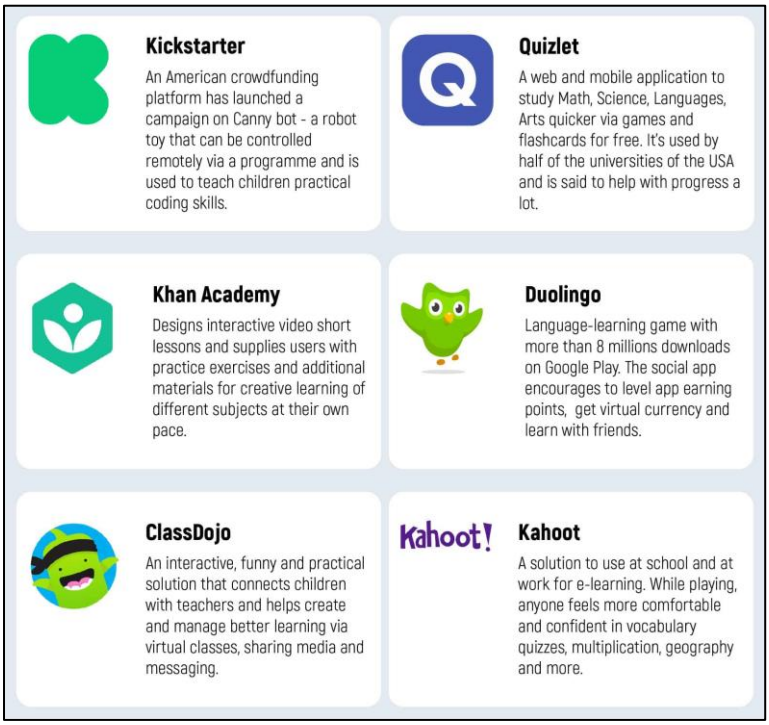



*Figure 27: Gamification example in education, figure adapted from* (Kvartalnyi, 2022)

Because of the short time we only described the language learning gamified Application named Duolingo. Its tailored learning technique is intended to assist the user in efficiently acquiring and analyzing the language. When a user masters new phrases, words, and grammar, he or she may win virtual coins, unlock new and higher levels, and monitor their fluency development over time. (*Duolingo*, no date)

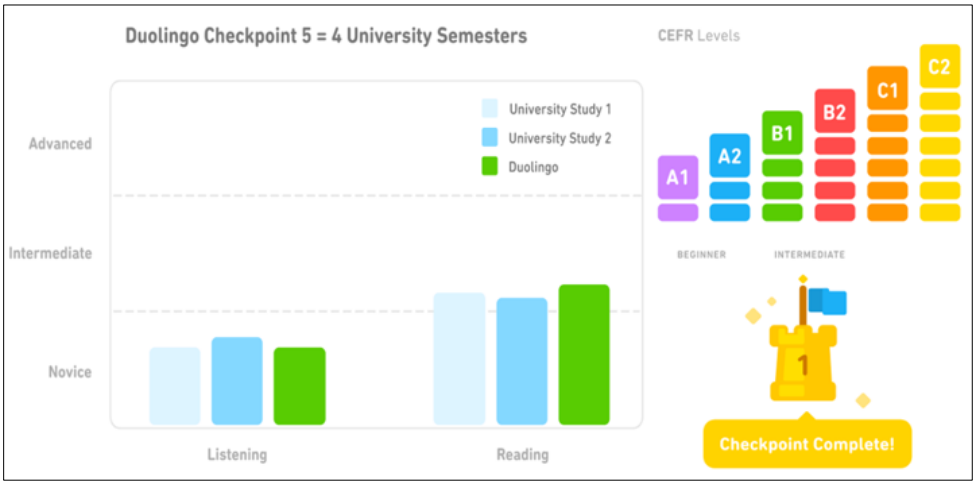



*Figure 28: Efficacy in Duolingo, figure adapted and edited from* (*Duolingo, Efficacy*, no date)

The implicit teaching strategy used by Duolingo promotes long-term memory to improve communication in a new language. For language competency, its courses are aligned with the worldwide standard level known as CEFR (Common European Framework of Reference), as illustrated in **figure 28**. (*Duolingo, Efficacy*, no date)

**Introduce gamification to a course**: There are various ways we can introduce or implement gamification in a course. Some methods are: gamify Moodle, establish frequent inter-class competitions, gradual rise in difficulty, tracking of progress, social networking, the system of points and advancement, unlocking content with action.

**Gamification during a pandemic**: During the pandemic, gamification was developed in the fields of science, technology, engineering, and mathematics (STEM). The gamified exercise was highly welcomed by learners, who deemed it to be effective, instructional, interesting, and, in some circumstances, even enjoyable. The majority of the research evaluated revealed a love of learning and favorable attitudes toward it, which are directly tied to intrinsic motivation.

**Sharing some quotes from interviews**:

A few important quotes were shared in the presentation. Some of these are-

- "students can be encouraged, they can have a better learning experience, they can be more engaged" – Respondent A
- "gamification, a good change, or engage people better, of course, people need to be interested in those things, otherwise, it won't happen" – Respondent B
- "…if you value being the best in a kind of competitive way, then an extrinsic motivator will work for you, but not everybody is that competitive so if you value actually learning as a kind of goal in itself" – Respondent C

- “I think not only software engineering students, but all students can be motivated through gamified experiences” – Respondent D
- “The potential problems with giving gamification I think oversimplifying and the lack of creativity” – Respondent E

The purpose of including a few comments on interview excerpts during the presentation session is to show participants that our professors have extensive knowledge and experience in the field of gamification. This may encourage them to participate more actively in workshop activities.

**Sharing Survey Results**:

The presentation included a few survey results. The survey was completed by all workshop participants. A few survey findings were presented to participants to encourage them throughout workshop activities.

- Survey question number 2: Are you familiar with the term “Gamification”?
- Survey question number 5: During covid situations do you think gamification can provide you an enjoyable learning experience when using an APP or doing a lengthy course?
- Survey question number 6: Do you think using gamification in a course/training/APP might increase your active participation?
- Survey question number 8: Do you think that students can be more encouraged with gamification systems to collaborate online?
- Survey question number 13: In your opinion, does gamification facilitate a better understanding of course materials?

The purpose of including survey results in presentation session is to appreciate participants’ efforts and to encourage them to conduct workshops that is related to the survey topic.

**Workshop activities**:

There were 15 participants, and they were divided into 4 groups. There were 3 fun activities in the co-design workshop. After finishing the 2nd and 3rd activities there were a few feedback sessions for each group. After finishing the 1st activity there was a 30-minute coffee break for the participants. All activities are described below:

**Activity 1**: Play Kahoot!

We used a Gamified Application “Kahoot” for activity 1. Before starting this activity, we described the App shortly. Kahoot is a learning software or platform that enables the creation and customization of learning games and trivia quizzes on any topic or context in any language. Anyone may be a host, creating and running live games with customized questions displayed on a large screen and shared with remote players.

After describing the App, a link was given to participate in the gamified quizzes. They logged in from their mobile or laptop. The main laptop showed the questions, and the answers were given by participants. It also shows every participant’s position in the quiz. There were a few basic questions about LUT University and Finland.

**Activity 2**: Play a cardboard game

4 groups (A, B, C & D) containing 3-4 participants were formed during this activity.

Each group was given 4 cardboard papers which contained a few areas (icons), such as “Moodle”, “quiz”, “assignment”, “online lecture”, “survey”, “pop-up quiz”, “breakout room activity”, “basic course for freshers” and, “surprise test” illustrated in **Figure 29**.

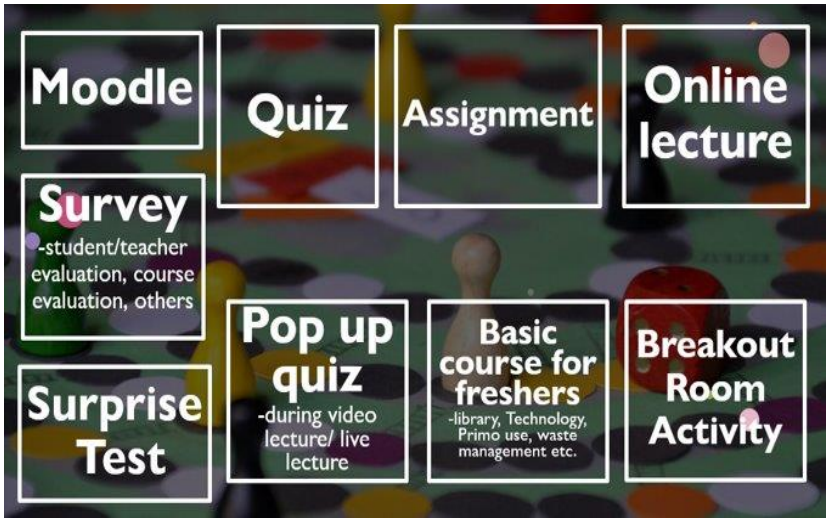



*Figure 29: Nine areas used in activity 2*

Here, we described all the nine areas to the participants so that they understand the activities more clearly.

- “Moodle” is a popular learning management system (LMS) that is extensively used to promote student cooperation in online learning contexts (Martín-Blas and Serrano-Fernández, 2009). Due to its adaptability and user-friendly interface, it is possible to create a gamified learning environment. The Moodle platform permits the incorporation of game components such as time limits, badges, chatrooms, leaderboards, discussion forums, indications of activity completion, progress bars, scoreboards, plugins, limited access, and points. (Hasan, Nat and Vanduhe, 2019)
- The phrase “survey” is a broad term that encompasses a variety of research objectives, sample and recruiting procedures, data collecting tools, and survey administration methodologies (Ponto Julie, 2015). At LUT university, we participate in online surveys to evaluate courses and teachers’ performances.
- “Surprise test” is an examination whose time and date are not specified.
- “Quiz” refers to a short test. Most of LUT’s courses have such tests every semester.
- Very few LUT courses have a “Pop-up quiz” option. It is similar to a quiz, but it will appear when attending a live online lecture or recorded online lecture. It can be a part of a breakout room activity.
- “Assignment” is a term that refers to a task or piece of labor that is assigned to someone as part of their employment or course of study. Most of the LUT’s courses have assignments every semester. It can be lengthy sometimes.

- We do not have this exact activity “Basic course for freshers” for new students but we have short courses for example, how to collect a book from the library physically or from an online library.
- “Online lecture” is a type of educational lecture that is meant to be delivered through the internet. Lectures are videotaped, audiotaped, or both, and then posted to and viewed on our course’s Moodle. At the university, we have live lectures which are saved as online lectures.
- The “Breakout room activity” are sessions that are split off from the main Zoom (or Microsoft Teams) meeting. Participants meet in smaller groups and are completely isolated in terms of audio and video from the main session. Such activity can be used for collaboration and discussion during the meeting (*Zoom, Breakout rooms*, 2022). During the pandemic, such activity is commonly used in online classes.

There were a few templates (game elements), such as “star” (with 1-5 values), “reward”, “coin”, “cross”, “leaderboard”, “badge” and, “avatar” illustrated in **Figure 30**.

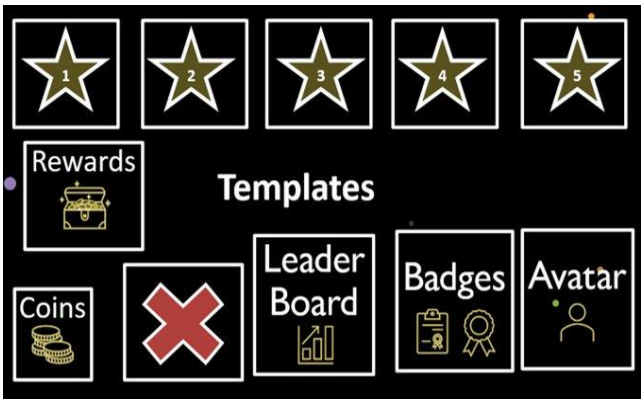



*Figure 30: Few game elements (templates) used in activity 2*

Here, we described all the game elements to the participants so that they will understand the activities more clearly.

- Typically, the term “Star” or “golden star” refers to a prize in a real-world game or gamified learning. We used these with a value of 1 to 5 in the workshop activity to evaluate the intercity of gamifying any area. For instance, “5-star” indicates that the region should be gamified but is not vital. “Star” with a value of 5 indicates that the region is in urgent need of gamification.
- “Reward” is handled through the usage of points, which can be redeemed for further customizable choices. This solution may be thought of as a mix of “Points” and effective reward programs (Hallifax *et al.*, 2019).
- A “Badge” is a technique or mechanism for displaying the user’s progress and accomplishments within the system. Users progress through levels and are awarded badges for actions such as extremely unusual findings. (Thiel, 2016)
- “Avatar”, as a system provides a space for storing information on a single user or for the user to modify. Users are characterized by a personalized avatar that they select and upload to galleries for other users to watch, rate, and comment on. (Thiel, 2016)
- The term “Coin” is used less frequently as a game element because it is included in the reward. However, we offered this aspect to the participants to determine the type of reward they desire in specific areas.

- The “Cross” does not refer to a game element; rather, but a template we employed during activity 2. Participants can place it in areas that they do not prefer to be gamified.
- A “leaderboard” provides a place for the display of information about a particular user or the modification of such information by the user. It allows users to compare their development to that of other users via competition. (Thiel, 2016)

Participants were asked to place the templates on the different areas of the cardboard. They can place one or more templates on the areas, or they can keep the area empty. After finishing the task there will be a feedback session. 20 minutes was given for activity 2 and Extra 10 minutes was given to describe the activity and to share feedback by each participant of each group.

**Activity 3**: Design a course

Every Group (of 3/4 person) are given a big piece of art paper, pencils, coloring pens, etc.

The first question was “Keeping a course in mind, you have to sketch it down how do you want your course to be designed in a gamified way?”.

The second question was “Other than having an enjoyable learning environment, active engagement, and so on, how do students can benefit when using gamification in a course?”

30 minutes was given for both questions. Extra 10 minutes were given to describe the activity and share feedback. After finishing the session one member from each group must come forward and present the solutions they have made.

- **Peer review and feedback**: After finishing the 2nd and 3rd activities one participant from each group described their collaborative work briefly.
- **Finishing up**: For this part, we described a few facts about gamification that we gathered from the interview and survey results. Gamification has been shown to improve communication and teamwork during co-design workshops. At the end of the workshop session, participants were requested to write down “one word” about gamification in Mentimeter. It enables the creation of engaging classroom quizzes (similar to Kahoot!) as well as live polls, word clouds, and surveys (Simon Deignan, 2021). The result as a word cloud is shown below in **figure 31**.

*Figure 31: Word cloud in Mentimeter made by participants during the co-design workshop*

### 4.3.3 Data Analysis

All participants successfully finished all activities within the required time limit. Few feedbacks from both “Activity 2” & “Activity 3” are given below:

**Activity 2:** It includes a description of the activities and feedback from all group members:

**Group A**: The photo of group A’s activity 2 is illustrated in **figure 32** below.

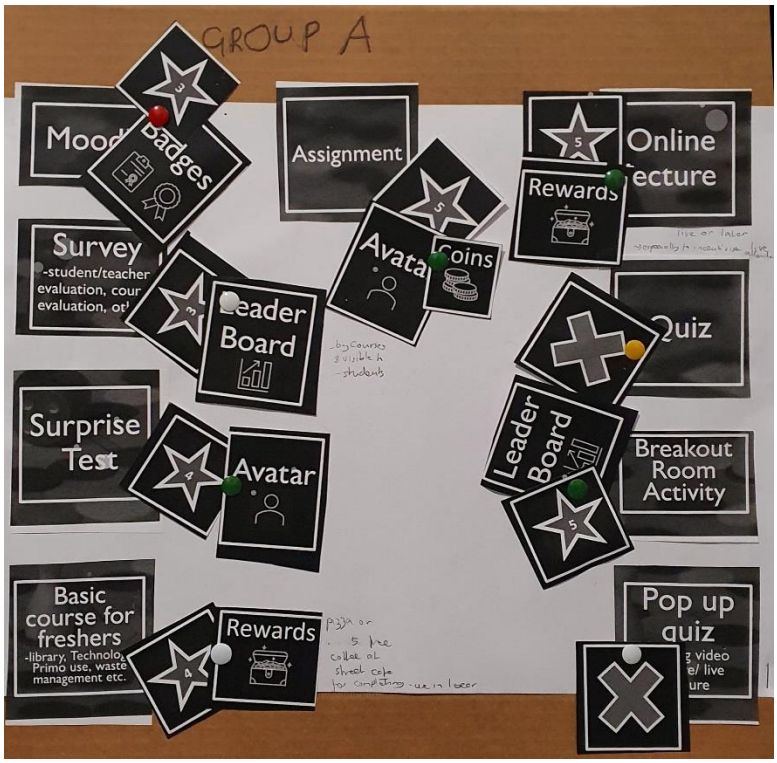



*Figure 32: Group A’s activity 2 during the co-design workshop*

The result of activity 2 of group A is described with the participant’s feedback in **table 13** below.

*Table 13: Group A’s feedback in activity 2*

| Areas | Templates | Feedback from group A |
|---|---|---|
| Moodle | • 3-star<br>• Badge | • “We gave a 3, if you think about the activities that somebody is doing on Moodle over time, that they may be on it more often. They may be the first person to go and look at certain activities”<br>• “maybe that could lead to some sort of Moodle badges to say that they’re an active engager or something”<br>• “So it could be gamified but it’s not that important” |
| Survey | • 3-star<br>• Leader board | • “especially this valuation surveys, wouldn’t it be fun because we already as professors, we get to see how everybody’s doing”<br>• “also show this to the sort of students need to have a leaderboard of courses so that would be maybe an incentive to |

| | | |
|---|---|---|
| | | do the surveys would be that you could then help people to see which were the most fun and this causes to be” |
| Surprise test | • 4-star<br>• Avatar | • “They can make people feel a bit more comfortable about doing it and then get over their nerves”<br>• “We could gamify it and so we put forth by importance, or maybe that it shouldn’t be that because it would give you much more anxiety if it was a leaderboard and people could see how you did”<br>• “So you just get like a personal referral rewards your avatar so that’s an incentive just for yourself” |
| Basic course for freshers | • 4-star<br>• Reward | • “wouldn’t be fun if because you’re just turning out and learning new stuff maybe those, especially as Moodle, things might be a bit boring so we put 4 for gamifying”<br>• “and it might be nice if you’ve got rewards for completing all of this boring kind of free stuff like free coffee, and maybe five free coffees over the course of the year” |
| Assignment | • 5-star<br>• Coin<br>• Avatar | • “assignments to go five nobody likes assignments apparently. So we could gamify the assignments and people could have coins and they can spend them on their avatars” |
| Online lecture | • 5-star<br>• Reward | • “online lectures, there’s a difference between doing them live or watching them later”<br>• “We should try and incentivize people to watch them live even if they could maybe still go see the recording after”<br>• “We put five, high important so that they could be rewards so especially this incentive for live attendance, but we didn’t say what the reward could be. Maybe similar to here” |
| Quiz | • Cross | • “Quizzes are kind of already is already gamified. So let’s not add anything” |
| Breakout room activity | • 5-star<br>• Leader board | • “For the breakout room activity because people normally go there and just kind of chat to each other and say, I don’t know why I’m doing that”<br>• “We should high priority tried to gamify it and maybe some kinds of activities or challenges that people could do with some leaderboard”<br>• “We get people more engaged in doing things like breakout rooms” |
| Pop-up quiz | • Cross | • “For the pop-up quiz, we kind of said that they intrinsically have this kind of gamification element” |

**Explanation of Group A’s feedback**:

- Group A prefers their “Moodle” to be gamified but to a certain extent. Only badges can be added there.
- From a professor’s point of view, it would be exciting for them to see how their students are doing by adding a leaderboard (and some incentives) to the “survey” area.

- The group thinks “surprise tests” might make people uncomfortable, so they recommended not to use a leaderboard as a game element or template here. But an avatar can be useful for self-motivation.
- They prefer “basic course for freshers” should be gamified and simple rewards can be given after finishing it.
- “Online lectures” should be gamified, and the attendees should get rewards.
- They highly recommend “breakout room activity” to be gamified. To ensure student engagement a leaderboard can be added to see their daily activities or challenges.
- The group recommends not to gamify “quiz” and “pop-up quiz” areas.

**Group B**: The photo of group B’s activity 2 is given below in **figure 33**.

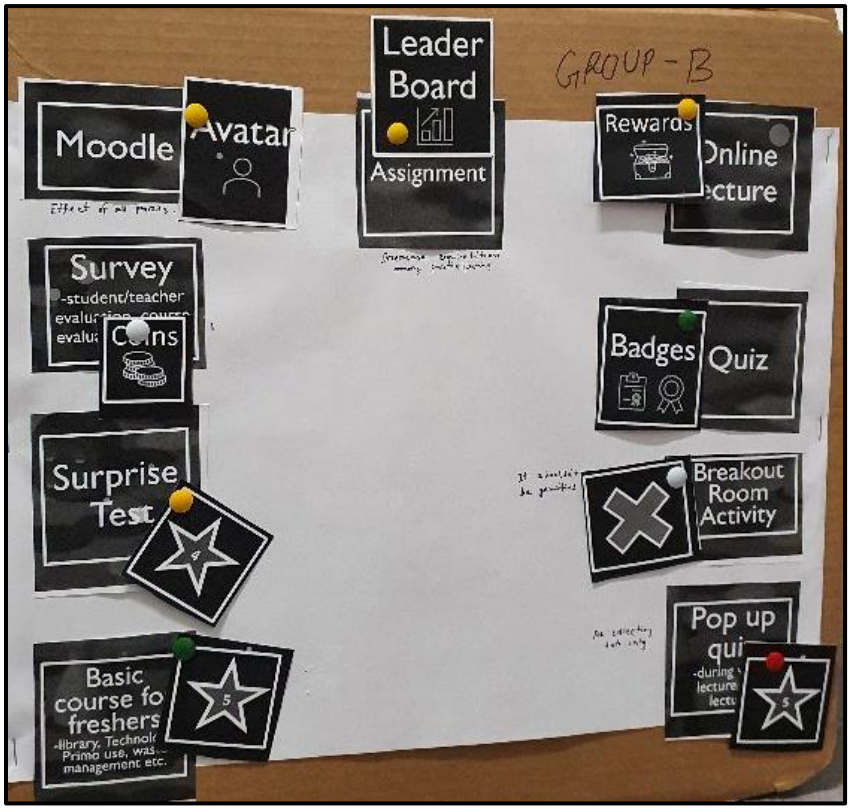



*Figure 33: Group B’s activity 2 during the co-design workshop*

The result of activity 2 of group B is described with the participant’s feedback in **table 14** below.

*Table 14: Group B’s feedback in activity 2*

| Areas | Templates | Feedback from group B |
|---|---|---|
| Moodle | • Avatar | • “We are thinking Avatar is a character that if you have a good point, some reward (a cap) or something, and if you fail, you remove the cap or something like this”<br>• “We think we didn’t go overthinking the model will be an effect couple of parameters from here”<br>• “We didn’t put the stars but it means that we totally agree with the gamification of the module and that sort of thing” |

| | | |
|---|---|---|
| Survey | • Coin | • "People don't have enough time to go through the readings and to spend on a survey and also sometimes difficult to understand"<br>• "So we can put interest in money or anything. People might spend some time and also try to read the new topics and participate in their" |
| Surprise test | • 4-star | • "a surprise test is not extremely bad, but pretty annoying things. So we wanted it as gamified"<br>• "you can find them then it could be very efficient and make it interesting to the students or participants" |
| Basic course for freshers | • 5-star | • "waste management things, this is really interesting if you might get gamification because it's more good way to explain how it should be"<br>• "it's pretty boring to read and do the stuff, so if you put some gamification here, this could be a very good point" |
| Assignment | • Leader board | • "It could be a situation that the leaderboard, you make encouragement and making competition between the participants" |
| Online lecture | • Reward | • "online lecture is the pretty boring thing sometimes. So, if there is any rewards or something"<br>• "it encourages student's participation. So the reward is something important" |
| Quiz | • Badge | • "if we are in any specific topic, let's say it's related to IT, so if anyone completes the quiz and passed it, then they will get a batch, it says he is proficient in IT" |
| Breakout room activity | • Cross | • "We totally disagree that, it should not be gamified. We think that it's a very serious topic and has to be discussed by like, professional way or right manner, which should not be okay" |
| Pop-up quiz | • 5-star | • "so it could be not for reading but only for collecting data about how the students are learning. And we also agree that it shouldn't be gamified"<br>• "also thinking that we give 5, yeah, which helps that if we can get something" |

**Explanation of Group B's feedback**:

- Group B did not put any "star" in the "Moodle" area, but they want this area to be gamified and only avatars can be used here.
- They mentioned incentives as "coin" can encourage students to participate in the "survey".
- The group prefers "surprise test" to be gamified because students will be encouraged to spend some time on it.
- Sometimes doing any "basic courses (for freshers)" which do not require any grading can be very boring, so the group strongly prefers such courses to be gamified.
- The group thinks students can be motivated if they can see their and others' results on the leaderboard for their assignments.
- There should be a reward system for "online lectures" to get rid of boringness.

- The group thinks students should be appreciated for their "quiz" results. So only badges can be implemented to show their proficiency in a course or program.
- They also think "breakout room activity" should be handled professionally so they do not prefer gamification there.
- The group thinks "Pop-up quiz" needs to be gamified in a sense that educators can collect data about how students are learning.

**Group C**: The photo of group C's activity 2 is given below in **figure 34.**

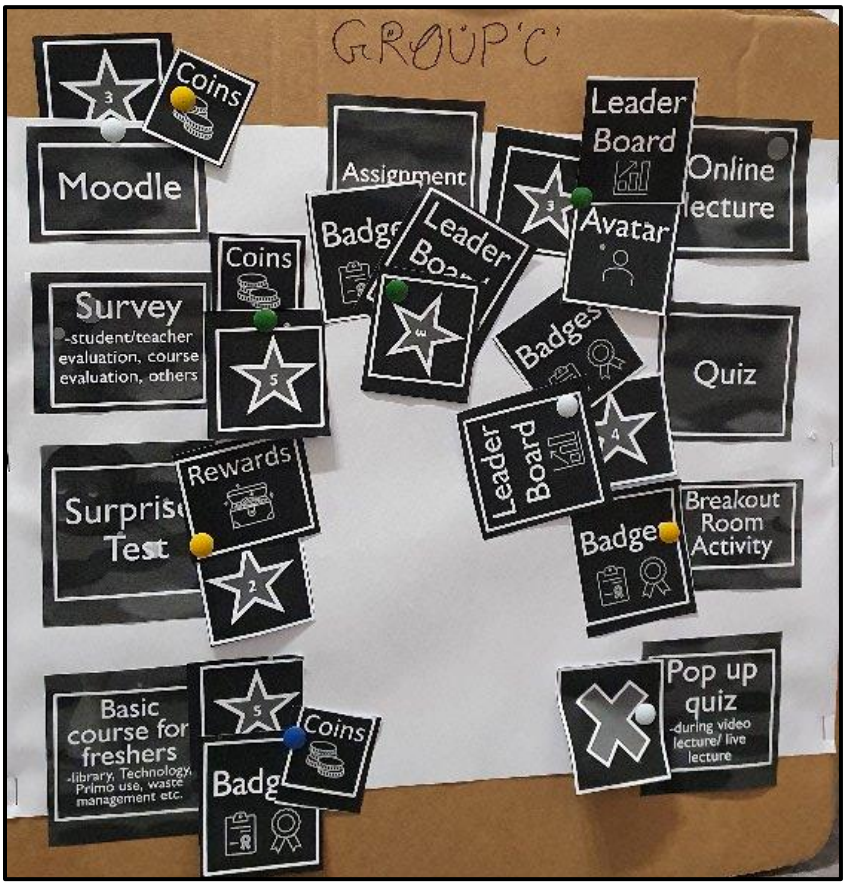



*Figure 34: Group C's activity 2 during the co-design workshop*

The result of activity 2 of group C is described with the participant's feedback in **table 15** below.

*Table 15: Group C's feedback in activity 2*

| Areas | Templates | Feedback from group C |
|---|---|---|
| Moodle | • 3-star<br>• Coin | • "We have given 3 here because we believe that we should gamify Moodle, not completely, not everything should be gamified"<br>• "So maybe say 50% of the process could be gamified"<br>• "we were giving coins because sometimes it's not always, you know, just the gamification in terms of his motivation sometimes it could be some cash reward also" |

| | | |
|---|---|---|
| | | • "for completing a very nice course or something very important and for students, it will be very beneficial" |
| Survey | • 5-star<br>• Coin | • "So for surveys, we believe, again, money goes with the survey, and it should definitely be limited"<br>• "because it's also very boring. So we agreed to that" |
| Surprise test | • 2-star<br>• Reward | • "Surprise test. Rewards. Yes. Sometimes it's necessary. That's why it's two. We don't recommend it. We don't support it. But we understand that it's sometimes necessary" |
| Basic course for freshers | • 5-star<br>• Coin<br>• Badge | • "Yeah, basic course for fresher, it should definitely be gamified"<br>• "We obviously see that in waste, recycling, and management we get money when we deposit our bottles and beer cans and such, So yeah, that's should be there, More gamified"<br>• "and badges, people should be, you know, recognized. For such kind of activity" |
| Assignment | • 3-star<br>• Leader board<br>• Badge | • "We should give badges, it should be gamified to a certain extent, but obviously not every assignment could be gamified. There are certain situations where people need a more serious, you know, written or description, things like that"<br>• "But yes, we do need a leaderboard" |
| Online lecture | • 3-star<br>• Leader board<br>• Avatar | • "We support that it should also be to some extent gamified should have leaderboard because we obviously we saw in Kahoot and everything, we had a leaderboard and Avatar" |
| Quiz | • 4-star<br>• Leader board<br>• Badge | • "Quiz, definitely more gamified should have badges and leaderboard" |
| Breakout room activity | • Badge | • "For Breakout Room activity. Could be given some badges. We do not agree on gamification on it. But according to that discussion and other things, we might give them badges"<br>• "For being a great team, in that sense, or might be we can introduce on the leaderboard also if the if you can calculate all the teams' performance" |
| Pop-up quiz | • Cross | • "We strongly disagree with pop-up quiz already"<br>• "At the time of the lecture, our attention should be on lecture, gamified or not"<br>• "if we have to do it, it should be gamified"<br>• "at least it should be interesting" |

**Explanation of Group C's feedback**:

- They have given 3-star to "Moodle" which means they think it should be gamified to a certain extent (almost 50%) but not completely. They gave "coins" because they think students can be motivated by getting cash rewards when completing a course.

- It could be beneficial for students. For the “survey”, they believe students can be encouraged to get rewards to fill up tedious surveys.
- They do not recommend or support “surprise tests” but if it is mandatory to have these in a course then rewards can be added to make students engaged.
- Not every “assignment” should be gamified because there are certain situations where people need more serious written descriptions and so on. But they surely need a leaderboard here.
- The area “online lecture” should be gamified to a certain extent. As they used Kahoot, they think leaderboard and avatar can be applied here.
- The “quiz” should be gamified more and must have badges and a leaderboard.
- This area “breakout room activity” could be given some badges. The group do agree on implementing gamification on it and badges can be added.
- They do not like the concept of the “pop-up quiz”. But if they need to do it at least it should be gamified.

**Group D**: The photo of group D’s activity 2 is given below in **figure 35**.

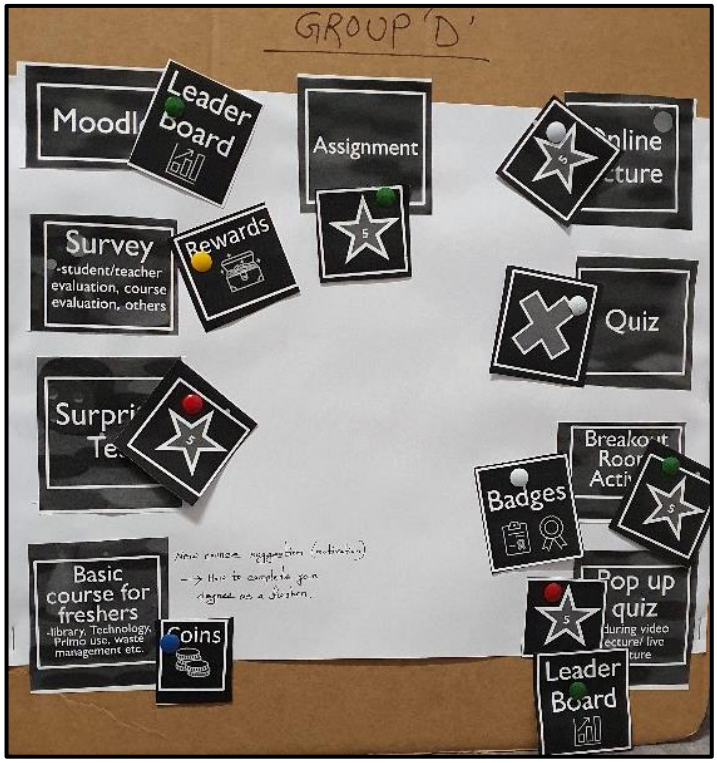



*Figure 35: Group D’s activity 2 during the co-design workshop*

The result of activity 2 of group D is described with the participant’s feedback in **table 16** below.

*Table 16: Group D’s feedback in activity 2*

| Areas | Templates | Feedback from group D |
|---|---|---|
| Moodle | • Leader board | • “So whatever the activities are given the module, whether it be just posting a comment or taking quizzes, it should be some leaderboards” |

| | | |
|---|---|---|
| | | • "You frequently will actually visit the model just to see whether now you're in phase two or phase one, similarly like Facebook, as when you click like and then you want to say Hey, someone else liked my photo or not. So there is a leaderboard" |
| Survey | • Reward | • "We hate surveys, but we can have rewards and it can be more like this lottery things" |
| Surprise test | • 5-star | • "Sometimes it's a bit annoying for the students but I think if we provide proper gamification it could be used as a tool to intrigue learning overall" |
| Basic course for freshers | • Coin | • "So we choose coins as I say that our goal was to keep it as simple as possible"<br>• "When you finish this will probably require coins and you can buy some coffee for yourself and your friends from Aleph (University cafe)" |
| Assignment | • 5-star | • "at this point of time, we don't support assignments because Finnish kids are doing fine without assignments and anything"<br>• "It needs to be gamified, otherwise it will be pretty boring"<br>• "We can try to do something, more like group exercises"<br>• "There was a course…it's more like how you discuss in the class, then you can skip that assignment part" |
| Online lecture | • 5-star | • "In the COVID period, we can publish multiple papers and gain money with it"<br>• "let's make gamified all our online courses and we can include all the tools" |
| Quiz | • Cross | • "Quiz in a form is already a gamified thing, so don't overdo it to work on it"<br>• "I think it's already gamified, we don't need to do anything else" |
| Breakout room activity | • 5-star<br>• Badge | • "Breakout room activity needs to be gamified as much as possible"<br>• "engagement activity needs to be done and what if we can gamify it by some badge, based on your engagement parameters how likely you engage in the course and discuss with others so that more you click, essentially you will learn more" |
| Pop-up quiz | • 5-star<br>• Leader board | • "the pop-up quiz needs to be there because if I want to keep all my attention this long"<br>• "pop-up quiz doesn't need to be on the content, it can be simple as that"<br>• "because on those recorded video lectures we cannot have those chitchats, so maybe this can be done" |

**Explanation of Group D's feedback**:

- Group D thinks "Moodle" should be gamified so that students can use it as a social media platform.
- Students do not like to participate in a "survey", that's why rewards can be added as a gamified tool.

- “Surprise test” can be gamified to make it less annoying to students.
- The group thinks students should earn “coins” after finishing “basic courses” (for freshers.
- They are not fond of “assignments” but if it is already in the curriculum they highly recommend, it needs to be gamified to make it less tedious.
- They think during the covid period, online courses (which includes online lectures) need to be gamified.
- The “quiz” is already gamified so no need to overdo it.
- The group gave 5-star which means they are very much interested in making the “breakout room activity” fully gamified and also “badges” can be added there to ensure students’ active engagement.
- Recorded videos do not have an option for conversation so the group thinks “Pop-up quiz” should be gamified to keep the attention of the students on the lecture for a longer period.

**Activity 3**: It includes a description of the final activities and feedback from all group members:

**Group A**: **Figure 36** illustrates group A’s gamified course design for the LUT university’s ongoing course “research methods (RM)”.

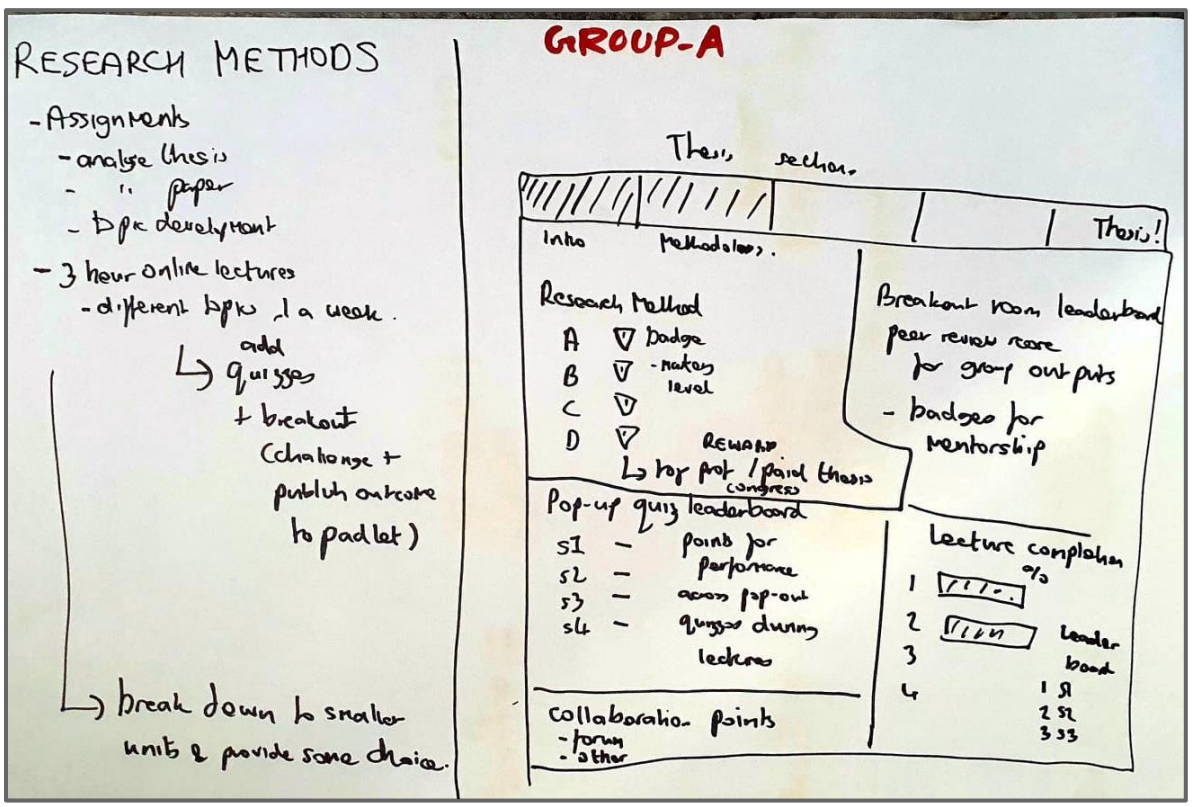



*Figure 36: Group A’s activity 3 during the co-design workshop*

**Explanation**: Group A planned to make this RM course gamified because they think this course includes 3 hours of a lecture which can be done in their free time. It means the course is lengthy and the coursework is too much for the students. There were assignments where students analyze their thesis and produce their own kind of thesis over time. They thought that they could improve

some of its elements. The first thing was that these online lectures could be broken down more into topics.

The course be presented in a better way with more interactive breakout rooms where students can do activities, post activities, get peer review feedback on artifacts that they create, and talk to each other a bit more. they could get to them if they help and do a lot of peer support looking at badges for mentorship. Also, there can be some of these quizzes and leaderboards and pop-up quiz leaderboards. But the most important thing they thought was to somehow gamify the whole course so that it can be broken down into topics. Students can complete the topics more in their own time, there would be a kind of progress bar where they could see how close they are to completing their thesis. The better they use different methods, the more mastery they will get. They can have "badges" for mastery. And at the end of that, there can be a kind of reward for the students who have mastered things the most. They can get to work on their own master's dissertation with some of the top professors, they can get paid thesis opportunities. Also, their work can be published at a conference, and they can get some fees to attend the conference to present their papers. The group also thought about incentivizing professors to participate and give guest lectures on such topics that they have a lot of knowledge about. Mastery badges and participation badges can be given to them so that the professors can be recognized for their hard work.

**Incentives and benefits**: Badges and mastery badges for appreciation, paid thesis opportunity and participation in seminars and so on.

**Group B**: **Figure 37** illustrates group B's gamified course design for the LUT university's ongoing course "LUT Introduction course".

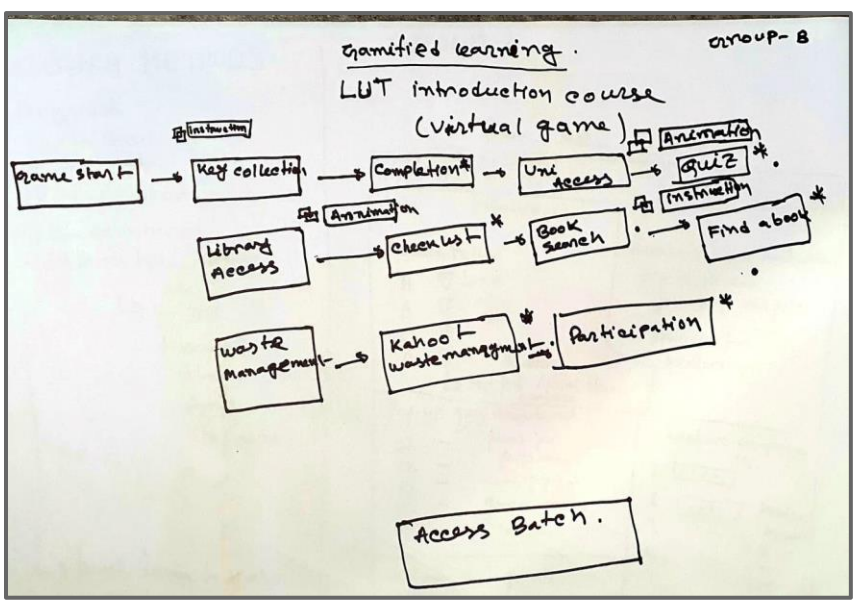



*Figure 37: Group B's activity 3 during co-design workshop*

**Explanation**: Group B wants to make this course 100% gamified and can be played on computers virtually. They have described only three topics, but it can be customized to have more topics based on necessity. By doing this gamified course Students will be able to understand and visualize everything before going to the university. They organize the course in three parts:

- **Key collection**: This game will have instructions about collecting the key from the university. One must finish the course to get university access. After that, there will be animation and quizzes.
- **Library access**: In this game, there will be some animations and a checklist where students can see the instructions to finish the activities. After getting the instructions, there will be a few tasks about how to search, collect books from the library, and how enroll in any course they like.
- **Waste management**: There will be a gamified quiz in Kahoot about waste management. Here students will learn how to put the right waste into the right dustbin before visiting the university, students can play this game to visualize the scenario. After that, they can go to the university physically to have a real idea.

**Incentives and benefits**: After finishing each part students will get a star. By getting all the stars they will get free access badge that can be used to enter the university. Group B believes during covid situations students do not have to come to the university to get ideas about the key collection, library access, or waste management. They can have most of the ideas after doing this course. After coming to the university new students will not need any help or instruction from anyone regarding these areas.

**Group C**: **Figure 38** illustrates group C's gamified course design for the LUT university's ongoing course "Mathematics".

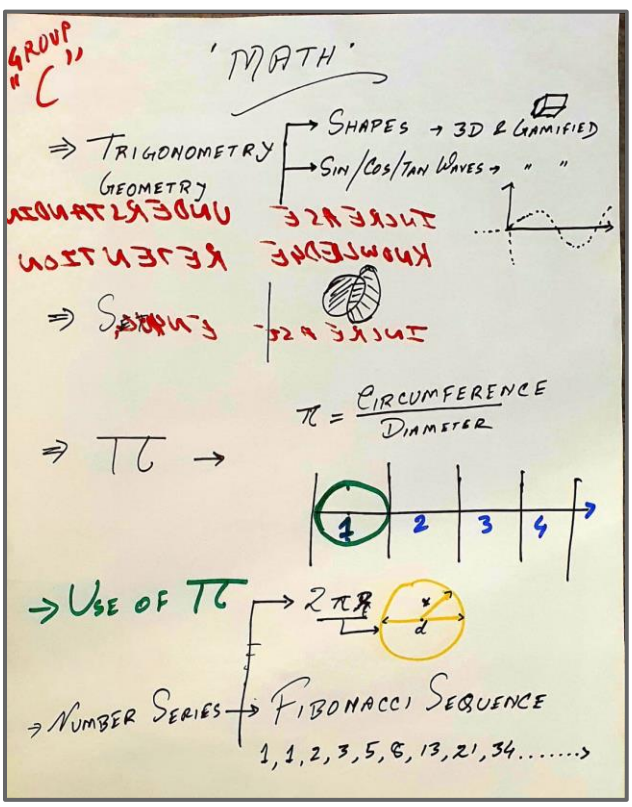



*Figure 38: Group C's activity 3 during the co-design workshop*

One member of Group C said he has always feared mathematics. So, they think math problems would look much easier and more interesting if it is gamified. For example:

- In geometry, we know about trigonometric functions, such as sine, cosine, tangent, and so on. Their waves can be represented in more visualized 3d animated models. Students can see changes and the effects of how the whole mathematical model of those waves works.
- Set theories and unions can be described through gamification with visual ideas.
- Also, Pi ($\pi$) can be described by diverse types of visual models. How it rotates, its values, measurements, and so on.
- In the end, they also mentioned mathematical number series (e.g., Fibonacci sequence) and their visual models.

**Incentives and Benefits**: The group only thinks about the benefits of the field that could lead to an "increased understanding" of the subject matter. It could help students retain knowledge originally for more information more clearly and for a longer period. It can also increase the engagement level of students with the course as well as with the professor.

**Group D**: **Figure 39** illustrates group D's gamified course design for the LUT university's ongoing course "Introduction to waste management".

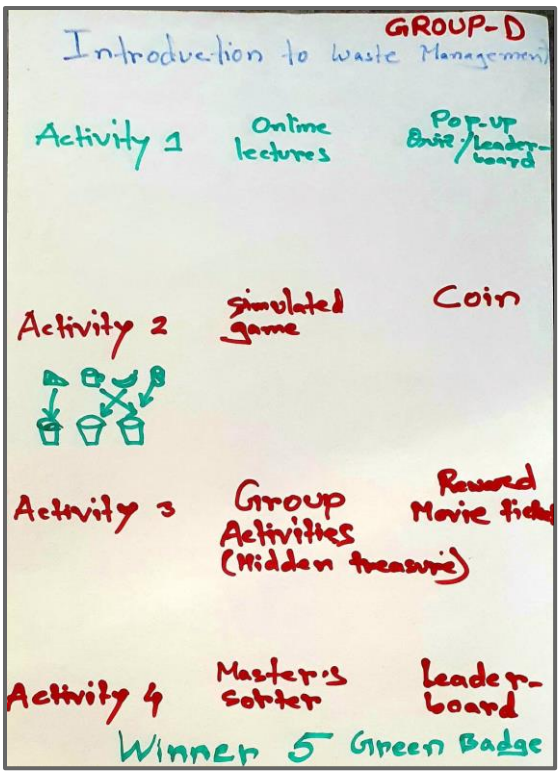



*Figure 39: Group D's activity 3 during co-design workshop*

**Explanation**: Group D chose this course because they think it can be an important and useful course for everyone, especially for newcomers. They designed their course with 4 activities, such as:

- **Online lecture**: There will be short videos and pictures for the students. During the video, there will be a pop-up quiz so that students can answer the quiz right after getting the idea from the course video. After finishing the quiz, students will see their results on the leaderboard.

- **Simulation game**: there will be a simulation game for the students so they can visualize the practical experience they are having. For example, there will be three trash bins and different types of trash will pop up and someone must put the right trash in the right bin. Students will get coins as rewards depending on their performance.
- **Group activities**: there will be this offline game, which can be similar to the hidden treasure game. Students have to look for various kinds of trash inside the university campus. Students have to pick up the trash and put it in the right bin. The more trash they recycle the more points they will get.
- **Master Sorter**: It is similar to group activities, but it is a semester-long process. Students can recycle coffee cups, beer cans, bottles, and similar things inside the university's waste vending machine.

**Incentives and Benefits**: There will be a leaderboard in the "online lecture" area. Students can be motivated to see their position on the leaderboard and engage them more in the course. During group activities, students can get free movie tickets depending on their points. After finishing the simulation game, students will get coins as rewards depending on their performance. Five students who recycle the most waste into the dustbin will get a green badge as master sorters.

Also, as an extra benefit, the group thinks the main purpose of gamification is, learning is like practicing so students are practicing what they are learning.

### 4.3.4 Findings

Each of the four groups proposed a unique approach to all the activities activity. Findings from all the activities are given below:

**Activity 1**: The workshop started on Saturday morning. At first, particularly when we described the introduction part of the workshop, most attendees struggled to maintain their attention. That is why we introduced them to a gamified App (Kahoot) and encouraged them to begin playing the quiz using the App.

The first exercise was designed to break the ice with the attendees. It showed them that learning can be enjoyable when gamification is included in classroom activities. While playing, participants developed their ability to interact and communicate with one another. It kept them occupied for about 20 minutes. Additionally, we saw that after completing the game, they were anxious to know the correct answers to the quiz and to see their ranking on the leaderboard.

**Activity 2:** From this activity, we understand the effect of game elements on the 9 given areas.

Here, we used 1-star counts as 1 point, similarly "5-star" = 5 points, and the other templates "Reward", "Coin", "Leaderboard", "Badge", and "Avatar" are counted as 1 point separately. But "Cross" and empty places are counted as 0 (zero). By calculating the values of game elements, we have come to the results which are illustrated in **table 17** below.

*Table 17: Points of all groups regarding activity 2*

| Groups → <br> Areas ↓ | A | B | C | D | Points |
|---|---|---|---|---|---|
| **Moodle** | • 3-star<br>• Badge | • Avatar | • 3-star<br>• Coin | • Leader board | **10** |
| **Survey** | • 3-star<br>• Leader board | • Coin | • 5-star<br>• Coin | • Reward | **12** |
| **Surprise test** | • 4-star<br>• Avatar | • 4-star | • 2-star<br>• Reward | • 5-star | **17** |
| **Basic course for freshers** | • 4-star<br>• Reward | • 5-star | • 5-star<br>• Coin<br>• Badge | • Coin | **18** |
| **Assignment** | • 5-star<br>• Coin<br>• Avatar | • Leader board | • 3-star<br>• Leader board<br>• Badge | • 5-star | **18** |
| **Online lecture** | • 5-star<br>• Reward | • Reward | • 3-star<br>• Leader board<br>• Avatar | • 5-star | **17** |
| **Quiz** | • Cross | • Badge | • 4-star<br>• Leader board<br>• Badge | • Cross | **7** |
| **Breakout room activity** | • 5-star<br>• Leader board | • Cross | • Badge | • 5-star<br>• Badge | **13** |
| **Pop-up quiz** | • Cross | • 5-star | • Cross | • 5-star<br>• Leader board | **11** |

For better understanding, we have placed the points of 9 areas from highest to lowest and showed it in **figure 40** below.

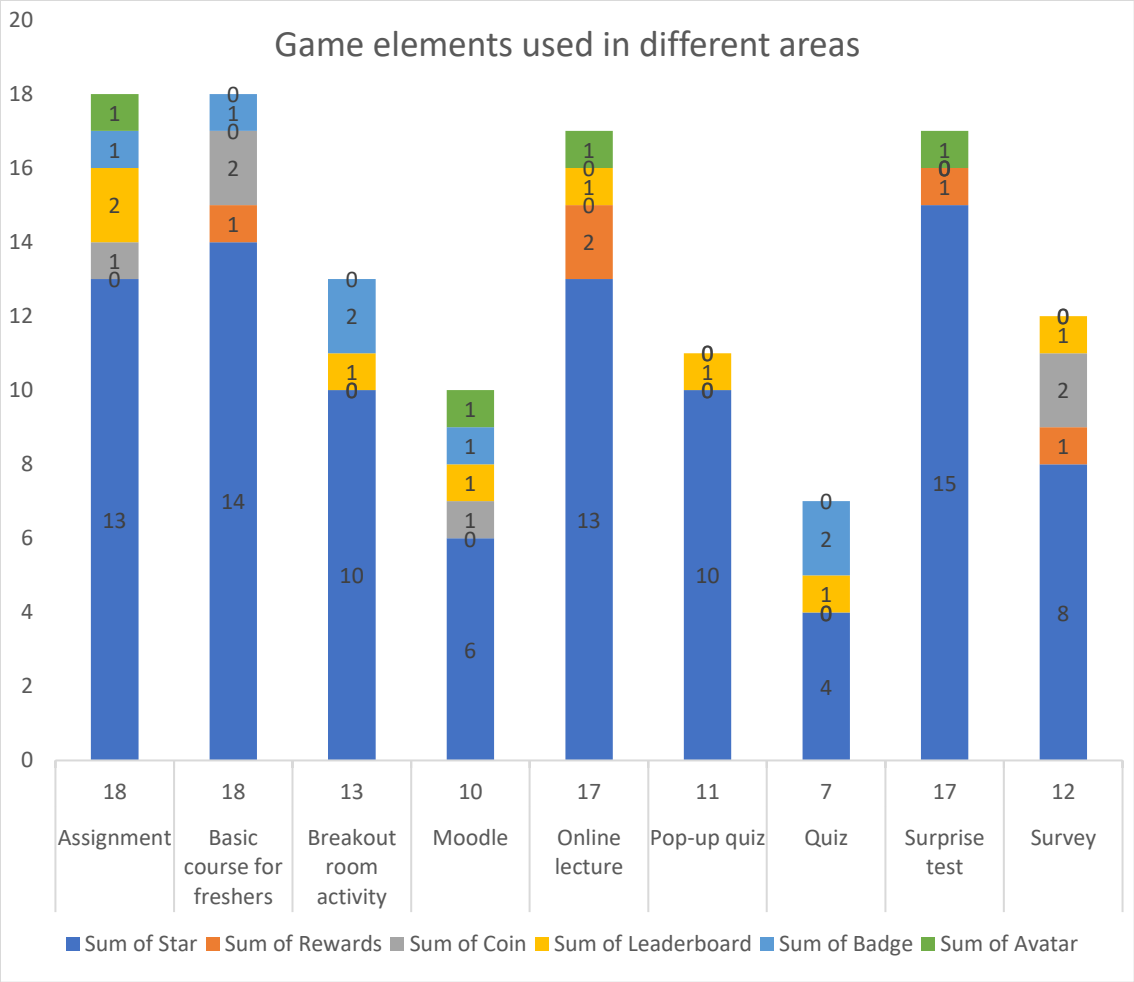



*Figure 40: Chart bar shows game elements used in different areas*

For better understanding, we have placed the points of areas from highest to lowest in **table 18**. Additionally, we have given a short explanation to describe why the different areas are getting such points.

*Table 18: Explaining the areas depending on the highest to lowest points they gain from activity 2*

| Areas | Points | Explanation |
|---|---|---|
| Assignment | 18 | The area "Assignment" gained the highest point. Two groups gave two 5-stars, and one group gave 3-stars. 2 leaderboards, coins, avatars, and badges make the total points of this area much higher than others. That means students want this section to be gamified so that they can enjoy the course work and submit it in time. |
| Basic course for freshers | 18 | This area "Basic course for freshers" gained the highest points like the area "assignment". There are a few short courses that newcomers need to do to know more about university activities which are sometimes boring. If the course is gamified with a reward system, coins and badges then students will be more interested in finishing this course on time. |

| | | |
|---|---|---|
| Online lecture | 17 | The area "Online lecture" can be lengthy and boring for a few students. That is why it gained 17 points. During covid situations, it is hard for teachers to understand if the students are listening to or enjoying the lecture. It is better to implement a rewards system, leaderboard, and avatar to make the lecture more exciting for the students. |
| Surprise test | 17 | Our university does not have such tests. Most of the students do not like to have surprise tests. Every group gave 2 to 5-stars on this area and demanded an avatar and reward system when it is gamified. |
| Breakout room activity | 13 | This area also received the 3rd highest point by getting two 5-stars from different groups. This means it should be gamified and "Badge" and "leaderboard" should be added to make it more interesting and useful to students. |
| Survey | 12 | After finishing a few courses, we all need to participate in the survey to give our feedback about the course and the professor. Sometimes students do not feel it necessary to enter a survey. In that case, it should be gamified and coin, reward, leaderboard can be added to make it more attractive to students. |
| Pop-up quiz | 11 | Few university courses have "pop-up quiz" which showed up during online lectures. This area is already gamified, but it can be improved and added a leaderboard to it as the students want it that way. |
| Moodle | 10 | Few universities already made their module gamified. Co-design participants also want to see their module with leaderboard, coins, avatar, and badges. |
| Quiz | 7 | The area "Quiz" received the lowest point which means students are not concerned about gamifying this section. One reason can be it is already gamified to some extent. It would be good for students if it is gamified with badges and leaderboards to make it look fascinating to them. |

Additionally, in **figure 41** we noted that the game element "Star" was applied the most in activity 2, while "Avatar" was applied the least. This means that various game components have different impacts on a course. That is why, regardless of how good a game element is, it cannot be used effectively in every area of course design.

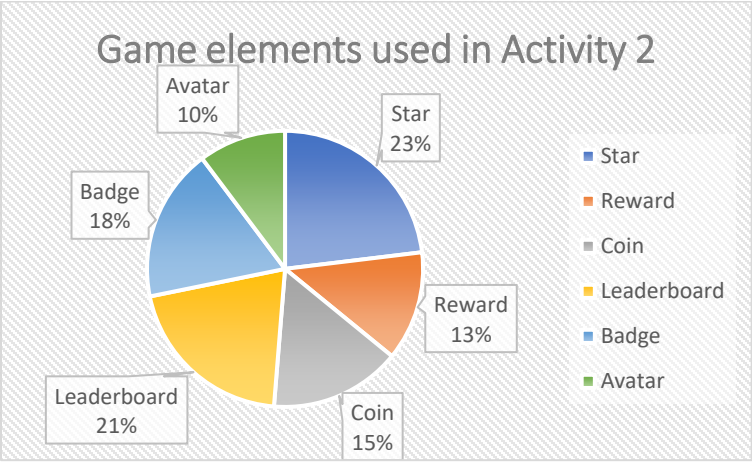



*Figure 41: Pie chart shows the percentage of game elements used in activity 2*

**Activity 3**: For this section, we made some mockups to get a better visualization of the courses. A mockup is a detailed static model of a prospective product. It will display screens or frames and illustrate the placement of material and functionality. In comparison to a wireframe, this appears to be a more accurate representation of the final result. A mockup assists in establishing content layouts, color palettes, brand fonts, and icons, as well as navigational concerns. (*Topflightapps, Mockup*, 2020) We used the Balsamiq wireframes application, a user interface design tool that helps to create low-fidelity prototypes or wireframes or mockups. (*Balsamiq, Mockups*, 2022). The **figure 42** illustrates the Moodle "user login" page and "course summary" page. We tried to keep the mockup as simple as possible for better understanding.

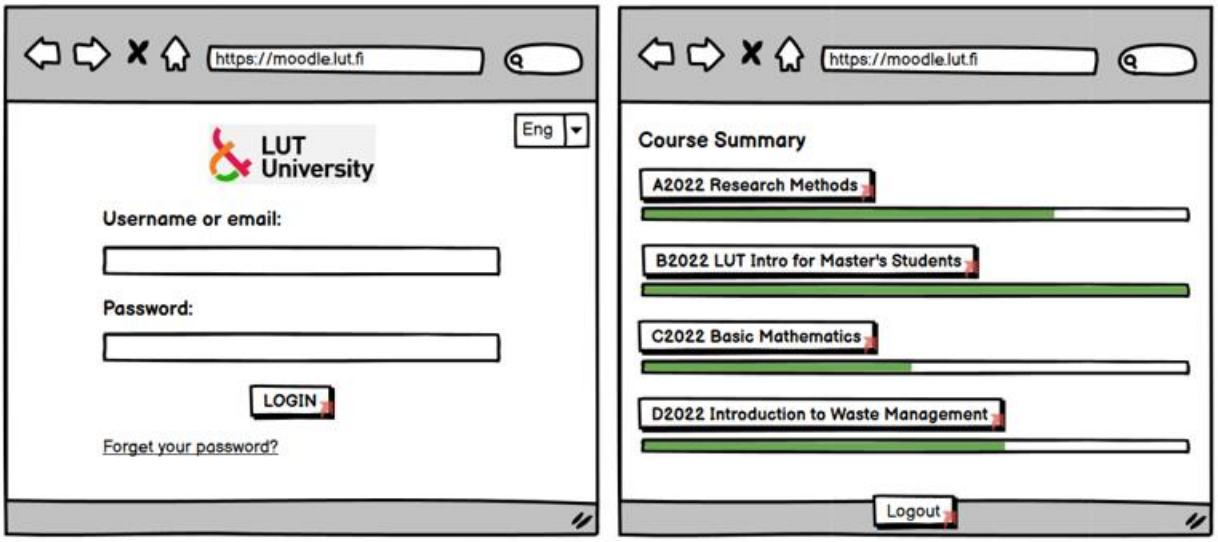



*Figure 42: Mockup of Moodle login page and course summary page*

**Group A** designed the RM course for activity 3. In **figure 43**, through mockup, we tried to show how this course will look if it is gamified by adding a few game elements, such as a leaderboard, rewards, and badges.

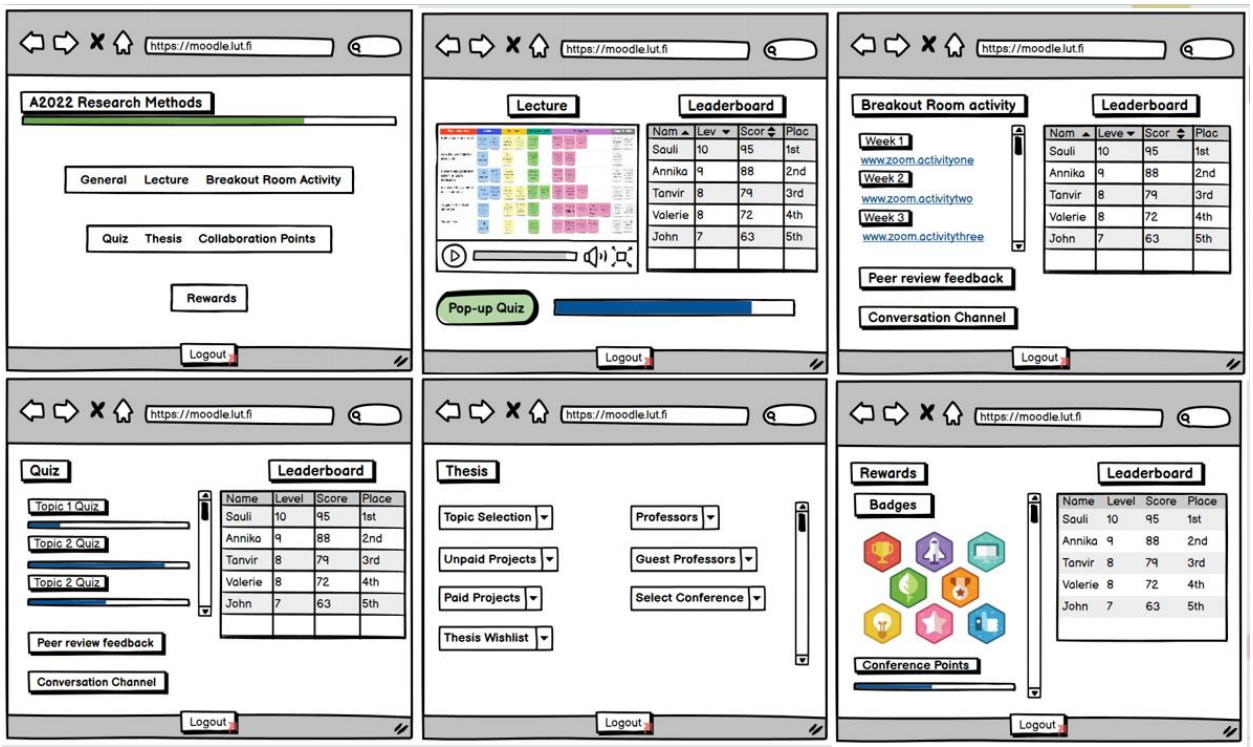



*Figure 43: Mockup of the course "Research Methods"*

**Group B** designed the course "LUT introduction course (virtual game)" for newcomers in activity 3. In **figure 44**, through mockup, we tried to show how this course will look if it is gamified by dividing it into three activities, such as key collection, library access, and waste management. There are rewards after finishing each activity.

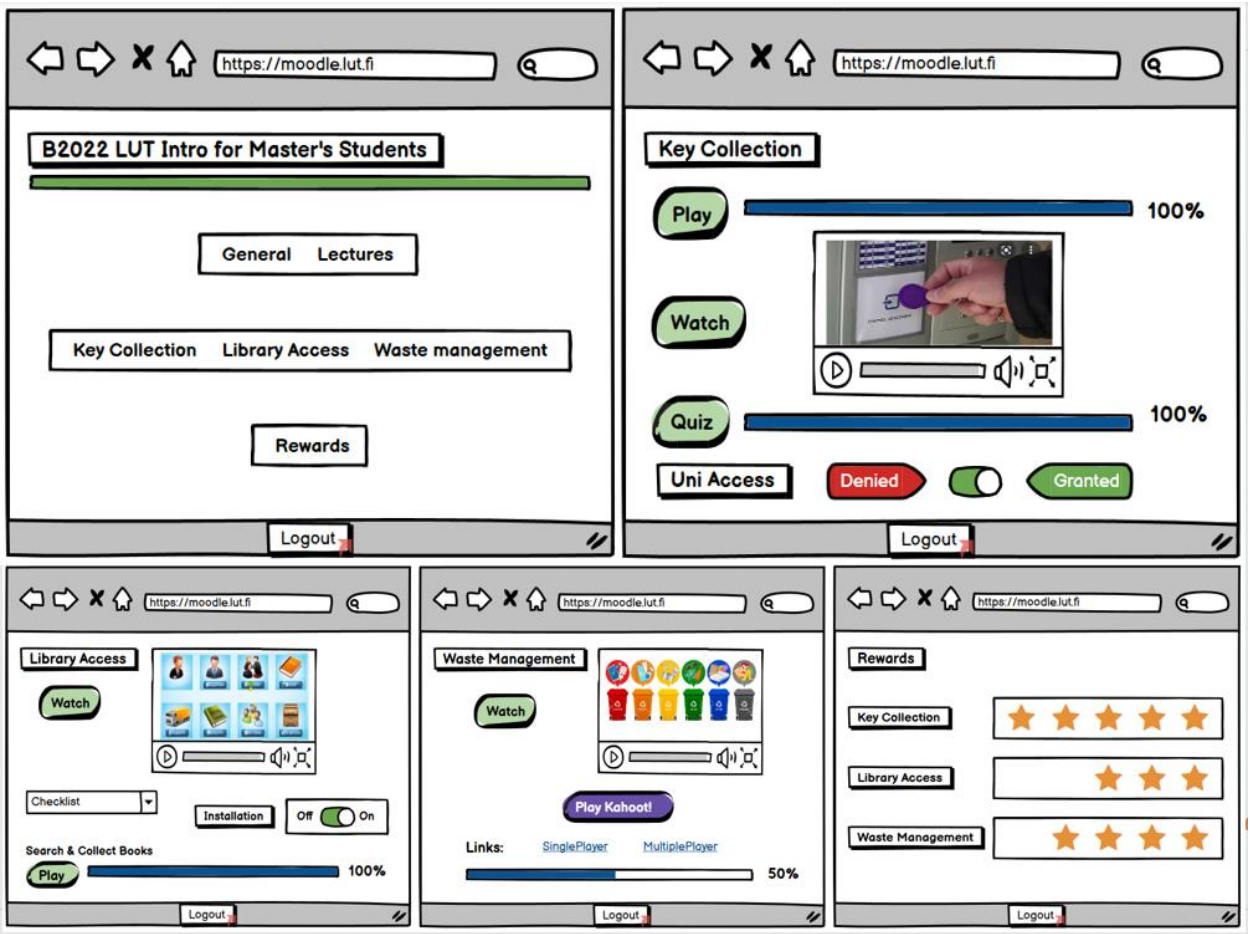



*Figure 44: Mockup of the course "LUT introduction course"*

**Group C** designed the course "Mathematics" for activity 3. In **figure 45**, through mockup, we tried to show how this course will look if it is properly gamified. They wanted their mathematical designs to be more visualized 3d animated models so that students will memorize them so easily. So, we made every chapter with an animated design that is easily understandable for the students.

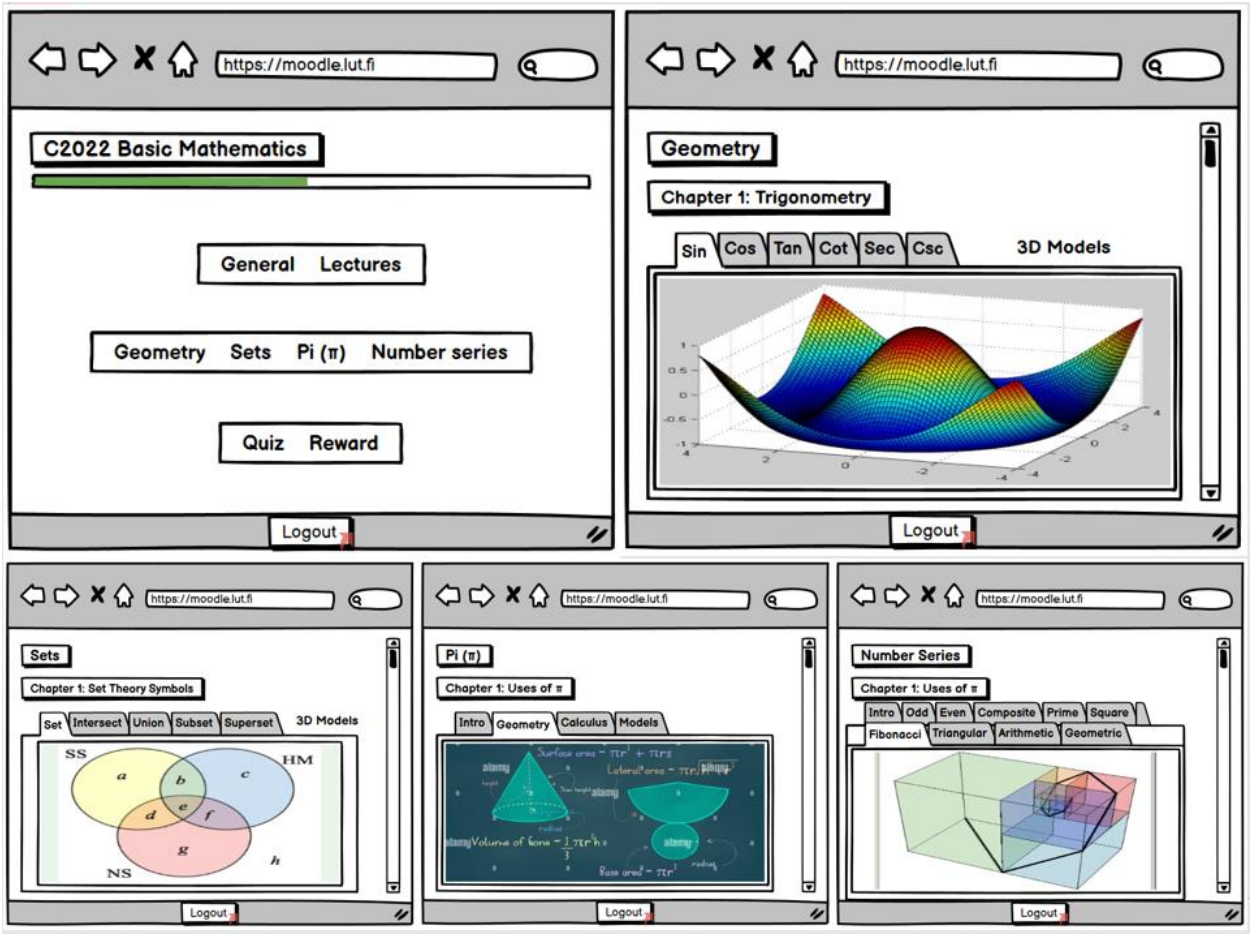



*Figure 45: Mockup of the course "Mathematics"*

**Group D** designed the "Introduction to waste management" course for activity 3. In **figure 46**, through mockup, we tried to show how this course will look if it is gamified when adding online lecture, simulation game, group activity, and master sorter.

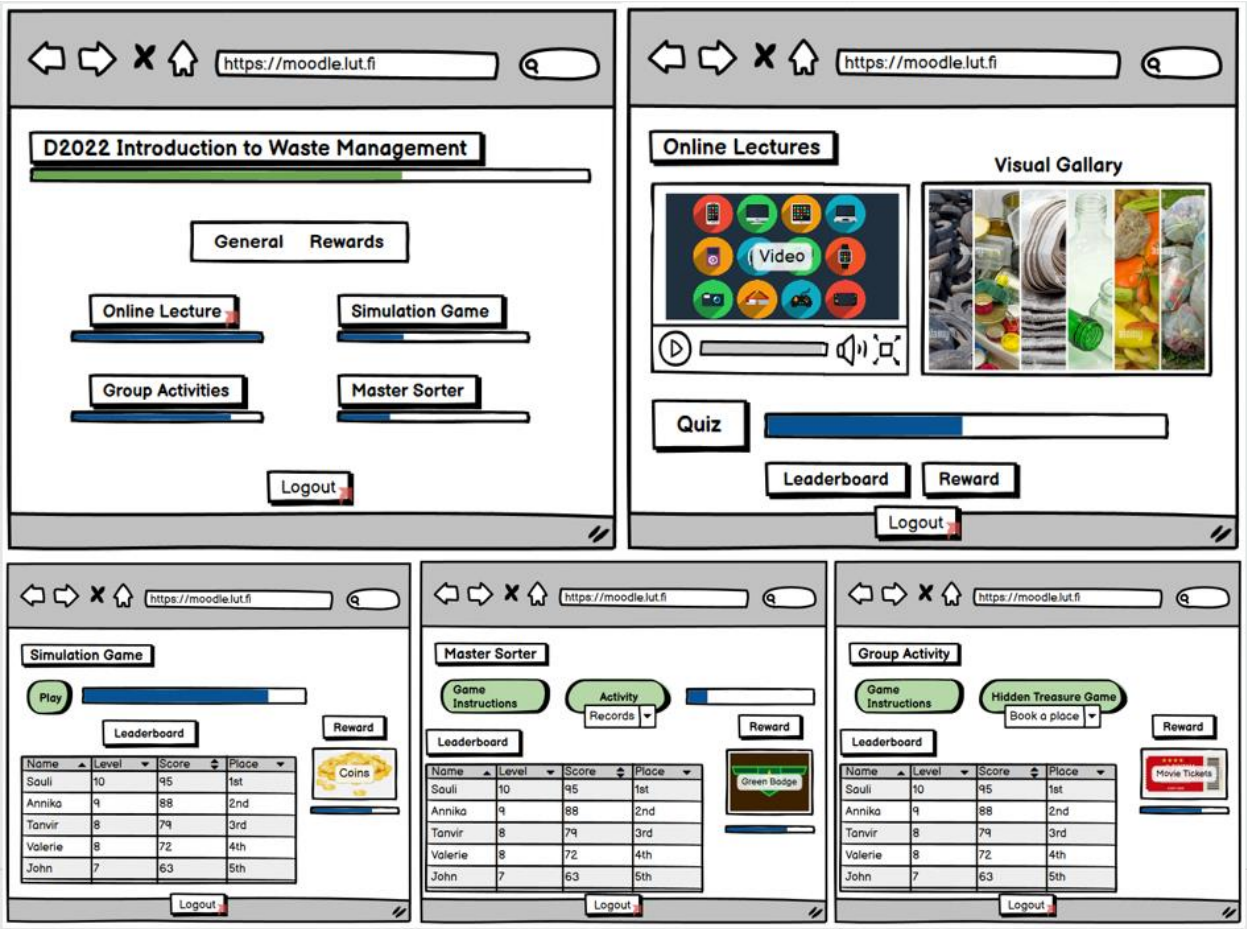



*Figure 46: Mockup of the course "Introduction to Waste Management"*

# 5 Discussion and conclusion

This section will discuss the broad scope of our study and our approaches to addressing the research questions we present, the difficulties we encountered, the implications of our findings, and our future plans.

## 5.1 Answering Research Question 1

**Research question:** *How can we develop gamified courses that are more engaging to students by utilizing a co-design and living lab approach?*

The purpose of this question was to provide a gamified solution using a Living lab and a co-design approach that would increase students' engagement and motivation with their coursework. A living laboratory can be arranged in a variety of ways. In our case, the university campus served as a live laboratory. We used a small portion of the university (as a living lab) to collaborate in the co-design workshop. At the very beginning of the study, we asked five professors from this university to participate in the interview since they have substantial knowledge about gamified learning and experience regarding the courses they have developed and taught for many years. After the interview session, we conducted a Webropol survey, and the participants were mostly LUT students and other university-level students. After getting data from the interview and survey, we observed that during the epidemic period, all students are taking online courses, and sitting near a computer to repeat the same sort of courses might be demotivating for certain students. They might lose concentration and focus on their studies.

To resolve this concern, we focused on developing a one-day co-design workshop. Participants included one professor and fourteen students (newcomers, final-year students, Ph.D. students, alumni, and others). Identifying and implementing a gamified solution to a learning problem is a challenging endeavor for a single student, as he or she only takes courses from one (or up to three) departments. That is why participants with diverse backgrounds were allowed to contribute to the design process and provide suggestions for the construction of a gamified course using both the living lab and co-design approaches. Both approaches had an immediate positive effect on students since the workshop provided a secure environment for brainstorming and activities without interruption or distraction. Three activities were included in the co-design workshop: "play Kahoot", "play a cardboard game", and "design a course". The first action provided participants with a link to the gamified application. The purpose of the game is to break the ice and provide firsthand experience to players through the use of gamification. The second task, using a cardboard game, teaches us which game elements and templates are necessary to construct specific sections of coursework and learning. Additionally, we observe whether the game elements have the greatest or least influence on various areas. Participants were separated into four groups for the third activity, and they provided us with four distinct gamified course designs. Three groups designed it with the appropriate number of game elements. Another group concentrated on visualizing their gamified course.

Group A engaged students in their RM course by incorporating a scoreboard and badges as gaming components. For lectures, quizzes, and breakout room activities, they used different leaderboards.

Additionally, they introduced conversation channels and peer review feedback to facilitate students and teachers in discussing and collaborating. Because the genuine RM course at the university includes thesis writing, the group made a few improvements in this area. They provided students with complete freedom to choose their own thesis topic or, for paid thesis, to select an organization directly from that Moodle page. Additionally, there were options to contact academics from several colleges in search of a thesis topic. Additionally, students might attend conferences to gain ideas for their thesis and to gain new expertise. At such conferences, students' work may be published.

Group B's "LUT orientation course" was developed to familiarize newcomers with university activities during inclement weather. The course's major chapters (activities) are key collection, library access, and waste management. To complete each chapter, students must watch a brief animation and participate in some gamified quizzes. Additionally, students can collaborate on the waste management chapter by using the gamified app Kahoot. It will assist newcomers in becoming more sustainable and aware of recycling. They used the term "Star" as a game element, and students would earn stars for completing each chapter of the course. After collecting all of the stars, they will receive an access badge that will grant them entry to the university.

Group C designed the course "Mathematics" because they feel it is too difficult and monotonous for some students. Students who lack motivation frequently drop out of courses or complete them with low grades or a lack of accumulated knowledge. The group wants to illustrate their course using 3D animated models and some gamified quizzes to increase student attentiveness and to establish a visual image of the mathematical models in their minds. They believe that by doing so, students will feel more connected to the course and the teachers. They did not include any game elements since they believe mathematics is a unique topic and gamifying it can assist students to have a better understanding of the topic and retain it more clearly for a longer duration of time.

The "introduction to waste management" course developed by Group D incorporates a few required game elements such as leaderboards, rewards, coins, and badges. The course is divided into four sections, each of which allows students to see a brief lecture and participate in a pop-up quiz to help them retain information from the courses. Students will be able to participate in a simulation game that will teach them how to properly recycle various forms of garbage by sorting it into appropriate containers. Students will have the opportunity to play this game physically in the campus area after completing this online assignment. However, because of covid rules and regulations, they must reserve a place to play these games. Students that are very motivated to sort or recycle waste will be rewarded. They will be recognized for their efforts with a green badge. The course has several required game components, like leaderboards, rewards, coins, and badges. Students who complete such courses will not receive any additional credit or grades (or very low credits); instead, the module will display "passed". That is why each task needs a reward to keep students engaged and intrinsically motivated to successfully finish this course.

All of the groups targeted such courses that are unduly lengthy, repetitive, and tedious, and do not require a sufficient amount of credit after completion. They recognize that students, as human beings, desire to be intrinsically or extrinsically motivated to complete a task, feel involved in the process, and collaborate. Sometimes they desire recognition for their efforts. Thus, gamification

along with game elements in the non-gaming environment increases student engagement and improves specific behaviors (Armier, Shepherd and Skrabut, 2016). On the other hand, gamification combining with living lab approach and co-design workshop made students more motived, engaged in coursework or any tasks (Dodero *et al.*, 2014; Saga and Dunk, 2017). By keeping these aspects in mind, the groups were able to create a few gamified courses that are both meaningful and engaging for the students.

## 5.2 Answering Research Question 2

**Research question:** *How effective is gamification in increasing student engagement, collaboration, and creating an enjoyable learning environment?*

This study topic sought to determine whether gamification is beneficial and meaningful to students. We are attempting to provide constructive responses to this question through the use of expert interviews, surveys, and co-design workshops.

Five significant themes emerged from our analysis of expert interviews. According to experts, gamification facilitates successful collaboration between students and teachers. It provides an engaging method of learning; students are more interested when they participate in gamified courses and activities. Gamification also contributes to the motivation and encouragement of students. However, before incorporating gamification features into a course or utilizing a gamified app, there are a few matters to consider. Attempting to gamify something that cannot be gamified is a waste of time and expensive technology. Since gamification cannot be used to solve all problems, we must resist overusing this technique. The majority of gamified classroom activities require a high-speed internet connection and smart technologies such as laptops and mobile phones. It might be a technological hurdle for students who lack further technological resources. Gamification does not have the same effect on all students. There will always be those students who will refuse to study (or join) regardless of whether their courses (or activities) are gamified. Some of them may lose interest if the whole course is gamified.

This is accurate since 29% highly agreed and 54% agreed that gamification provided an excellent learning experience throughout the pandemic. Nonetheless, this feature makes online learning more enjoyable and interesting. According to one participant, when it is employed, courses become less complex. The majority of respondents (almost 66%) acknowledged that they employed gamification whether utilizing a gamified application or taking an online course. Additionally, 31% of respondents strongly agreed, and 53% agreed that their university should include gamification in classes, seminars, and other areas. 72% of participants believed that a gamification system might be used to motivate them to interact online. 59% believed that gamification may make studying more interesting, resulting in students focusing more intently on schoolwork than ever before. 60% of participants believed that gamification may increase the efficiency of communication while collaborating with others. 63% felt that gamified courses improve students' intrinsic motivation. 55% of participants believed that gamification improves students' overall performance. 62% believed that gamification aids in the comprehension of course topics. Almost seven out of ten poll responses favored gamification. To go deeper into the subject, we added two more survey questions in which participants were questioned about potential issues and difficulties with this technology. Almost 27.3% agreed that gamification may present some challenges, and

almost 26.9% said that it may present some barriers. Additionally, respondents acknowledged the downsides of gamification in the survey.

Additionally, after evaluating the survey, we identified nine key themes. The first two themes demonstrate that gamification is an effective educational technique to be used during a pandemic and that it offers numerous opportunities for online learning. The following 7 topics are mostly concerned with the issues that students and educators may have while implementing and integrating this tool into a course and its activities. While gamification can make courses more enjoyable, there is a risk that the course's content will deteriorate. Also, certain courses are so unique that they lose their effectiveness when gamified. After utilizing this technology for the first time, students, especially educators, must be prepared for unanticipated issues. They may encounter a variety of technological difficulties. That is why an experienced educator is necessary, as is the hiring of skilled specialists to build gamified courses and others. When used excessively, it may lose its efficacy. Additionally, it can go off track. It has the potential to be addictive for some students. Some may focus only on the gamified portion, while others may get unduly obsessed to the point of neglecting social life. Additionally, indeed, gamification is not beneficial for every sort of person.

We observed participants' brainstorming and collaborative group work during co-design activities. We recognize the importance of game elements in gamification from activity 2. Additionally, when the features are applied appropriately in a gamified course or activity, they can enhance student engagement. Additionally, we could see the potential of the game elements included in the courses created by participants. They designed their gamified courses and created an enjoyable learning environment in such a manner that students will be intrinsically or extrinsically motivated to be engaged in the coursework. Gamification significantly increases intrinsic motivation compared to the other which is more immersion-oriented characteristics. (Hamari and Koivisto, 2014)

Finally, after analyzing the data and receiving insightful comments from the interview, survey, and co-design workshop, we concluded that gamification does indeed increase student engagement, encourage collaboration, and create an enjoyable learning environment for both students and teachers. However, gamification is a relatively new tool and a new learning strategy that is rapidly evolving (Noran, 2016). It must be used wisely otherwise students or educators will not acquire any knowledge and benefits from it (Faiella and Ricciardi, 2015).

## 5.3 Limitations and Future Work

I recognize some limitations in the research work.

- Gamification is a broad area, and its use in education is also a popular topic in the current period. Numerous journals, papers, and websites are filled with information on the topic. It was difficult to obtain essential information from there since we were a bit unsure of which facts to include in the thesis paper.
- It is not always possible to gather sufficient data during a single day of co-design workshop sessions.
- We invited only five professors to participate in the interview session. Because time was limited, and professors were constantly occupied.

- Due to the covid situation, some of our qualified and experienced participants were unable to attend the offline co-design session.

The future work can be,

- Implement gamification to the courses with higher credits (4 to 6) and at the end of the course, there will be a mandatory survey session. Data can be collected to differ from last year's course survey and recent course survey. This course will take almost 4 months to complete so the students will get more time to familiarize themselves with a gamified course. Hopefully, their feedback will be detailed and less biased.
- Another similar future work can be, making two short courses (1 to 2 credits), one is a normal course and another one is gamified course. Students from the different departments will take each course and can finish it within a month. After finishing the course, we can collect their feedback.
- Make a framework to design a (gamified) university course.
- Create mockups for courses and observe how students react to them. It is a living lab approach for gathering participant input or monitoring their reaction, which may provide a practical answer to the research paper's problem.
- Determine the effects of the different game elements in different situations.

## 5.4 Conclusion

We examined how a Living lab and co-design method may be applied to solve a learning-related problem (during a pandemic) on university premises in this research. To accomplish the intended solution, extensive literature reviews, participant surveys, and expert interviews were conducted to gain a better understanding of the problem and to experience the various effects of gamification, the usefulness of various game elements, and gamified course design. We discovered a plethora of positive comments about gamification, however, there were a few negative comments about this technology that cannot be overlooked. According to expert interviews and survey responses from hundreds of participants, gamification has the potential to engage students, inspire collaboration, and make any environment more entertaining. However, we must acknowledge that gamification is not appealing to all sorts of students. While some educators may incorporate gamification into nearly all aspects of learning, it cannot be applied in some unique courses and activities. On the other hand, gamified courses and students benefit from game elements. However, similar to gamification, game elements should be employed wisely in a course or activity; otherwise, the primary purpose of improving the learning system would remain unachieved. Additionally, after conducting expert interviews and conducting a survey, we sense the need to prepare a co-design workshop in which participants' suggestions are integrated to generate four gamified course concepts and ideas. After focusing on the entire research process, we created a mockup (using the Balsamiq tool) to visualize the gamified course. From this study, it has become evident that gamification can play a significant role in intriguing students' active engagement in a course by introducing gamifying elements to the pedagogic design considering users' perspectives as well as preferences. This master's thesis work speculates the possibilities of adopting co-design framework to capture users' perspectives and requirements for designing a gamified course.

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## Appendix 1: Interview Questions

1. Can students be encouraged with gamification systems to collaborate online? (Knutas *et al.*, 2014)
2. What kind of impact does using a gamified, collaborative system have on any course? (Knutas *et al.*, 2014)
3. Does increased collaboration improve course outcomes or communication efficiency? (Knutas *et al.*, 2014)
4. Do you think using gamification in a few LUT courses will make learning more enjoyable (or understandable) and ensure student engagement? Have you noticed it through your course or any recent research?

5. What motivates you to write a research paper on gamification or a similar field? Or what encourages you to use such a gamified learning platform in your course?
6. Do you have any evidence that intrinsic or extrinsic motivators are more successful at motivating students?
7. What do you see as the potential problems with gamification? What barriers are there when implementing gamification?

Several questions were taken straight from a research paper that is included with the questions (from 1 to 3). The fifth question was exceptional since each professor has different knowledge and experience in this field.

## Appendix 2: Survey Questions

1. Participation in the study
   - I understand the purpose of research and volunteering
   - I do not want to participate in the research

2. Are you familiar with the term "Gamification"?
   - Yes
   - No
   - Maybe
   - Did not notice

3. You have experienced (any type of) gamification practices-
   - All the time
   - When using an Application (APP)
   - When doing an online course
   - Have not noticed
   - Others [_____]

4. How often do you use gamified APPs, or perform online courses, training etc.?
   - Very often
   - Sometimes
   - Never
   - Have not noticed

5. On a scale of 1 to 5, during a covid situation do you think gamification can provide you with an enjoyable learning experience when using an APP or doing a lengthy course?
   - Strongly agree
   - Agree
   - Neither agree nor disagree
   - Disagree
   - Strongly disagree

6. Do you think using gamification in a course/training/APP might increase your active participation?
   - Yes
   - No
   - Maybe

7. On a scale of 1 to 5, do you think your university should use gamification in courses, seminars, and others to increase the active engagement of the students?
   - Strongly agree
   - Agree
   - Neither agree nor disagree
   - Disagree
   - Strongly disagree

8. Do you think students can be more encouraged with gamification systems to collaborate online?
   - Yes
   - No
   - Maybe

9. Do you think gamification can make study more enjoyable so that students will concentrate more on coursework than before?
   - Yes
   - No
   - Maybe

10. Do you think gamification can improve communication efficiency when working with others?
    - Yes
    - No
    - Maybe

11. In your opinion, does gamified courses have a positive influence on students' intrinsic motivation?
    - Yes
    - No
    - Maybe

12. On a scale of 1 to 5, in your opinion, does gamification have a positive effect on students' overall performance?
    - Strongly agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree

13. In your opinion, does gamification facilitate a better understanding of course materials?
    - Yes
    - No
    - Maybe

14. Do you see any potential problems with gamification?
    - Yes [_____]
    - No
    - Maybe

15. Do you think there are any barriers when implementing gamification in a course?
    - Yes [_____]
    - No
    - Maybe

16. Please feel free to leave any comments or feedback you have about this survey
    - [_____]

**DEMOGRAPHIC QUESTIONS**

17. Your age?
    - 17-24
    - 25-34
    - 35-44
    - 45-64
    - 65+

18. Gender?
    - Male
    - Female
    - I wish not to answer

19. What is your key role at the university?
    - Staff
    - Bachelor's student
    - Masters' student
    - Doctoral students
    - Others