User Experience and Gamification: Understanding Effective Game Mechanics and the Flow State Within Digital Learning Experiences

by

Katherine Fretz

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Faculty Supervisor:

Maurita T. Harris, Ph.D., Assistant Professor – Faculty of Liberal Arts

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Race family

Dr. Maurita Harris

Abstract

This honours thesis explores how gamification can impact user experience and guide users into a flow state within digital learning platforms. A comparative study was conducted on the gamified e-learning platform Duolingo and the non-gamified e-learning platform Khan Academy. The research study analyzes how specific game mechanics affect user engagement, satisfaction, information retention, and the flow state within both platforms. A 10-day diary study was conducted on eight participants using quantitative Likert-scaled survey responses and qualitative open-ended responses to gather data.

The research study found that Duolingo's gamified e-learning platform led to higher user engagement, satisfaction, perceived information retention, and consistency compared to the non-gamified e-learning platform Khan Academy. Similarly, participants who interacted with the gamified platform Duolingo were likelier to achieve a flow state with common indicators reported, including high immersion, time loss, and feeling in control of the activity. The qualitative feedback discovered that Duolingo participants felt most motivated by the rewards and streaks system.

The findings of this research study suggest that gamification in e-learning environments can enhance immersive experiences for end users. When game mechanics are crafted to support a flow state, an e-learning platform can create stronger intrinsic motivation, engagement, and a deeper connection with the experience. Moreover, this paper contributes to the previous literature and research on user experience, gamification, and the flow state in e-learning experiences. The insights from this paper help designers create more interactive, innovative, and immersive products or services for end users.

Keywords: *user experience, e-learning, flow state, gamification, engagement, motivation*

Table of Contents

Chapter 1: Introduction

In recent years, gamification has become a popular tool to enhance user engagement, satisfaction, and retention across various industries, including education, e-commerce, and fitness. When gamification is implemented into digital experiences effectively, the platform has the potential to lead users into a state of deep immersion, also known as a 'flow,' a state where a person becomes deeply involved in a task, losing track of their external surroundings. (Csikszentmihaly, 1990). Recent research has shown that gamified elements such as challenge, feedback, and progression create suitable conditions to support a flow state (Oliveira et al., 2021). Although gamification is widely used across the vast digital landscape, little research has been conducted bridging the gap between specific game elements and the flow state within everyday digital experiences. As many physical realms are transforming to digital platforms, designers need to understand the particular design mechanics that make more interactive and meaningful experiences for the end users. Despite the new age trend of gamification in mobile application design, many product design teams across industries lack clear support proving which game mechanics lead to a flow state. The absence of knowledge for designing for a flow state runs a risk of gamification becoming trivial and inefficient.

This honours thesis investigates the connection between gamified digital experiences and the flow state by using a comparative analysis of two e-learning platforms: Duolingo, the gamified experience and Khan Academy, the non-gamified experience. The research study explores how specific game mechanics affect user engagement, satisfaction, and information retention with the platform's ability to guide users into a flow state. The research questions that guided this research study include:

1. What are the design principles and game mechanics that support people in achieving a flow state?
2. How do we keep users engaged with a digital experience?
3. How does one know they are in a flow state within a digital experience?

This honours thesis reviews the current literature on gamification and the flow state within digital experiences, outlines the research study's methodology, presents the two-week diary study results, and discusses the future implications for experience designers.

Definitions of Terms

Gamification: Adding game-like elements such as leaderboards, points, badges, etc., to a non-game-like product or service to encourage users to complete a desired task.

Flow state: A mental state where a person becomes fully immersed in a task or activity, losing track of their physical surroundings.

Game mechanics: Elements that define how a game works by guiding player actions.

User engagement: The degree of user engagement with a task or activity.

User Satisfaction: Measuring how happy or satisfied users become with an experience.

User retention: The user can remember the information they were given.

Digital experience: A user's overall experience interacting with a digital service.

E-learning platform: A digital application with educational content to support online learning.

Intrinsic motivation: Motivation driven by internal rewards, such as personal enjoyment, interest, or challenge.

Self-determination theory: A theory that identifies autonomy, competence, and relatedness to support intrinsic motivation.

Chapter 2: Literature Review

This chapter explores previous literature and research studies about the relationship between user experience, gamification, and the flow state theory. The research study also raises other key themes, such as gamification in different industries, self-determination theory, and gaps in existing research.

Gamification and User Experience

Gamification adds game-like elements such as points, badges, and leaderboards to non-game-like contexts, encouraging user participation in a desired task. In recent years, gamification has been extensively adopted by designers of all industries to increase efficiency within the product or service and improve experiences. The gamified system can offer users a sense of autonomy and relatedness by

integrating challenges, rewards and other interactive elements, improving the overall user experience. (Hsu & Chen, 2018). There are many benefits of incorporating gamification into digital designs. Integrating gamified elements can increase user engagement, motivation, and enjoyment of an experience. This can create more meaningful and positive interactions between users and the experience. Meanwhile, in the back end, gamification reduces task errors, promotes task performance, and increases the frequency of user revisits to the digital experience. (Putri & Razi, 2022). Moreover, a study conducted by a team of researchers at the University of Zaragoza, surveying 276 participants, found a 23% increase in user engagement within gamified mobile applications. (Bitrián et al., 2021).

Flow State

The flow mental state was a concept created by an American psychologist, Mihaly Csikszentmihalyi, when his book *Flow: The Psychology of Optimal Experience* was published in 1990. The concept entails that when people become absorbed with an activity, they lose track of their physical surroundings. Time loss and the loss of one's self-consciousness have also been standard reports by people who have achieved a flow state. Flow theory is a widely recognized term among designers and psychologists, allowing users to stay immersed in the activity. A flow state can be achieved when an activity perfectly balances the task challenges with the user's abilities. When the designed task becomes overly challenging, it can bring the user a sense of anxiety, stress, or frustration. If the user's ability to complete a task becomes too high, they may become bored of the activity and lose interest. (Yang, 2017). However, when a digital experience balances task challenges and user abilities, the user becomes fully immersed, potentially falling into a flow state.

Gamification Across Industries

Many corporations in varying industries incorporate game elements into their digital products or services to improve positive user experiences. These industries include digital learning, fitness, and

e-commerce. Although none of these industries relate to one another, they overcome the obstacle of transforming traditional applications into rewarding experiences by implementing game mechanics.

Gamification in Digital Learning

Gamification is a widespread tactic for e-learning applications to promote user retention and keep users engaged with the learning materials, leveraging experience satisfaction. Many well-known learning applications, including Duolingo, Kahoot, and Quizlet, integrate game elements into their digital services, making learning more interactive. A study found that the typical game elements of these systems, including points, badges, leaderboards, challenges, and quests, have proven to be the most effective for digital learners. (Strmečki et al., 2015). Although these gamified elements prove effective with research, Stuart Hallifax, a postdoctoral researcher, theorizes that digital learning platforms should not rely strictly on the game mechanics but personalize experiences with the differentiation of users' learning needs. (Hallifax, 2021). Altogether, the gamified learning experiences of digital applications demonstrate improvement in a learner’s experience, but there remains room for improvement considering the varying learning needs of individual users.

Gamification in Fitness Technology

Many mobile fitness applications or wearable technology have integrated gamified elements into their platforms, encouraging users to exercise by engaging with the design. Examples of popular systems that have gamified the fitness experience include Fitbit, Apple Watch, and Runkeeper. A research team randomly assigned 144 participants to a gamified or non-gamified fitness-tracking application. The results found that the group assigned to the gamified fitness application recorded more steps than the non-gamified fitness experience. (Tu et al., 2019). Similarly, other researchers have found that gamified fitness experiences encourage participation but argue that designs should investigate the longer-term intellectual incentives and encouragements. (Cotton & Patel, 2019).

Gamification in E-commerce

Retailers across the globe will go the extra mile searching for strategies to increase profits. One scheme that has worked for many of these corporations is gamification. A typical digital gamified design many companies offer is a loyalty program; the more a person spends with the corporation, the more rewards the user will receive. An example of a well-known company that employs an effective gamified digital loyalty reward program is Starbucks. When a user mobile orders from the app or scans their account in person, they collect reward points used to get discounted in-store purchases.

Self-Determination Theory and Gamification

The self-determination theory (SDT) was created by the two psychologists Edward Deci and Richard Ryan in the 1980s. The theory explains that humans are intrinsically motivated by the three psychological needs of autonomy, competence, and relatedness. (Deci & Ryan, 1985). When these three psychological needs are met, users are more likely to become intrinsically motivated with their task or activity, potentially leading to higher engagement, satisfaction, and continued interaction with the activity. This theory is commonly reflected when designing digital experiences to foster motivation, as the three psychological needs play a crucial role in sustaining platform use. In gamified experiences, SDT is commonly used to explain why an experience is more likely to resonate with users if the psychological needs are met. The following sections briefly describe the three psychological needs and how they can be designed and accounted for in digital experiences.

Autonomy

Autonomy relates to the concept of a person being in control of their actions. Gamified platforms can support autonomy by allowing their user base to choose when and how they want to interact with its content, progress through content at their own pace, and set personal goals.

Relatedness

Relatedness refers to a person feeling socially connected with others, even within an individual task. Designers can support relatedness in a gamified system by integrating leaderboards, badges, and social sharing features.

Competence

Competence is a sense of mastery when interacting with a task or activity. Gamification can support competence by integrating mechanics such as points, levels, and streaks to reinforce users' behaviour positively.

Gaps in Existing Research

Throughout the examination of existing research studies with findings of gamification and user experience, the flow state, and game mechanics used in varying industries, several gaps in research exist, including the negative impacts of gamification, personalization in gamified systems, and the role of artificial intelligence in a gamified design. Similarly, limited research bridges gamification with Mihaly Csikszentmihalyi's flow theory to enhance the user experience.

Negative Impacts of Gamification

The majority of previous studies' findings point towards the positive impacts of gamification on user experience, leaving the adverse outcomes, such as addiction, manipulation, or discrimination, unknown. Similarly, few publications display the ethics in gamification design to prevent the possibility of a negative impact on the end user. This lack of research presents the need for a deeper investigation of a balance between the use of gamification to enhance engagement and ethically explored designs, preventing potential harm to the user.

Personalization in Gamified Systems

Throughout existing research, the most common gamified elements studied remain points, badges, and leaderboards, excluding the potential to design for personalization in gamified experiences.

Personalized gamified experiences are tailored game elements to suit the preferences and characteristics of each user. Examples of these experiences include customizable aviators and profiles, behavioural tracking and suggestions, and storylines based on the user's interests. With the study of personalized gamified systems, digital experiences have the potential to resonate with users in more meaningful ways.

Artificial Intelligence in a Gamified Design

Over recent years, artificial intelligence has become a more powerful tool for users of all demographics, gaining attraction for its immediate feedback and insightful responses. By incorporating artificial intelligence into a gamified experience, the tool can personalize it, address accessibility issues, and analyze user activities for front-end improvements. Despite artificial intelligence's potential, there remains a lack of research exploring how AI can be integrated into gamified products or services to enhance user experience.

Flow Theory and Gamification

Despite the rising popularity of flow theory and gamification in digital experiences, there remains a lack of research bridging these two concepts. "Several methods and gamification elements have been used to get people into a flow experience. However, there is no consensus on which methods and gamification elements should be used" (Olivira et. al, 2021). This quotation explains that although some research has been conducted to study what game mechanics induce a user flow state, the results were mixed and difficult to interpret. Similarly, gamification and a flow state are mainly used as favourable terms within the digital technology and experience field, leaving many questions about the harmful impact of combining both theories. Altogether, vast information regarding the flow state and gamified elements remains unknown to researchers.

Chapter Summary

This chapter discussed the vast published literature and research studies on user experience, gamification, and the flow mental state. Previous researchers have found that gamified elements have the potential to improve the user experience if game mechanics are applied correctly. A flow mental state can be achieved with a perfect balance of task challenges and the user's abilities. Various industries have adopted gamification in their digital experiences, including e-learning platforms, fitness technology, and e-commerce techniques. Finally, there remain several gaps in research on user experience, gamification, and the flow state, including the negative impact of gamification, personalized gamified elements, and artificial intelligence in a gamified design.

Chapter 3: Methodology

This chapter discusses the various methods used in the research study. It also outlines the study design, participants, materials, measures, and data analysis. Understanding the methodology used in the research procedure is essential as it will help determine the results.

Study Design

This research study utilized a mixed-methods diary study to acknowledge the connection between user experience, gamification, and the flow state in e-learning platforms. The study compared two e-learning experiences: Duolingo, the gamified platform and Khan Academy, the non-gamified platform. This study investigated how specific game mechanics affect user engagement, satisfaction, and information retention while analyzing their potential to lead users into a flow state when interacting with digital learning experiences. Participants were randomly assigned to one of two groups to interact with either Duolingo or Khan Academy for 15 minutes daily for 10 days. Participants of each group were assigned to learn math content on their assigned platforms. Participants completed a series of surveys throughout the various stages of the research study, including a pre-test study to collect participant baseline information, diary-logs to track progress responses, and a post-test research to evaluate the overall experiences of both groups and assess indicators of a flow state.

The study design allowed for a collection of both quantitative and qualitative data. Quantitative data was measured through Likert-scaled questions on participant engagement, satisfaction, information retention, and perceived flow. Qualitative data was collected through open-ended survey responses, allowing participants to expand on their perceptions and providing the researchers a deeper understanding of their experiences. The mixed-method research approach provided valuable insights on how gamification impacts user experience.

Participants

This research study initially aimed to have 10 participants complete the study. Although 10 participants enrolled in the study, only 8 completed the research study from beginning to end, allowing for data analysis. Participants between 18 and 24 were recruited for this research study through university-affiliated social media channels and word of mouth. All participants in this study were required to have a strong proficiency with technology and access to either a mobile or desktop device, enabling them to complete the study remotely. The participant age group for this research study has been found to have the most substantial proficiency with technology compared to other generations, making them the most suitable for remote research on user experience. (Choudhary et al., 2024). Participants were randomly assigned to interact with one of the two e-learning platforms:

- Group A: The gamified platform Duolingo
- Group B: The non-gamified platform Khan Academy

Each group consisted of 4 participants dedicated to each e-learning platform. Both groups were required to learn math material on their assigned e-learning experience for 15 minutes a day over 10 days. All participants received an informed consent form before participating in this research study, informing them of their right to withdraw from this study at any time. Similarly, the data collected within this study was anonymized, protecting participants from any identifiable or retractable data and ensuring participant privacy.

Materials

E-learning Platforms

Participants were randomly assigned to interact with one of the two digital learning platforms:

- Duolingo: Participants assigned to group A interacted with a math course on Duolingo's gamified e-learning application. They learned math-related materials by interacting with Duolingo's gamified features, such as points, badges, leaderboards, and streaks. These features were integrated into the Duolingo platform to promote user engagement while balancing skill challenges.
- Khan Academy: Participants assigned to group B interacted with math-related materials on the non-gamified application Khan Academy. Participants learned math-related materials using instructional videos, short quizzes, and written questions. Khan Academy does not offer a gamified experience, relying heavily on traditional learning methods.

Pre-test Survey

Participants of this study were asked to complete a pre-test survey before the 10-day diary study. The pre-test survey collected data regarding participant demographics, prior math knowledge, and technology proficiency. Understanding the demographics of the participant pool was essential pre-dirary study as the data provides important context when analyzing user engagement: identifying correlations between participant background and responses and collecting data regarding participants' prior knowledge of the math subject assisted with eliminating bias by accounting for the various baseline understandings that could influence user engagement, satisfaction, or information retention throughout the study. Finally, understanding participants' proficiency with technology ensured participants were effectively able to navigate the experiences remotely to continue with the study.

Diary Logs

During the diary study, participants interacted with their assigned platform for 15 minutes daily for 10 days. After each participant completed a daily 15-minute session, they were required to upload a brief survey recording their daily engagement, using each log submission as a proof of completion. Duolingo's gamified e-learning platform has recommended practicing for 15 minutes daily for an optimal learning experience, improving information retention over time and preventing task boredom. (Duolingo, 2023). This structured approach allowed for consistency across participants while aligning with the recommended usage patterns to collect the most accurate results regarding daily engagement.

Post-test Survey

A post-test survey was sent to all participants who completed the 10-day diary study. It collected information regarding their engagement with the assigned platform, task satisfaction, retained information, and flow state evaluation. Similarly, the post-test survey had open-ended questions, allowing participants to explain their experiences and provide qualitative feedback. Moreover, the final poll determined how likely participants would continue using their assigned platform for future learning, evaluating the experience’s continued business.

Measures

This research study measured variables correlating the assigned digital experiences to user engagement, user satisfaction, information retention, and the flow state. All of the measures throughout this study were collected through survey responses using 5-point Likert scale responses and open-ended qualitative questions.

User Engagement

User engagement was measured both during and after the diary study period. The daily diary logs recorded responses on a 5-point Likert scale regarding the level of focus, interest, and interaction with the assigned platform after a daily 15-minute session. Moreover, the post-study survey collected data

regarding user engagement by using a 5-point Likert scale to evaluate their overall engagement throughout the study duration and expand on their experiences through open-ended qualitative feedback responses.

User Satisfaction

User satisfaction was assessed through the post-study analysis using Likert-scaled items to identify each participant's enjoyment of the platform interaction, ease of use, and interface satisfaction. Similarly, at the end of the post-study survey, participants could provide open-ended reflections on what they liked or disliked about their experience.

Information Retention

The analysis of participant information retention of the math content learned throughout the diary study was collected via post-test survey through Likert-scale responses. Participants were asked to rate how well they understood and remembered the content they had learned over the 10 days. Moreover, participants were also asked how comfortable they felt describing what they had previously learned in a real-world setting.

Flow State

Determining if participants achieved a flow state was measured through 5-point Likert scales and open-ended responses within the post-test survey. Participants ranked their agreement with statements relating to Csikszentmihalyi's flow state characteristics. Open-ended survey responses allowed participants to expand on their experiences, whether participants believed they achieved a flow state, and reflect on why they think a flow state was or was not achieved.

Data Analysis

Data collected from the pre-test, diaries, and post-test surveys were analyzed through quantitative and qualitative methods to assess user engagement, satisfaction, information retention, and the flow state.

Quantitative Analysis

Survey responses to Likert-scaled items were coded numerically from 1 to 5, with 1 being strongly disagreeing and five being strongly agreeing. Quantitative data was organized through Microsoft Excel and analyzed through average scores. Similarly, the daily diary log submissions were recorded to examine patterns over time.

Qualitative Analysis

Open-ended survey responses were analyzed throughout the post-test using a thematic analysis. Responses were reviewed and grouped by topic. Recurring patterns within the open-ended responses were coded and categorized into broader themes. Common themes found within the open-ended reactions provide insight into the user experiences of this research study and give context to the numerical data. Furthermore, the qualitative data found within the post-test surveys also assisted with determining whether participants had achieved a flow state with their experience descriptions.

Chapter Summary

This chapter outlined the methodology used within the research study to correlate the relationship between user experience, gamification, and the flow state. The chapter considers the design by defining the essential details of the research study. The participants were discussed by explaining the number of participants gathered and the inclusion criteria for the study. The study materials included the pre-test survey, diary logs, post-test survey, and e-learning platforms. The user engagement, satisfaction, retention, and flow state data measurements are explained. Finally, the data analysis process was discussed, highlighting the extraction of survey data and coding participant Likert scale responses, identifying trends and differences between the gamified and non-gamified systems.

Chapter 5: Results

This section of the honours thesis presents the findings of the comparative 10-day diary study examining user engagement, satisfaction, information retention, and the flow state between the gamified and non-gamified e-learning platforms. The data was collected through Likert-scaled survey responses and open-ended qualitative feedback.

Engagement and Time Completion

Participants assigned to the gamified Duolingo experience presented higher levels of engagement than participants assigned to the non-gamified experience Khan Academy. User engagement was measured using a 5-point Likert scale in the post-test survey responses. Duolingo participants reported an average engagement score of 4.0, while Khan Academy participants reported 3.25 for an average engagement score. Similarly, Duolingo participants completed the 10-day diary study in less time compared to Khan Academy users. The average time it took Duolingo participants to complete the diary study was 13.75 days, while the average days of completion for Khan Academy participants was 20 days. These findings suggest that participants in the gamified research group were more likely to remain engaged with their assigned platform and complete tasks 31% faster than participants assigned to the non-gamified group.

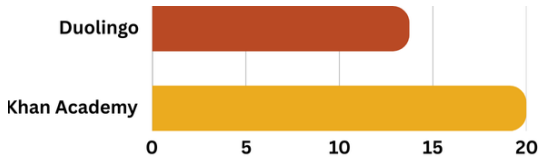

Figure 1.1: Diary study average time completion

Satisfaction and Motivation

Participants assigned to the gamified platform Duolingo reported higher satisfaction and motivation than Khan Academy participants. These results were measured using a 5-point Likert scale in

the post-test survey responses. Duolingo participants reported an average motivation score of 3.75, while Khan Academy's average motivation ranked at 2.5. In terms of enjoyment, Duolingo participants rated their experience with the platform more positively, with an average score of 4.5, while a 3.0 was ranked the average experience for Khan Acdemy participants. These findings suggest that gamification increases motivation and builds an emotional connection to the design, improving user enjoyment.

Information Retention

Participants assigned to interact with the Duolingo platform for 10 days reported having stronger retention of the information learned over the diary study period than participants assigned to Khan Academy's platform. Within the post-test survey, participants were asked to rank how well they believed they retained the information learned over a culmination of the previous learning sessions on a 5-point Likert scale. Participants from the gamified group Duolingo scored an average of 3.25 on information retention, while the non-gamified group Khan Academy scored an average of 2.75. These findings suggest that the interactive elements within the gamified e-learning experience and daily repetition contribute to a more excellent perceived learning experience.

Immersion and Flow State Indicators

To evaluate if participants within this research study had achieved a flow state, the post-study survey analyzed quantitative data from Likert-scaled questions and open-ended qualitative survey responses. The three core flow state indicators, immersion, time loss, and effortless tasks, were evaluated. Duolingo participants reported higher levels across all three flow state metrics than Khan Academy participants.

Immersion

Duolingo participants reported higher levels of immersion, with an average score of 4.25, while the average for Khan Academy participants was 2.75. This suggests that users of the gamified platform

were more likely to be fully absorbed with the platform's learning materials and less likely to become distracted.

Time Loss

Within the post-test survey, participants were asked if they felt they had lost track of time when interacting with their assigned platform. Duolingo participants reported higher levels of time loss with an average of 4.0, while a 2.0 average was discovered for Khan Academy participants. Similarly, after rating their time-loss observations, participants could further explain their experiences. One participant assigned to Duolingo stated, “My tasks felt like a game, I often wanted to do more than 15 minutes.” Another Duolingo participant said, “Because I was fully engaged, I wasn’t looking at a clock, and the 15 minutes felt very fast.” Although Duolingo participants had positive feedback explaining their time loss, none of the participants from the Khan Academy group gave qualitative feedback regarding their time loss experience when interacting with the platform. The difference in reported time loss for each learning experience suggests that gamified systems are more likely to induce temporary disociation, a standard indicator of a flow state.

Effortless Tasks

Within the post-test survey, participants were asked to rank their experience on a Likert scale on how well they felt their tasks were effortless, with one entirely disagreeing and five fully agreeing. The average of Duolingo participants agreeing with that statement was 4.5, while Khan Academy participants ranked an average of 3.75. This measure reflects how naturally participants of this study were able to learn tasks without succumbing to frustration or boredom.

Preferred Features and User Feedback

Within the post-test survey, participants were asked open-ended questions about what they had felt were most helpful, enjoyable, and rewarding when completing tasks within their assigned platform.

The qualitative responses from research participants revealed key differences between the gamified platform Duolingo and the non-gamified platform Khan Academy.

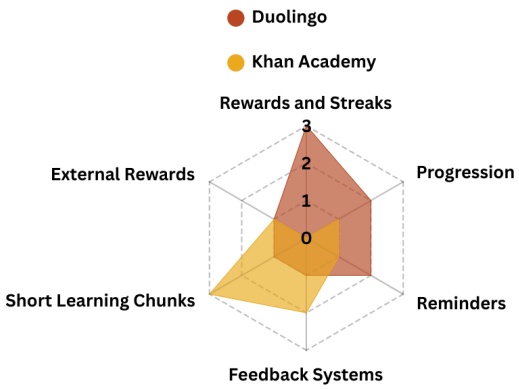

Figure 1.3: Key motivators gathered from qualitative feedback

Duolingo Qualitative Feedback

Participants assigned to the Duolingo experience reported rewards and streaks (n=3), progression (n=2), and reminders (n=2) as the top motivators to continue interacting with the gamified platform. These gamified features helped users stay consistent, track progress, and remain motivated while completing learning tasks.

Khan Academy Qualitative Feedback

Participants assigned to the Khan Academy experience reported short learning chunks (n=3) and feedback systems (n=2) as the primary helpful features integrated into the e-learning platform. Khan Academy users appreciated the learning platform's clear structure and ability to complete lessons quickly. However, these participants did not mention rewards and streaks, indicating a lack of motivational learning and consistency of use.

Chapter Summary

Overall, the comparative diary study results suggest Duolingo's gamified platform outperformed Khan Academy on all measured experiences. Participants assigned to Duolingo's platform reported higher levels of engagement, satisfaction, information retention, and indicators of a flow state. Moreover, it was also found that Duolingo participants completed the diary study portion much faster than Khan Academy participants, suggesting that gamification also improves user consistency. Furthermore, the qualitative analysis highlighted which design principles kept participants of each group the most motivated throughout the research study. These findings emphasize the importance of gamification and user experience in enhancing digital learning.

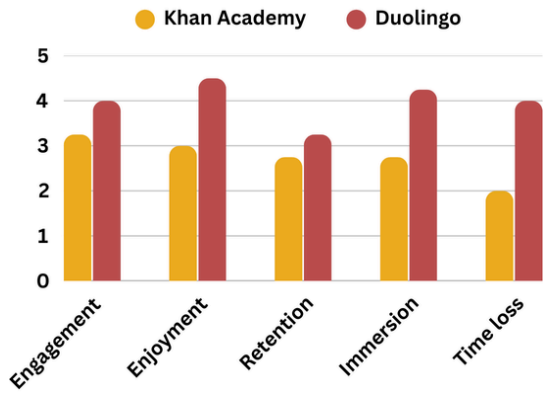

Figure 1.3: Comparison of metrics across e-learning platforms

Chapter 6: Discussion

This chapter discusses the research findings discovered within the comparative diary study of the gamified e-learning platform Duolingo and the non-gamified e-learning platform Khan Academy. The research study results examine the correlations between user engagement, satisfaction, information retention, and flow across gamified and non-gamified e-learning platforms. By exploring quantitative and qualitative data, the research study results are analyzed from the perspective of ongoing literature on user experience, gamification, and the flow state. This chapter also discusses the implications of designing for gamification in e-learning platforms, the limitations of this research study, and recommendations for

future research within the field. It approaches to measure a flow state within user experience environments.

Overview of Research Findings

This research study explores the relationship between gamification and the flow state in e-learning experiences by comparing Duolingo with the non-gamified platform, Khan Academy. By analyzing quantitative Likert-scaled data and qualitative open-ended responses, several patterns emerged from the 10-day diary study, including user engagement, satisfaction, information retention, consistency, and indicators of a flow state.

Participants assigned to the gamified e-learning platform Duolingo reported higher levels of engagement, faster task completion, and more enjoyment upon interaction with the platform. These findings align with Hsu and Chen (2018), who discovered that carefully crafted user experiences in gamified environments enhance user engagement, perceived benefits from the platform, and consumer return rate. Similarly, this research study found that Duolingo participants maintained motivation through the rewards and streaks system the most, closely followed by the progression system and notification reminders. These results are similar to the patterns of Bitrián et al. (2021), who discovered that achievement and progression gamified elements satisfy user needs of competence, autonomy, and relatedness to increase user engagement. Moreover, participants assigned to the Duolingo e-learning platform completed the research study 31% faster than participants assigned to the Khan Academy platform, suggesting that the rewards and streaks game mechanics improve user consistency of use.

Analyzing flow-related metrics of immersion, time loss, and efortlessness, Duolingo participants ranked higher on average across all three criteria than Khan Academy participants, suggesting that gamified systems are more likely to lead users into a flow mental state. These metrics align with Csikszentmihalyi's (1990) flow theory, where a person becomes so immersed in an activity that matches the user's abilities that they become so immersed that they lose track of time.

Gamification and User Engagement

One of this research study's most significant findings was the difference in user engagement levels between the gamified e-learning platform Duolingo and the non-gamified e-learning platform Khan Academy. Participants assigned to interact with Duolingo reported 23% higher engagement levels with their experience when compared to Khan Academy users. These findings suggest that gamified e-learning platforms significantly impact user engagement. By integrating rewards, streaks, progressive systems, and notifications, gamified e-learning platforms have the potential to sustain end-user motivation and improve participation over time. Moreover, the commonly reported motivating game mechanics rewards, streaks, progress tracking, and daily notifications create feedback loops encouraging users to continue participation and support enhancing engagement. Koivisto and Hamari published a review explaining that gamified systems can support affordances such as competence, autonomy, and relatedness by encouraging intrinsic motivation. (Koivisto & Hamari, 2019). Duolingo's gamified e-learning platform leverages its game mechanics to sustain these affordances, increasing inherent motivation to foster engagement and long-term participation.

In contrast to the gamified system, Khan Academy participants reported appreciating the clear structures integrated into the platform. Still, they specified a lack of incentives to encourage consistency of use. This observation from the research study corresponds to the survey *Gamification of E-learning in Higher Education* by Khaldi et al. (2023). These researchers found that digital learning systems with traditional learning methods lack the motivational affordances that gamified e-learning experiences provide, leading to decreased user motivation. Altogether, non-gamified, traditional e-learning platforms fail to integrate feedback loop systems that make the experience enjoyable and interactive for the end users.

Satisfaction, Motivation, and Learning Retention

This research study found that Duolingo participants reported higher satisfaction, motivation, and perceived information retention than Khan Academy participants. These findings suggest that gamified

platforms potentially connect with users on an emotional level by positively reinforcing user interactions with the rewards and streaks systems. A key theme within the qualitative data results showed that Duolingo participants felt more motivated to complete their daily learning tasks than Khan Academy participants. These findings are consistent with the previous research of Huang and Hew (2018), who found that gamification in learning experiences increased user participation, the quality of student work, and the perceptions of the overall learning experience. The findings from both research studies argue that gamification in e-learning platforms has the potential to increase user engagement and satisfaction, but also the effectiveness of the overall learning experience.

Flow State in Digital Learning

One of the main focuses of this research study was to understand how users can enter a flow state when interacting with digital learning experiences. Csikzentmihalyi's (1990) flow theory is the ideology where users become so absorbed with a task or activity that they lose track of their physical surroundings. When someone enters a flow state, the concept is characterized by the reported symptoms of time loss, complete immersion, and high intrinsic motivation. Previous research found that when designing for flow, the digital experience must have a full balance of task challenges and the user's abilities, providing the user a sense that they are entirely in control of their actions. (Yuan & Shang, 2018). This research study discovered that users assigned to the gamified e-learning platform were 20% more likely to feel in control of their progress and performance when compared to users assigned to the non-gamified e-learning platform. These findings suggest that gamification in digital learning platforms is more likely to lead users into a flow state than platforms that rely on traditional learning methods.

Design Implications of UX and E-learning

The results of this research study offer guidance to user experience designers and developers working closely on digital learning platforms. As demonstrated throughout the results of this research study, the gamified e-learning platform Duolingo has carefully integrated successful game mechanics into

its platform to provide an enhanced user experience. Duolingo's gamified platform increased user engagement, satisfaction, perceived information retention, consistency of use, and flow state reports compared to Khan Academy's digital experience that uses traditional learning methods. These findings suggest that gamification should not be viewed as an unnecessary layer to digital learning experiences but rather a core design strategy to make the experience more interactive and successful.

From a user experience design standpoint, gamified elements such as rewards, streak progress tracking, and notifications significantly benefit user motivation and the consistency of the user with the digital platform. These game mechanics align with Deci and Ryan's self-determination theory, emphasizing the importance of the three user needs: autonomy, relatedness, and competence. (Deci & Ryan, 1985). In this research study, the gamified e-learning platform supported the three user needs of the self-determination theory by integrating clear goals, immediate feedback, and a sense of accomplishment to enhance the emotional connectivity users have with the digital experience. While non-gamified e-learning platforms are great for simplicity, they often struggle to maintain user engagement, leading to decreased motivation and a lack of consistency. Altogether, when designing for an enhanced user experience for e-learning platforms and when designed effectively, gamification can potentially create emotionally engaging experiences for the end users.

Limitations of the Research Study

While this research study provided valuable insights into user experience, gamification, and the flow state theory, several study limitations should be addressed.

Participant Sample Pool

This research study had a small sample size (n=8), which completed the entirety of the study from start to finish. Although both quantitative and qualitative data revealed consistent patterns between the relationship of user experience, gamification, and the flow state, the findings may not represent the general population. Similarly, the study focused on analyzing participant data between 18 and 24.

Participants of this age range were studied for convenience of university campus recruitment and high technology proficiency. The participant age group excludes younger learners and adult professionals, which limits the findings to other age demographics who might interact with digital learning experiences.

Perceived Information Retention

One of the metrics this research study measured was perceived information retention. The accurate remembrance of information was not measured in this study. In the post-test survey, participants were asked to rate how well they believed they had remembered the information they had learned in the previous 10-day diary study. However, the information collected does not confirm how much content was retained during this period.

Diary Study Duration

The diary study took place over a short period, limiting the ability for researchers to assess the long-term impact of gamification in e-learning platforms. Although the diary study provided valuable insights into user experience, gamification, and the flow state, a more extended diary study would reveal more patterns regarding user engagement, satisfaction, information retention, consistency, and the flow state.

Duolingo and Khan Academy

Duolingo and Khan Academy differ beyond gamification; they are the two platforms used within the diary study. While this research study specifically focused on how game mechanics affect the end user experience, many variables, such as interface design, tone of instructions, and course structure, have been excluded from the study that may affect the results. The differences between the two platforms could affect the overall research results and should be considered upon analyzing the findings.

Future Research

While this research study provides a foundation for understanding the relationship between user experience, gamification, and the flow state in e-learning platforms, researchers should consider several important directions for future research.

First, future studies should move beyond perceived information retention and focus on how well participants remember the learned information when interacting with a gamified e-learning experience. While self-reported metrics provided valuable insight to this study, future research could include quizzes or task-based assessments to analyze how much information was retained after interacting with a gamified or non-gamified digital learning platform. This future research would help researchers distinguish between feeling like one has learned and demonstrating one has learned. Second, expanding the participant sample size and diversity is essential for future research. This research study featured eight participants who all resided in the same area. More extensive research studies could focus on researching participants with various age ranges, different academic backgrounds and across a broader geography to unveil how different populations react when interacting with a gamified or non-gamified system. Third, future research should consider expanding the duration of the diary study. Increasing the diary study duration could reveal the long-term effects of gamification in digital learning that weren't discovered within the 10-day diary study period. Finally, future research could benefit from platform comparisons beyond Duolingo and Khan Academy. Exploring different gamified and non-gamified e-learning experiences could reveal what specific game mechanics or design principles influence a flow state that may have been overlooked from the studied platforms.

Altogether, addressing the areas that have been missed within this research study could contribute to a deeper understanding of how gamification in digital learning tools can provide the end users with an optimal learning experience.

Chapter Summary

This chapter interprets the results from the comparative research study on the gamified e-learning platform Duolingo and the non-gamified platform Khan Academy. The results analyzed how users assigned to each group differed on the various metrics, including engagement, satisfaction, perceived information retention, consistency of use, and the flow state. The study discovered that participants assigned to the gamified experience, Duolingo, were more likely to have higher motivation, faster task completion, and a stronger connection to the experience. The study results were analyzed and compared to previous findings and ideologies of user experience, gamification, and the flow state from researchers globally. The limitations of this research study were acknowledged, including the participant sample pool, reliance on perceived information retention, duration of the diary study, and the differences between the studied platforms. Finally, recommendations for future research were proposed, discussing the need for a more diverse participant sample pool, a more extended diary study period, and an investigation into another comparative study on two different gamified and non-gamified e-learning experiences.

Chapter 7: Conclusion

This honours thesis aimed to understand the relationship between user experience, gamification, and the flow state within digital learning experiences. By comparing the gamified e-learning platform Duolingo and the non-gamified e-learning platform Khan Academy, this research study investigated how specific game mechanics affect user engagement, satisfaction, information retention, and the ability to achieve a flow state. Upon analyzing the 10-day diary study findings, gamification suggests having a more positive user experience in digital learning compared to applications with traditional learning methods. Participants of this research study who were assigned to interact with Duolingo reported having higher levels of motivation, faster completion of assigned tasks, increased enjoyment when interacting with their assigned platform, and a stronger emotional connection with the experience compared to the results of Khan Academy participants. Similarly, participants from the gamified platform reported feeling most motivated by the rewards and streaks system. Khan Academy participants relied on the short learning chunks to stay engaged. Moreover, users who interacted with the gamified learning platform

were more likely to show signs of entering a flow state. Users reported feelings such as time loss, effortless tasks, and high immersion, correlating with Csikszentmihalyi's flow theory (1990).

The results of this research study contribute to previous literature and research revolving around user experience, gamification, and the flow state within digital learning experiences. This research addresses the limitations of the research study including the small participant pool sample, limited diary study duration, inaccurate information retention results, and the differences between learning platforms. Future research can build on these findings by exploring more diverse participant groups, more rigorous testing on information retention, studying different e-learning platforms, and increasing the duration of the diary study for long-term findings. This research study supports the findings that gamification can enhance the end user experience in digital learning platforms and beyond. By creating experiences that are not just functional but emotionally engaging and intrinsically motivational, designers can create meaningful and innovative experiences for the end users.

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