Gamifying Financial Literacy: A Marketing Strategy for a Mobile App using Gamification to Improve User Engagement

William Divay

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Abstract

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Keywords : Financial literacy, Gamification, User engagement, Educational mobile applications, Self-determination theory, Game elements, Motivation

The global financial crisis of 2008 highlighted the critical importance of financial literacy and effective personal financial management. Despite the growing need for financial education, a significant portion of the global population remains financially illiterate, which poses long-term risks to individual and societal economic stability. This thesis explores the potential of gamification as a strategy to enhance user engagement in a mobile application designed to improve financial literacy.

By integrating game elements such as points, badges, leaderboards, and personalized learning paths, the proposed app aims to make financial education interactive and engaging. This study is grounded in the Self-Determination Theory, which emphasizes the importance of competence, autonomy, and relatedness in motivating behavior. Through a combination of literature review, survey analysis, and empirical data collection, the research investigates the effectiveness of different gamification elements in enhancing user engagement.

The findings reveal that elements focused on competition, social relationships, feedback, progression, and rewards significantly enhance user motivation and engagement. However, immersive elements such as customizable avatars, while enhancing user experience, do not have a significant standalone impact on engagement. This research provides valuable insights for developers and educators on the strategic implementation of gamification in financial literacy applications, highlighting its potential to foster a more financially informed and competent society.

Resumo

Gamificação da literacia financeira: Uma estratégia de marketing para uma aplicação móvel que utiliza a gamificação para melhorar o envolvimento dos utilizadores

William Divay

Palavras-chave : Literacia financeira, Gamificação, Envolvimento do utilizador, Aplicações móveis educativas, Teoria da autodeterminação, Elementos de jogo, Motivação

A crise financeira mundial de 2008 pôs em evidência a importância crucial da literacia financeira e de uma gestão financeira pessoal eficaz. Apesar da crescente necessidade de educação financeira, uma parte significativa da população mundial continua a ser financeiramente analfabeta, o que coloca riscos a longo prazo para a estabilidade económica individual e social. Esta tese explora o potencial da gamificação como estratégia para aumentar o envolvimento dos utilizadores numa aplicação móvel concebida para melhorar a literacia financeira.

Ao integrar elementos de jogo como pontos, distintivos, tabelas de classificação e percursos de aprendizagem personalizados, a aplicação proposta visa tornar a educação financeira interactiva e envolvente. Este estudo baseia-se na Teoria da Autodeterminação, que enfatiza a importância da competência, da autonomia e do relacionamento na motivação do comportamento. Através de uma combinação de revisão da literatura, análise de inquéritos e recolha de dados empíricos, a pesquisa investiga a eficácia de diferentes elementos de gamificação no aumento do envolvimento do utilizador.

Os resultados revelam que os elementos centrados na competição, nas relações sociais, no feedback, na progressão e nas recompensas aumentam significativamente a motivação e o envolvimento dos utilizadores. No entanto, os elementos imersivos, como os avatares personalizáveis, embora melhorem a experiência do utilizador, não têm um impacto autónomo significativo no envolvimento. Esta investigação fornece informações valiosas para programadores e educadores sobre a implementação estratégica da gamificação em aplicações de literacia financeira, realçando o seu potencial para promover uma sociedade mais informada e competente em termos financeiros.

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Chapter I Introduction

The global financial crisis of 2008 underscored the critical importance of personal financial management. Many households, affected by job losses and reduced income, struggled without adequate savings to cover their mortgage payments. This experience highlights the necessity of acquiring financial management skills and financial literacy from a young age. Financial literacy is a favorable attitude and mindset towards making informed decisions based on financial information, which can influence an individual's ability to derive monetary pleasure and improve their financial situation. It encompasses an individual's capacity to apply knowledge to make suitable financial decisions, enabling them to understand what, how, why, where, and when to spend money. By teaching people to apply classroom knowledge to real-life financial management, financial literacy fosters future success and happiness, ultimately enhancing life satisfaction through improved financial well-being as defined by Banthia et al (2022).

Mistakes made in financial planning during the early stages of independent life can have long-term repercussions, impacting not just the immediate economic well-being of households but also their future stability (Navickas et al., 2014).

An essential component of financial literacy is personal financial management, which Navickas et al. (2014) define as "*all financial decisions and activities that a person could make. This could include budgeting household incomes and expenditures, savings, investments, mortgages, insurance and all other decisions that require money. The most important factor of personal finance management is financial planning, which should involve analyzing the financial position and setting of short-term and long-term goals*."

However, for those without financial education, navigating personal finance can seem discouraging. Indeed, such individuals often do not know how to effectively manage their finances, including planning, saving, investing, and borrowing when necessary. Research by Navickas et al. (2014) reveals that about 67% of respondents in both Lithuania and the United States correctly understand simple interest calculations, indicating that the challenge of low financial literacy is not confined to one region but is a widespread issue globally. This last statement is supported by Lusardi (2019) who state that on average, around one-third of the world's population master’s the basic concepts that underpin everyday life. The Navickas et al. (2014) study also suggests that higher education in fields such as economics and management

does not necessarily equalize to high financial literacy, raising questions about effective solutions to this omnipresent issue.

Responsible management of financial resources benefits not only individual households but also the entire country. Making correct decisions requires an appropriate level of financial literacy (Navickas et al., 2014).

Furthermore, the rise of social media has led to an increase in the number of "coaches" promising quick and easy wealth through lucrative investments. A young and uneducated population may be easily swayed by these promises, potentially putting themselves at financial risk.

Given the rapid digitization of our lifestyles and all sectors of activity, leveraging digital solutions seems to be a viable way to address these challenges.

In a context where financial literacy is becoming increasingly essential, there is a need for effective educational tools. My project aims to fill this gap by proposing an innovative mobile application.

The creation of this application is part of CLSBE's “New Business Opportunities” seminar, led by Rute Xavier. This seminar aims to develop concrete business ideas by providing a solid theoretical basis and practical application. My project meets this objective by proposing a mobile application designed to improve the financial literacy of individuals and professionals.

In France, and around the world, lack of financial knowledge is a major problem, with limited education. This app, using gamification, aims to fill this gap by making financial learning interactive and personalized.

The app will include gamification elements such as points, badges, and leaderboards to motivate and engage users, while offering tailored learning paths. By addressing the needs of competence, autonomy and social connection, this application aims to increase user engagement.

This thesis work will play a crucial role in the development of the application by integrating gamification elements and assessing their potential impact on user engagement.

Research objectives and questions.

Today's population is highly connected, making a mobile application an appropriate tool for this purpose. By leveraging gamification, we aim to create an engaging and personalized learning experience that enhances user engagement. The proposed research aims to develop a marketing strategy for a personalized financial literacy app that leverages gamification to improve user engagement. To achieve this goal, we will investigate the following research questions:

- **How does gamification affect user engagement with mobile apps?**
- **Which elements of gamification are most effective in improving user engagement?**
- **To what extent does the combination of different gamification elements influence user engagement?**

By exploring these research questions, this thesis seeks to contribute to the academic discourse on gamification and translate theoretical insights into practical solutions for financial literacy education. The innovative application of gamification, offers a novel approach to engage users deeply, making the learning process more interactive, personalized, and effective. This approach is particularly relevant in the context of financial literacy, where understanding complex concepts and applying them in real-life scenarios are crucial for individuals' financial autonomy and well-being.

Furthermore, this thesis will explore how these technologies can be implemented to design a user-centric financial literacy application that not only educates but also motivates and retains users over time. The potential of such an application to improve financial literacy on a broad scale could have significant implications for individual financial decision-making and overall economic health. In doing so, this research aims to bridge the gap between theoretical models of gamification and their practical utility in enhancing financial literacy education, thereby contributing to the creation of a more financially informed and competent society.

Chapter II Literature review

The literature review is a critical component of any research study, as it provides a comprehensive understanding of the existing knowledge and theories related to the research topic. In this chapter, we will delve into the relevant literature on gamification, its definition, game elements, and its strategic application in marketing. We will also explore the transformative impact of gamification on learning, engagement, and motivational dynamics, as well as the power of personalized gamification in customizing engagement.

1. Gamification definition

The term gamification was first introduced by Nick Pelling, a computer programmer and inventor, in 2002 (Treiblmaier et al., 2018). Despite its early inception, the concept only started to receive significant recognition in academic circles around 2010 (Liu, Santhanam, & Webster, 2017). Even though the term gamification has only recently come into common usage, the use of games within the workplace has been studied in research dating back to the 1930s. However, there is evidence to suggest that games were employed to motivate workers in ancient Egypt (Edery & Mollick, 2009). Also, "*gamification has seen substantial growth in its application across industry sectors in recent years, with an estimated 70 per cent of Global 2000 organizations having at least one gamified application"* (Harwood & Garry, 2015).

Today, there are many definitions of the term gamification. In this section, we'll look at several of them from the authors' different perspectives.

Gamification is a concept that has gained significant attention in recent years, particularly in the fields of education, training, and business. The term "gamification" refers to the application of game mechanisms, elements, and thinking in non-gaming environments with the aim of enhancing the processes enacted and the experience of those involved (Caponetto et al., 2014).

From the definition of Kapp (2012) gamification is "*using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems.*" Similarly, Deterding et al. (2011) define "*gamification as the use of game design elements in non-game contexts."*

Several other authors share a definition close to that of Deterning et al., such as Marczewski (in Kiryakova et al., 2014), who defines gamification as the use of game metaphor, game elements and ideas in a context other than that of the game, with the aim of increasing

motivation, engagement and influencing user behaviour, and many others (Seaborn & Fels, 2015; Werbach & Hunter, 2012).

Blohm and Leimeister (2013) define gamification as "*enriching products, services, and information systems with game design elements to positively influence motivation, productivity, and behaviour of users*".

For some others, "*gamification is not merely about slapping some badges on your website*" (Zichermann & Cunningham, 2011). It is a process of enhancing a service with affordances for gameful experiences to support users' overall value creation. The goal of gamification is to create gameful experiences that give rise to positive outcomes, rather than simply using game design elements. Gamification can be conceptualized as a strategic approach where the 'gamifier' aims to foster game-like experiences by infusing a service with designed features for this purpose. However, it is important to consider that gamification "*does not imply that the process of gamification is inherently successful: gamification can only attempt to support the user in creating gameful experiences that promote the user's overall value creation*" (Huotari & Hamari, 2012).

Other authors take a more critical position on the subject "*marketing, invented by consultants as a means of capturing the wild beast the wild and coveted beast that is video games, and domesticate it for big business"* (Harwood & Garry, 2015).

It's also important to distinguish between the various forms of game that can be found in educational and/or professional environments.

Putz et al. (2018) based on the work of Wood and Reiners (2012) makes the distinction between gamification and serious games, which are full-fledged games played for reasons other than "just for fun". Pervasive games or mixed-reality games, on the other hand, strive to combine the physical, social, and virtual worlds to create new games.

Another key point is to differentiate gamification from experiences that might be identified as gamified when brands set up loyalty programs. Gamification differs from traditional loyalty programs by offering additional social and motivational advantages through the use of products, not just through spending (Blohm & Leimeister 2013; Huotari & Hamari 2012).

From all the definition we had, we can tell that gamification is the integration of game elements and game thinking in activities that are not games, with the goal of elevating the implemented processes and enriching the experiences of those engaged.

In view of the major gamification trend that has emerged in recent years, it is now essential to understand the structure of gamification to optimize its application.

And for Gartner "*a clear design strategy is the key to success in gamification*" (Mora et al., 2015).

2. Game Elements of Gamification : Design is key.

Gamification design elements serve a distinct purpose compared to game design; they are employed to increase engagement in various settings, while game design aims at delivering pure entertainment. Mora et al. (2015) clearly differentiates between the design and characteristics of games and gamification. Initially, game design typically begins with the fundamental concept of enjoyment, whereas gamification is oriented towards achieving a business goal. Furthermore, the establishment of metrics or game objectives should occur at various phases throughout the design process. However, the core principles of gamification are deeply rooted in game design theory (Mora et al., 2015).

The Elemental Tetrad Model proposed by Schell (2008) offers a widely acknowledged framework for designing games, consisting of four interrelated design characteristics: story, mechanics, aesthetics, and technology. These elements create a cognitive and affective ecosystem that promotes player immersion and engagement.

2.1 Design Element 1: Story

The story or narrative format provides context to a game, adding meaning to the consumption experience and guiding user actions. Many companies acknowledge storytelling's persuasive power but lack insight into using narrative elements in mobile games for marketing effectively (Hofacker et al., 2016). Research on narrative transportation (e.g.van Laer et al., 2014) -who refers to "*a convergent process, in which all of the person's mental systems and capabilities become focused on the events occurring in the narrative*" from Green & Brock's work (2000)- offers significant insights into the role and impact of the narrative component. It shows that the story element is crucial for immersing players in the game, as it enables them to focus attention on the story development, analyze it, and relate to the story characters. Escalas (2007) demonstrate that a detailed narrative proves especially beneficial for consumers with educational objectives, as the process of narrative transportation links closely with increased self-reflection and enhanced learning (Hofacker et al., 2016).

But the integration of narrative into gamification is not unanimously supported. Even though some experiments conducted by O'Donovan, Gain and Marais (2013),where they integrated narrative to a game development course, engaging students in a quest to retrieve an item by completing learning tasks have demonstrated convincing results on student engagement during the course, some authors do not share the same opinion on the subject. In particular, "*Zichermann and Cunningham explicitly exclude narrative from their list of gamification elements, claiming that gamification (in their view) is used to construct "non-fiction experiences*" (Mader et al., 2019).

2.2 Design Element 2: Mechanics

"*Game mechanics refers to the game's procedures and rules, how players achieve goals, and how players are rewarded. The mechanics of a game provide the feedback that makes game outcomes comprehensible."* (Hofacker et al., 2016).

Game mechanics provide players with indications of how to navigate the game and enable them to understand what is expected and rewarded at different hierarchical levels. These mechanisms create a game dynamic which, in turn, shapes a specific user experience. (Hofacker et al., 2016)

"*Common game mechanics include badges, points, progress bars, and leaderboards*" (Hofacker et al., 2016). Other game elements such as avatars, profiles, narratives, customization (Koivisto & Hamari, 2019) have been related by Deci & Ryan (2000) to the satisfaction of psychological needs, «*but these were not as commonly implemented as achievement and social affordances*" (Koivisto & Hamari, 2019). Even though review of empirical literature suggests that the combination of points, badges, and leaderboards remains predominant in the realm of gamification. Koivisto & Hamari, (2019) and prior studies have shown that when users engage with these kinds of elements, they tend to feel a sense of competence. *"(e.g., Hassan et al., 2020; Peng et al., 2012; Sailer et al., 2017; van Roy & Zaman, 2019; Wee & Choong, 2019; Xi & Hamari, 2019)*" as cited by Bitrián et al. (2021). Nonetheless, there isn't a definitive collection of gaming elements that are exclusively found in games and inherently create game-like experiences (Huotari & Hamari, 2012).

"*Rewards systems help motivate players, create loyalty, and signal social status* " (Hofacker et al., 2016). Other studies indicate that rewards with unpredictable sizes are more motivating than those with predictable sizes, even if the anticipated value of the uncertain reward is less. This motivational influence of uncertainty arises when individuals focus on the pursuit of the reward rather than the reward's actual result (Shen et al., 2015).

Additional studies propose that to sustain engagement, rewards need to be consistently provided; removing these incentives results in users losing interest and abandoning the activity (Hofacker et al., 2016).

In gamification, points and badges can be considered as rewards, attributed to the player through his performance. However, it's important to know how to differentiate between the two elements. Points can be tangible or intangible rewards (e.g. a virtual currency in a game, discount vouchers on a website...) where badging refers to the conditions in which visual symbols are awarded to represent a player's earned accomplishments and their status within the game's social hierarchy, as observed in World of Warcraft (Hofacker et al., 2016).

It is essential that certain elements of gamification are present when designing game mechanics. There are, however, nuances in terms of user expectations of reward processes. It is therefore essential, through statistical studies, to visualize the position adopted by potential users and the "*individual differences in risk aversion and reward seeking*." (Hofacker et al., 2016).

2.3 Design Element 3: Aesthetics

Aesthetics refer to the look and feel of a game. It gives games a sense of purpose and enhances story progression. In many games, the focus on visual imagery and presentation is crucial to creating an attractive environment, although it can also involve engaging other senses (Hofacker et al., 2016).

Furthermore Hofacker et al. (2016) echoes Alba & Williams' words consider that appearance plays an important role in creating an appealing experience, with aesthetics being more important for hedonic products than for utilitarian ones.

However, it would be reasonable to consider gamification as being made up of these two elements. The utilitarian in the goal of developing skills through the use of a gamified application whose design best meets hedonic consumption, defined as follows by Hirschman and Holbrook: "*those facets of consumer behavior that relate to the multisensory, fantasy, and emotive aspects of one's experience with products*." (Alba & Williams, 2013).

The importance of aesthetics in enhancing the effectiveness of gamification should be proportional to the degree of consumer attachment to the aesthetic aspects of marketing products and fit with consumer mood (Hofacker et al., 2016).

2.4 Design Element 4: Technology

The technology element pertains to how the medium shapes the game experience (Hofacker et al., 2016).

Advancements in mobile technology present both opportunities and obstacles for gamification. For example, the introduction of bigger devices like the iPhone 6 and 6+, Samsung Galaxy, and various tablets allows users to engage in more captivating experiences. There is informal evidence suggesting the importance of screen size and processing power; research conducted by the industry indicates that individuals who own tablets engage in downloading and playing games more frequently than those who only have mobile phones (Hofacker et al., 2016).

In addition, the incorporation of audiovisual components into games elicits a more immersive participatory response by stimulating the various senses. This suggests that the characteristics of mobile platforms could influence how the story affects narrative immersion and, consequently, the success of the mobile gamification effort (Hofacker et al., 2016). This point of view could be challenged by the age of the literature in question. Technological innovations, particularly in mobiles, now make it possible to support multi-gigabyte games and give users the full benefit of the experience.

However, the effect of technological capabilities in gamified environments depends on consumers' needs for rich information compared to simple interfaces, as well as on the experience, age, and gender of individual consumers (Hofacker et al., 2016)

3. Enhancing User Engagement Through Mobile Gamification in Marketing Strategies

We've been talking about engagement since the beginning of this thesis. But it would seem consistent to give it a clear definition.

For Schaufeli, W. B. (2013) engagement include involvement, commitment, passion, enthusiasm, absorption, zeal, and energy. Similarly, the Merriam-Webster dictionary defines engagement as "emotional involvement or commitment" and as "being in the heat of the action”.

On the marketing side, and more specifically in the mobile applications sector, the in-app engagement refers to the interactions that occur between a user and a mobile application. To measure engagement, several parameters are analyzed together to understand user behavior within the app. Mobile advertisers rely on these metrics to assess the effectiveness of their

mobile marketing campaigns. Factors such as the frequency of in-app events and the impact of advertising efforts on app usage are considered to assess engagement and maintain user loyalty.

"*One of the significant challenges in the mobile app market is to keep the user engaged in the long-term or in an ongoing regular basis during app's usage, avoiding loss of interest"* (Cecchetti et al., 2019).

In fact, only 32% of users use a particular app more than 10 times. What's more, 25% of mobile apps are abandoned after a single use following their download (Bitrián et al., 2021).

Applying strategies that reinforce user engagement is an effective approach to motivating behavioral change, and gamification appears to be one answer to these challenges. Particularly considering the fact that engagement is a pivotal factor in maintaining user interest in mobile applications, as it minimizes dropout rates by providing motivation (Bitrián et al., 2021).

So, it seems essential to understand the fundamental psychological levers involved in motivation. The theory proposed by Deci & Ryan (2000) seems to offer the beginnings of an answer.

STD theory (Self-determination theory) is a method for understanding human motivation and personality. It employs traditional empirical research methods within an organismic framework that emphasizes humans' natural capacities for personal growth and self-regulation. Highlighted by Ryan, Kuhl, and Deci in 1997, SDT focuses on exploring the inherent growth tendencies and fundamental psychological needs that underlie self-motivation and the integration of personality. These include the needs for competence, relatedness, and autonomy. Recognizing these needs is crucial as they are seen as vital for promoting the optimal functioning of our natural tendencies towards growth, integration, constructive social development, and personal well-being.

Competence is the individual's belief in their ability to successfully perform an activity and achieve desired results. Autonomy involves the capacity to make choices about one's actions. Lastly, relatedness is the feeling of being connected to others (Bitrián et al., 2021).

As discussed earlier in this thesis work, a review of the empirical literature suggests that the combination of points, badges and leaderboards remains predominant in gamification. Koivisto & Hamari (2019) and previous studies have shown that when users engage with these types of elements, they tend to feel a sense of competence.

On the other hand, for the autonomy aspect, elements like leaderboards, badges, and challenges have been demonstrated to install a sense of freedom in users (Bitrián et al., 2021).

Finally, this sense of connection to others can be fulfilled by setting up a leaderboard, sharing achievements with friends and multiplayer objectives into the game. In fact, Raith et al. (2021) stated that engagement in Massively Multiplayer Online (MMO) games is positively related to players' sense of gamer identity, and this in turn is related positively with aspects of well-being such as enhanced self-esteem, social competence, and reduced loneliness.

Understanding the theoretical underpinnings of gamification, such as those provided by Self-Determination Theory, establishes a robust framework for appreciating its impact. The next step is to explore how these principles translate into tangible marketing strategies that effectively captivate and engage users. By examining practical implementations across various industries, we can see how these theoretical concepts are brought to life, driving user engagement.

As mentioned by Koivisto & Hamari (2019): "*Gamification today is a widely trusted and applied technique to encourage engagement"* (Singh et al., 2021).

As highlighted by Syrjälä et al. (2020), these concepts are regularly linked across various fields, often seen as a fundamental aspect of gamification research. The term 'engagement' encompasses a range of interpretations and is applied to various contexts, leading to different terminologies like customer engagement, brand engagement, student engagement, employee engagement, and user engagement, indicating the breadth and complexity of its application (Bitrián et al., 2021).

Building upon this understanding, numerous studies, such as those by Harwood & Garry (2015), have emphasized the significant impact of gamification elements in enhancing engagement levels (Singh et al., 2021). These studies reveal that organizations primarily adopt gamification to boost customer loyalty, stimulate positive word-of-mouth, and enhance overall engagement (Hwang et al., 2020).

Delving deeper, the concept of utilizing gamification features to generate user motivation and engagement is termed 'funware.' According to Zichermann & Cunningham (2011): "*Funware is the use of game mechanics for generating extrinsic and/or intrinsic motivation to their users, encouraging desired user actions, creating experiential values, and developing customer loyalty* " This strategy has been effectively implemented in TripAdvisor's marketing efforts, as detailed by Sigala (2015).

Sigala (2015) illustrates how TripAdvisor's application of funware effectively fosters user engagement. The platform's gamification employs points and badges, which not only enhance the enjoyment of the travel planning process but also increase the duration and depth of user interactions. This strategic use of game mechanics significantly amplifies user engagement, encouraging frequent and sustained participation. As a result, TripAdvisor not only meets its strategic marketing objectives but also cultivates a loyal user community, deeply engaged with the platform's content and services.

Moreover, the utility of gamification extends beyond the travel industry. The potential of gamification to boost engagement is extensively recognized across various domains, including business energy conservation, education, health and fitness, sustainable behavior, and crowdfunding (Singh et al., 2021). Notably, student engagement in academic activities represents one of the most thoroughly researched applications of engagement through gamification (Bitrián et al., 2021).

Indeed, recent research has further validated the application of gamification across diverse marketing realms, encompassing Consumer Loyalty, online reviews, Brand Love, Behavioral Engagement and Purchase, Customer Engagement , participation in online co-creation communities, and intrinsic need satisfaction (Shen et al., 2015).

"*In parallel with the growth of mobile marketing, there is a nascent but growing interest in gamification (Marchand, André, & Hennig-Thurau, Thorsten, 2013; Terlutter, Ralf, & Capella, Michael L., 2013)*" (Hofacker et al., 2016).

Integrating gamification into mobile marketing effectively boosts user engagement by meeting their intrinsic psychological needs: competence, autonomy, and relationship. Examples such as TripAdvisor show how gamification stimulates user interaction and loyalty. As technology advances, the role of gamification in marketing is set to grow, offering dynamic ways of engaging consumers. By harnessing the elements of gamification, marketers can create enjoyable and meaningful experiences that not only achieve business objectives, but also keep users engaged over the long term.

4. Gamification in Education: Enhancing Engagement, Motivation, and Collaboration through Technology and Personalized Learning Approaches

The primary challenges faced by modern education are the lack of engagement and motivation among students (Kiryakova, Angelova, & Yordanova, 2014). This decline in motivation necessitates a deeper examination into its origins and potential solutions.

Yu-kai Chou (2019) highlights a significant shift within the education system from intrinsic motivation—where students are driven by natural curiosity and the desire to creatively apply what they learn—to extrinsic motivation. This shift emphasizes achieving good grades, satisfying authority figures, and obtaining diplomas for career advancement. Such a change from internal drivers like curiosity and creative autonomy to external rewards can lead students to lose sight of the real purpose of their education. Consequently, students might only do the minimum required to meet these external expectations, which can result in academic dishonesty and a diminished genuine learning experience.

Supporting this perspective, Deci & Ryan (2000) in their Self-Determination Theory (STD), also differentiate between these types of motivation. They argue that intrinsic motivation entails engaging in an activity because it is inherently interesting or enjoyable, whereas extrinsic motivation involves performing tasks to achieve a separable outcome. This fundamental distinction underscores the need for educational strategies that foster intrinsic motivation to ensure deeper and more effective learning.

Furthermore "*Studies in the field indicate that gamification methods are successful in fostering collaboration, especially when following the principles of self-determination theory*" (Knutas et al., 2018).

Gamification has emerged as an important tool for meeting the challenges of motivation within the education system. By integrating game elements into learning environments, gamification fosters an atmosphere in which students are not simply recipients of knowledge, but active participants in their learning processes. Kiryakova, Angelova and Yordanova (2013) note that such integration can provoke student activity and encourage deeper participation.

This transformative approach is supported by numerous studies demonstrating significant enhancements in academic performance and engagement. For instance, McClean et al. (2001) found that students who studied cell biology using video games scored 30% higher on their assessments than those who did not use video games. Students who used video games to

improve their programming skills saw a 12% improvement in their final exam grades. Additionally, video games used as homework in a digital methods course were shown to increase students' intellectual vigor, inherent motivation, positive emotions, and overall engagement (Barata et al., 2013).

Chou (2019) states that gamification motivates students to actively participate in class and learn through entertainment, emphasizing positive competition and making learning fun. One benefit of using gamification within the classroom is that students can follow their own progress and achievements via instantaneous feedback, allowing for an increase in motivation and engagement. However, learning objectives must be specific and clearly defined. The fundamental aim of education is to achieve these objectives; without them, all activities - including those involving gamification - can appear pointless. These objectives guide the selection of educational content and activities and dictate the choice of appropriate game mechanisms and techniques used in the learning process (Kiryakova et al., 2014).

Moreover, researchers often suggest that the positive effects of gamification in education are not only limited to its ability to improve knowledge memorization but also enhance skills such as problem-solving, collaboration, and communication (Putz et al., 2018). Gamification techniques have been adopted to support classroom learning in specific subject areas and to pursue transversal objectives such as fostering collaboration, self-guided learning, completion of homework assignments, and strengthening student creativity (Busch et al., 2014). Collaborative-based learning (CBL) methodology, which focuses on maximizing collaboration among students, has been found to improve learning activities and results by enhancing the exchange of information and knowledge (Burguillo, 2010).

In a gamified context, there is no single way to achieve success or accomplish a goal, and students are empowered by this flexibility to take a personalized path to success. Gamification acts as a mechanism that works on the principles of the goal-setting theory, which suggests that goals can influence human behavior (Thomas et al., 2023).

Successful gamification in collaborative learning has been reported in studies where activities in the system increased online reputation, and course participants were able to publish their competence and compare the results to those of their peers (Knutas et al., 2018). However, it is essential for teachers to define students' characteristics (profiles) and determine whether the new tools and techniques would be suitable for them (Putz et al., 2018).

A tailored approach is regarded as a way to improve student gamification experiences, which corresponds to any changes in learning contents or strategies to reach individual learning needs and preferences (Hong et al., 2024).

Based on self-determination theory (SDT), gamification effectively improves student engagement and motivation by integrating game elements like points, badges, and leaderboards into educational environments, which not only makes students active participants but also addresses major educational challenges by enhancing engagement and motivation through intrinsic incentives, emphasizing that the quality of motivation significantly influences learning outcomes and advocates intrinsic motivation over extrinsic rewards.

These same strategies are applicable to the entire population, including users of education apps. By creating motivating and engaging experiences, gamification addresses universal needs for competence, autonomy, and relationship. In this way, gamification principles can be extended to improve financial engagement and understanding in a variety of contexts, contributing to financial autonomy for all.

Chapter III Research methodology

In this crucial chapter, we navigate through the methodological landscape that underpins this thesis, aiming to unravel the intricate relationship between gamification and user engagement within the realm of financial literacy via a personalized mobile app. This section stands as the conduit between the theoretical foundations laid out in previous chapters and the empirical exploration that follows, setting the stage for a thorough investigation into how gamification elements resonate with users across diverse demographic backgrounds. By meticulously designing a research methodology that aligns with our investigative goals, we seek to bridge the gap between conceptual insights and practical applications, ultimately shedding light on the effectiveness of gamification as a tool to enhance user engagement.

1. Research Model and Hypotheses

The research framework for this study is structured around three primary questions, each addressing a distinct aspect of gamification's influence on user engagement. These inquiries are pivotal in understanding how gamification can be leveraged to design a more engaging and mobile application for financial education.

It seems appropriate to consider several hypotheses for each of the questions addressed in this thesis, in order to provide sufficient answers.

H1. Gamification elements focused on competition, such as multiplayer modes, group challenges positively influence user engagement.

H2. Gamification elements focused on social relationships, such as social networking functions or participating into a community, positively influences user engagement.

A reciprocal benefit reflects the perceived social value of the service, where an individual anticipates that their contributions to the community will generate mutual advantages. This reciprocal benefit is driven by an altruistic motive, suggesting that an individual is prepared to enhance the well-being of others while gaining rewards such as reputation, anticipated relationships, and trust in return. In addition, gamified systems can promote better communication among employees through social interactions that are integrated into the game's design (Silic et al., 2020).

H3. Gamification elements focused on feedback, positively influence user engagement.

H4. Gamification elements focused on progression, such as rankings, progress bars or levels positively influences user engagement.

H5. Gamification elements focused on rewards, such as points, or badges positively influences user engagement.

As we've seen gamification boosts user engagement by enhancing intrinsic motivation, satisfying users' needs for competence (linked with performance), autonomy, and relatedness, leading to higher levels of app usage and loyalty. This is grounded in the principles of Self-Determination Theory (Deci & Ryan, 2000).

When employees view a gamified system as beneficial for their work, they tend to believe that their performance will improve with the system's use. The utility of a gamified system mainly stems from its ability to enhance understanding, communication, and recognition of a company's internal procedures (Silic et al., 2020).

H6. Immersion-based gamification elements, such as avatars or customizable user profiles, positively influences engagement.

Flow theory suggests that employees can achieve a state of flow through deep immersion, absorption, enjoyment, intrinsic motivation, and interest while engaging in a task or activity. Flow represents a psychological state where an individual is fully engaged with an activity, experiencing concentrated focus, complete involvement, and pleasure in the process. (Silic et al., 2020).

Immersive features such as avatars and compelling narratives can foster a sense of relatedness between users, but do not affect users' perceptions of competence (e.g. Xi & Hamari, 2019) or autonomy (e.g. Sailer et al., 2017) (Bitrián et al., 2021).

And we know that *"SDT focuses on exploring the inherent growth tendencies and fundamental psychological needs that underlie self-motivation and the integration of personality. These include the needs for competence, relatedness, and autonomy*."(cf. infra page 16)

On the other hand, game element category including "*avatars, or profiles, narratives or meaningful stories, and customization (Koivisto & Hamari, 2019). These elements have been related to the satisfaction of psychological needs (Deci & Ryan, 2000)."* (Bitrián et al., 2021).

2. Approach and Data Collection

Utilizing a quantitative research methodology, this study employs an online survey distributed across various digital platforms to ensure a broad demographic reach.

Data collection in research is crucial to ensure the integrity and validity of results. In this study, we opted for a data collection methodology involving the manipulation of the independent variable among different participants. This choice is based on the recommendations of Field (2009), who highlights the effectiveness of this method for examining variations caused by experimental manipulations without the constraints of repeated measurements.

The data was collected by means of a questionnaire distributed via social networks such as LinkedIn and Facebook, thus guaranteeing a wide range of participants and a diversity of responses. This method is not only relevant for reaching a connected population but also for exploiting current channels of communication and interaction.

Chapter IV Results and Findings

1. Results from the survey:

The survey gathered a total of 76 responses (3 were deleted due to inconsistencies in the answers provided). The demographic profile of the participants revealed that 50% were female and 50% were male. The majority of respondents fell within the age range of 18-24 (48%) and 25-34 (40%)

In terms of educational attainment, 60% of the participants held a master's degree, 24% had a bachelor's degree, and 5% had achieved a Doctorate level. This indicates that the user base is highly educated. The respondents come predominantly from Europe with 99% and a smaller percentage from other regions.

Regarding employment status, 35% were students, 48% were employed full-time, and 11% worked in entrepreneurial or freelance roles, showing a diverse professional background among the users.

When it comes to the usage of mobile applications in the fields of education and culture, 47% of the participants currently use such applications. The most frequently used application among the respondents is Duolingo, which 40% of the users engage with most often. These users have been utilizing this application for an average duration of 1 year (50%) and half a year (31%), with a usage frequency of 1 times per week/month for 50% of them.

Moreover, 73% of the respondents noted that the applications they use/used incorporate elements of gamification, such as rewards, challenges, leaderboards, and varying levels of difficulty, enhancing the learning experience through interactive and game-like features.

2. Data reliability

To ensure the reliability of the measurement instruments used, in this case, the questionnaire items, it is essential to employ proven statistical tests. The Cronbach Alpha test is one of the best known for assessing the internal consistency of measurement scales. This coefficient allows us to judge the reliability of a scale based on the variance of item responses and the correlation between them. This test is crucial for confirming that items reliably measure the same theoretical construct (Shavelson, 2015).

In addition to Cronbach's test, it is advisable to complement the reliability analysis with Principal Component Analysis (PCA) to examine the factor structure of the scales and thus

confirm their construct validity. PCA helps to understand how variables are combined or grouped, providing further validation of the structuring of questionnaire items.

Moreover, the Kaiser-Meyer-Olkin test (KMO),serves as a second indicator of the strength of the relationship among items. It measures the adequacy of performing a factor analysis by comparing the magnitudes of the calculated correlation coefficients to those of the partial correlation coefficients. A high KMO value indicates that the dataset is suitable for factor analysis, which will enable us to determine whether it is possible and relevant to carry out a factorial analysis at a later stage (Pett, M. A et al., 2003).

3. Factor analysis.

Now that we've collected all our data and cleaned it up, it's time to start the factor analysis. There are several key stages in the process of carrying out a factor analysis: the initial assessment of factors such as the adequacy of the sample size, the determination of the number of factors to be retained and the choice of items belonging to a given factor. After these steps, you can assess whether the items in your analysis are consistent, and whether they accurately measure the concepts they are designed to measure (Field, 2009).

Before delving into the principal component analysis of the items intended to gauge user engagement and satisfaction within our proposed framework, it is crucial to establish the reliability of the measurement instruments. Ensuring that our scales are both reliable and valid is fundamental to producing actionable and trustworthy insights. To this end, we employ Cronbach's alpha for the 18 items from our questionnaire, item that represents our independent items, to allows us to identify and potentially exclude any items that do not contribute positively to the overall scale reliability.

Reliability statistics

Cronbach's Alpha	Number of items
,853	18

Table 1 : Cronbach's Alpha test (independent variables) without item removal, SPSS.

Above is the result of our first Cronbach test, carried out without deleting data that do not strongly contribute to the reliability of our scales.

This first test highlights four items that could potentially improve Cronbach's alpha if removed (**APPENDIX A**) . Items 8, 9 and 11 do not seem to contribute positively to the overall reliability of the scale. We will not include them in the rest of the analysis.

Reliability statistics

Cronbach's Alpha	Number of items
,872	15

Table 2: Cronbach's Alpha test (independent variables) with items removal (8,9,11), SPSS.

The second Cronbach's test was carried out by deleting items that did not seem to contribute positively to the reliability of our dataset. The increase in alpha highlights the improved reliability of our dataset and will enable us to carry out more reliable analyses on it.

To further refine our model, it would be prudent to perform a third Cronbach's test.

This third test enabled us to identify an additional item that does not contribute to the model's consistency. Indeed, removing item **32** increases the overall Cronbach's alpha. (**APPENDIX B).**

Reliability statistics

Cronbach's Alpha	Number of items
,875	14

Table 3 : Cronbach's Alpha test (independent variables) with items removal (8,9,11,32), SPSS.

Now, we'll carry out an initial PCA analysis on 14 items that represents our independent variables.

With a factorial reduction on SPSS, we were able to obtain various results that will enable us to determine the relevance of carrying out a factorial analysis on these items.

A KMO test was first carried out. The Kaiser-Meyer-Olkin (KMO) statistic evaluates the extent of variance in your data due to underlying factors, with a range from 0 to 1. A higher KMO value suggests that factor analysis may be effectively applied to your data. KMO values from 0.5 to 0.7 are deemed acceptable, from 0.7 to 0.8 are good, from 0.8 to 0.9 are very good, and values exceeding 0.9 are considered excellent (Field, 2009).

Indice KMO et test de Bartlett

Kaiser-Meyer-Olkin index for measuring sampling quality		,762
Bartlett's sphericity test	Chi-square approx.	517,111
	ddl	91
	Signification	<,001

Table 4 : KMO and Bartlett's test (independent variables) with item removal (8,9,11,32), SPSS

In our analysis, the KMO measure yielded a value of 0.762, which indicates a good level of adequacy for factor analysis, suggesting that the dataset is suitably structured for this type of analysis. This good KMO value underscores that a substantial proportion of the variance in the dataset could be explained by underlying factors, confirming the appropriateness of proceeding with a factorial analysis.

Following the KMO test, we conducted Bartlett's Test of Sphericity, which further supports the suitability of the data for factor analysis. The test demonstrated a chi-square value of approximately 517,111 with 91 degrees of freedom and a significance level below 0.001. This highly significant result rejects the null hypothesis that the variables are orthogonal and unrelated, indicating that the observed variables intercorrelate sufficiently to provide a meaningful basis for factor extraction.

These tests collectively affirm that the application of factor analysis is justified and likely to yield valid and interpretable factors, facilitating a deeper understanding of the underlying dimensions within the data.

On this statistical basis, we carried out a principal component analysis (PCA) (**Appendix C**)to further explore the intrinsic relationships between the variables, and to simplify the data set while retaining the essential information.

The initial eigenvalues indicated that the first four components each had values exceeding one, aligning with Kaiser's recommendation (1960) to retain all factors with eigenvalues above one (Field, 2009). Together, these components (4 in total) accounted for 68.881% of the total variance. We'll be keeping the 5th component, however, in view of the result of the latter (0,905). With the addition of this component, this now explains 75.344% of the variance.

This significant figure suggests that these components capture the majority of significant information present in the data. The first component alone accounted for 39.366% of the variance, underlining its dominant role in representing the entire data set. The importance of

this and subsequent components gradually diminishes, with the second and third components explaining 13.343% and 8,723% of the variance respectively.

To further clarify the structure of these factors and enhance the interpretability of our analysis, a Varimax rotation **(APPENDIX D)** was applied to the principal components. As a result of this test, **item 30** did not appear to be relevant to our model and was therefore excluded.

Indeed, SPSS provides various methods for factor rotation, including the Varimax method of orthogonal rotation. Varimax focuses on maximizing the dispersion of loadings within each factor. This approach aims to load a fewer number of variables highly on each factor, resulting in more clearly defined and interpretable clusters of factors. This makes Varimax particularly useful for achieving distinct and meaningful factor solutions in factor analysis (Field, 2009).

Factor	Concept	Associated Items	Possible Interpretation	Factor Loadings
Collaboration	Collaboration and exchange	23, 24, 26	This factor highlights the importance of collaboration and exchange within the application's community.	0.682, 0.820, 0.823
Feedback	User feedback	18, 20	This factor emphasizes the role of user feedback in improving the effectiveness of learning.	0.875, 0.872
Progress Indicators	Progress tracking	15, 17, 21	This factor reflects the importance of indicators that allow users to track their progress and performance.	0.778, 0.790, 0.700
Reward Systems	Rewards and challenges	6, 12, 14	This factor shows the usefulness of reward systems and challenges to motivate and enhance individual learning.	0.762, 0.737, 0.711
Multiplayer Modes	Multiplayer challenges	27, 29	This factor indicates the effectiveness of multiplayer modes in enhancing learning through competition and group challenges.	0.866, 0.752

Table 5 : Factor analysis and interpretation of gamification components

Now that we've carried out an initial in-depth analysis of our independent variables, we're going to carry out the same methodology using our dependent variables, so that we can confidently begin our data analysis.

We therefore conducted an initial Cronbach's test on the 9 items that make up our dependent variable.

Reliability statistics

Cronbach's Alpha	Number of items
,697	9

Table 6 : Cronbach's Alpha test (dependent variables) without items removal, SPSS.

Above is the result of our first Cronbach test, carried out without deleting data that do not strongly contribute to the reliability of our scales.

10. This type of grading system motivates me in my learning process.	31,07	19,176	,020	,739

Table 7 : Item n°10 from the first Cronbach's Alpha test (dependant variables) , SPSS.

This first test highlights 1 items that could potentially improve Cronbach's alpha if removed (**APPENDIX E**). Items 10 do not seem to contribute positively to the overall reliability of the scale. We will not include it in the rest of the analysis.

Reliability statistics

Cronbach's Alpha	Number of items
,739	8

Table 8 : Cronbach's Alpha test (dependent variables) with items removal (10), SPSS.

The second Cronbach's test was carried out by deleting item that did not seem to contribute positively to the reliability of our dataset.

As applied to our independent variables, we apply a third Cronbach's test to further refine our model.

This third test enabled us to identify an additional item that does not contribute to the model's consistency. Indeed, removing item **31** increases the overall Cronbach's alpha. (**APPENDIX F).**

31. Being able to create a customizable avatar or profile motivates me in my learning process.	28,29	15,291	,287	,750

Table 9 : Item n°31 from the second Cronbach's Alpha test (dependant variables)(APPENDIX F), SPSS.

The increase in alpha highlights the improved reliability of our dataset and will enable us to carry out more reliable analyses on it.

Now, we'll carry out an initial PCA analysis on the 7 items that represents our dependent variables.

KMO index and Bartlett test

Kaiser-Meyer-Olkin index for measuring sampling quality		,716
Bartlett's sphericity test	Chi-square approx.	120,139
	ddl	21
	Signification	<,001

Table 10 : KMO and Bartlett's test (dependent variables) with item removal (10,31), SPSS

With a KMO index of 0.716, which indicates a good level of adequacy for factor analysis, and a highly significant Bartlett's test of sphericity ($p < 0.001$), suggesting that the correlations between the variables are sufficiently large, we proceeded with the factor analysis. This indicates that the dataset is suitably structured for factor analysis, confirming the suitability of this approach.

The initial eigenvalues indicated that the first two components each had values exceeding one. Together, these components accounted for 58.537% of the total variance. **(APPENDIX G)**

Then Varimax rotation was applied to the principal components **(APPENDIX H)**

Factor	Concept	Associated Items	Possible Interpretation	Factor Loadings
Factor 1: Motivation through Feedback and Interaction	Feedback, Cooperation, Multiplayer Modes	19, 25, 28	Factor emphasizing motivation through feedback, interaction with friends, and multiplayer modes.	0.812, 0.674, 0.773
Factor 2: Motivation through Rewards and Challenges	Rewards, Challenges, Progress Indicators	7, 13, 16	Factor emphasizing motivation through reward systems, individual challenges, and progress indicators.	0.858, 0.746, 0.639

Table 11 : Factor analysis of motivation components in gamified learning

Since we want to measure motivation. It would seem coherent to construct a single variable based on the 2 components. In fact, we know from the preceding explanation that gamification effectively addresses major challenges in education by enhancing engagement and motivation through intrinsic incentives, in line with self-determination theory (SDT). SDT underscores that the quality of motivation significantly influences learning outcomes and promotes intrinsic motivation (cf., page 21).

Furthermore, engagement is a pivotal factor in maintaining user interest in mobile applications, as it minimizes dropout rates by providing motivation. (cf., page 16).

We can therefore easily consider the motivation variable as a vector of engagement and retention for mobile application users.

To do this, we have created 1 variable for each component. We then calculated the mean of these 2 variables, so as to have just one.

Now that we have identified all our variables, both independent and dependent, it is time to conduct various statistical tests to draw meaningful conclusions.

4. Data analysis

The primary objective of this analysis is to investigate the extent to which different gamification elements affect user engagement. These gamification elements serve as our independent variables, while user engagement (through motivation) is treated as the dependent variables.

To achieve this objective, we employ both simple linear regression and multiple regression analyses. These powerful statistical tools enable us to understand the relationship between each gamification element and the dependent variables, as well as the combined effect of all elements.

Before conducting the analysis, a factor analysis was performed to identify the underlying structure of the data and reduce the number of variables to a manageable set of factors. The factor analysis revealed several key components that represent distinct gamification elements within the app:

1. **Multiplayer Modes**: This factor indicates the effectiveness of multiplayer modes in enhancing learning through competition and group challenges.
2. **Collaboration** : This factor highlights the importance of collaboration and exchange within the application's community.
3. **User Feedback**: This factor emphasizes the role of user feedback in improving the effectiveness of learning.
4. **Progress Indicators**: This factor reflects the importance of indicators that allow users to track their progress and performance.
5. **Rewards and Challenges**: This factor shows the usefulness of reward systems and challenges to enhance individual learning.

Each of these components was derived from rigorous factor analysis, ensuring that they represent coherent and meaningful constructs within the context of gamification.

Regression analysis is chosen for its ability to handle complex, multivariate relationships and provide clear insights into the predictive power of each independent variable. According to Field (2009), regression analysis is ideal for testing hypotheses about the effects of several variables simultaneously, making it a perfect fit for our study's needs.

Initially, we will perform simple linear regression analyses to evaluate the impact of each gamification element on user engagement. This method allows us to:

1. **Assess the individual contribution**: Determine the strength and direction of the relationship between each independent variable (gamification element) and the dependent variable.
2. **Identify significant predictors**: Identify which gamification elements have a statistically significant effect on user engagement.

Following the simple linear regression analyses, we will conduct multiple regression analysis to evaluate the combined impact of all gamification elements on user engagement. This method allows us to:

1. **Estimate the magnitude and direction of the impact**: Quantify the relationship between multiple independent variables and the dependent variables simultaneously.
2. **Control for the influence of other variables**: Understand the unique contribution of each gamification element while accounting for the influence of other elements.

By employing both simple linear regression and multiple regression analyses, we aim to provide insights into which gamification strategies are most effective in enhancing user engagement in a financial literacy app. This approach will not only validate our hypotheses but also guide the design and implementation of more engaging and effective gamified educational tools.

4.1 Linear regression analysis

The first linear regression is going to be conducted with **Multiplayer modes** as independent variable.

Model overview

Model	R	R-squared	R-squared adjusted	Standard error
1	,615[a]	,379	,370	,44347

a. Predictors: (Constant), Multiplayer modes

Table 12: Linear regression analysis of multiplayer mode on motivation, SPSS

This first simple linear regression analysis revealed a positive relationship between multiplayer modes and user motivation ($R = 0.615$). The model explains approximately 37.9% of the variance in user motivation ($R^2 = 0.379$). The regression analysis showed that multiplayer modes significantly predict user motivation, with an increase in multiplayer modes resulting in a significant increase in motivation ($B = 0.615$, $p < 0.001$) **(APPENDIX I.1).** Overall, these results highlight the significant role of multiplayer modes in enhancing user motivation within the app.

The second linear regression is going to be conducted with **Collaboration** as independent variable.

Model overview

Model	R	R-squared	R-squared adjusted	Standard error
1	,748[a]	,560	,554	,37327

a. Predictors: (Constant), Collaboration

Table 13: Linear regression analysis of collaboration on motivation, SPSS

The simple linear regression analysis revealed a strong positive relationship between collaboration and user motivation ($R = 0.748$). The model explains approximately 56% of the variance in user motivation ($R^2 = 0.560$). The regression analysis showed that collaboration significantly predicts user motivation, with an increase in collaboration resulting in a significant increase in motivation ($B = 0.748$, $p < 0.001$) (**APPENDIX I.2**). These results highlight the critical role of collaborative elements in enhancing user motivation.

The third linear regression is going to be conducted with **Feedback** as independent variable.

Model overview

Model	R	R-squared	R-squared adjusted	Standard error
1	,587[a]	,345	,336	,45525

a. Predictors: (Constant), Feedback

Table 14: Linear regression analysis of feedback on motivation, SPSS

The simple linear regression analysis revealed a moderate positive relationship between feedback and user motivation (R = 0.587). The model explains approximately 34.5% of the variance in user motivation (R^2 = 0.345). The regression analysis showed that feedback significantly predicts user motivation, with an increase in feedback resulting in a significant increase in motivation (B = 0.587, p < 0.001) **(APPENDIX I.3)**. Overall, these results highlight the significant role of feedback in enhancing user motivation.

The fourth linear regression is going to be conducted with **Progress indicator** as independent variable.

Model overview

Model	R	R-squared	R-squared adjusted	Standard error
1	,657[a]	,432	,424	,42391

a. Predictors: (Constant), Progress Indicators

Table 15: Linear regression analysis of progress indicators on motivation, SPSS

The simple linear regression analysis revealed a positive relationship between progress indicators and user motivation (R = 0.657). The model explains approximately 43,2% of the variance in user motivation (R^2 = 0.432). The regression analysis showed that progress indicators significantly predict user motivation, with an increase in progress indicators resulting in a significant increase in motivation (B = 0.657, p < 0.001) **(APPENDIX I.4)**.Overall, these results highlight the significant role of progress indicators in enhancing user motivation.

The fifth and last linear regression is going to be conducted with **Rewards** as independent variable.

Model overview

Model	R	R-squared	R-squared adjusted	Standard error
1	,693[a]	,481	,473	,40535

a. Predictors: (Constant), Rewards

Table 16: Linear regression analysis of feedback on motivation, SPSS

Finally, this last simple linear regression analysis revealed a strong positive relationship between rewards and user motivation ($R = 0.693$). The model explains approximately 48.1% of the variance in user motivation ($R^2 = 0.481$). The regression analysis showed that rewards significantly predict user motivation, with an increase in rewards resulting in a significant increase in motivation ($B = 0.693$, $p < 0.001$) **(APPENDIX I.5)**. Overall, these results highlight the significant role of rewards in enhancing user motivation.

4.2 Multiple regression analysis

In this section, we utilize multiple regression to examine the impact of various gamification elements - Multiplayer Modes, Rewards, Feedback, Progress Indicators, Collaboration - on user motivation. This analysis enables us to estimate the magnitude and direction of the impact of these elements while controlling for the influence of other variables. By doing that, we aim to identify the unique contribution of each gamification element on user motivation, thereby validating our hypotheses and providing insights into which strategies are most effective in enhancing engagement in a financial literacy app.

Multiple regression is particularly advantageous in this context as it can handle complex, multivariate relationships and provide clear insights into the predictive power of each independent variable. According to Field (2009), this method is ideal for testing hypotheses about the effects of several variables simultaneously, making it a perfect fit for our study's needs

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Model overview

Model	R	R-squared	R-squared adjusted	Standard error
1	,918[a]	,843	,831	,22940

a. Predictors: (Constant), Multiplayer Modes, Rewards, Feedback, Progress Indicator, Collaboration

Table 17: Multiple regression model overview, SPSS

ANOVA[a]

Model		Sum of squares	ddl	Medium square	F	Sig.
1	Regression	18,943	5	3,789	71,990	<,001[b]
	of student	3,526	67	,053		
	Total	22,469	72			

a. Dependent variable: Motivation

b. Predictors: (Constant), Multiplayer Modes, Rewards, Feedback, Progress Indicator, Collaboration

Table 18: ANOVA result from the multiple regression analysis, SPSS

Coefficients[a]

Model		Unstandardized coefficients B	Unstandardized coefficients Standard error	Standardized coefficients Bêta	t	Sig.
1	(Constante)	,141	,224		,628	,532
	Rewards	,275	,054	,307	5,107	<,001
	Collaboration	,214	,042	,320	5,074	<,001
	Feedback	,097	,038	,151	2,570	,012
	Progress Indicator	,219	,055	,235	3,952	<,001
	Multiplayer modes	,162	,039	,239	4,164	<,001

a. Dependent variable: Motivation

Table 19: Regression analysis of game design elements on motivation, SPSS

The multiple regression analysis reveals a very strong positive relationship between the combined gamification elements (collaboration, feedback, progress indicators, rewards, and multiplayer modes) and user motivation ($R = 0.918$). The model explains approximately 84.3% of the variance in user motivation ($R^2 = 0.843$), indicating a high level of explanatory power. This suggests that the combination of these gamification elements significantly predicts user motivation. The ANOVA results confirm the overall significance of the regression model ($F = 71{,}990$, $p < 0.001$). Among the predictors, collaboration had the highest standardized coefficient (Beta = 0.320, $p < 0.001$), followed by rewards (Beta = 0.307, $p < 0.001$), multiplayer modes (Beta = 0.239, $p < 0.001$), progress indicators (Beta = 0.235, $p < 0.001$), and feedback (Beta = 0.151, $p = 0.012$).

Finally, we can now answer our hypothesis:

Hypothesis	Description	Status
H1	Gamification elements focused on competition, such as multiplayer modes, group challenges, positively influence user engagement.	Confirmed
H2	Gamification elements focused on social relationships, such as social networking functions or participating in a community, positively influence user engagement.	Confirmed
H3	Gamification elements focused on feedback positively influence user engagement.	Confirmed
H4	Gamification elements focused on progression, such as rankings, progress bars, or levels positively influence user engagement.	Confirmed
H5	Gamification elements focused on rewards, such as points or badges, positively influence user engagement.	Confirmed
H6	Immersion-based gamification elements, such as avatars or customizable user profiles, positively influence engagement.	Not Confirmed

Table 20: Hypothesis confirmation status

Chapter V Discussion and conclusions

1. Discussion

The results of the study strongly support the majority of the hypotheses, indicating that various gamification elements—competition, social relationships, feedback, progression, and rewards—positively influence user engagement within a financial literacy mobile application. These findings underscore the significant potential of gamification to enhance user motivation and interaction, contributing to a more engaging and effective learning environment.

Hypothesis H1: Gamification elements focused on competition, such as multiplayer modes, group challenges, positively influence user engagement.

The analysis showed a significant positive relationship between competitive gamification elements and user engagement, supporting Hypothesis 1. Studies demonstrated that competition in a non-controlling context increases intrinsic motivation compared with a controlling context, due to participants' perception of autonomy (Deci & Ryan, 2000).

In addition, gamification techniques promote collaboration and autonomous learning, improving information exchange and learning outcomes (Busch et al., 2014, Burguillo, 2010). Thus, competitive elements in a financial literacy application can increase engagement by creating a collaborative and motivating environment.

Hypothesis H2: Gamification elements focused on social relationships, such as social networking functions or participating in a community, positively influence user engagement.

The results for Hypothesis 2 confirmed a significant positive impact of social relationship-focused elements on user engagement, emphasizing that social-oriented elements are crucial for fostering a sense of community and relatedness. This finding is supported by the study conducted by Silic et al. (2020), which demonstrated that social interactions integrated into game designs can promote better communication and enhance user engagement. Social networking functions and community participation effectively fulfill the need for relatedness, making users feel more engaged (Silic et al., 2020).

Hypothesis H3: Gamification elements focused on feedback positively influence user engagement.

The analysis demonstrated that feedback-focused elements have a moderate positive relationship with user engagement, confirming Hypothesis 3. The linear regression analysis indicated that these elements significantly predict user motivation and engagement. Feedback mechanisms, by providing timely responses to user actions, reinforce their sense of competence and autonomy. This is in line with Chou (2019) assertion that benefit of using gamification within the classroom is that students can follow their own progress and achievements via instantaneous feedback, allowing for an increase in motivation and engagement.

Hypothesis H4: Gamification elements focused on progression, such as rankings, progress bars, or levels positively influence user engagement.

The analysis identified a significant enhancement of user engagement through progression-based gamification elements. The model underscored the importance of progress indicators, such as rankings and progress bars, in maintaining user interest and engagement. And we know that empirical literature suggests that the combination of points, badges, and leaderboards remains predominant in the realm of gamification. (Koivisto & Hamari, 2019) and prior studies have shown that when users engage with these kinds of elements, they tend to feel a sense of competence.

Hypothesis H5: Gamification elements focused on rewards, such as points or badges, positively influence user engagement.

Hypothesis 5 proposed that gamification elements focused on rewards, such as points or badges, positively influence user engagement. The results strongly supported this hypothesis, with rewards-based elements significantly predicting user engagement. The regression analysis confirmed that the introduction of points and badges led to increased motivation and sustained engagement, highlighting the effectiveness of reward systems in gamification. Supporting this finding, Hofacker et al. (2016) noted that reward systems create loyalty and signal social status, serving as key motivators in gamified applications. Additionally, Shen et al. (2015) documented the motivational influence of rewards, even those of uncertain size, showing that points and badges can significantly enhance user engagement by providing clear, tangible goals.

Hypothesis H6: Immersion-based gamification elements, such as avatars or customizable user profiles, positively influence engagement.

Contrary to the other hypotheses, Hypothesis 6 was not confirmed. The analysis indicated that while immersion-based elements, such as customizable avatars, did promote a sense of relatedness, they did not significantly impact overall user engagement. This finding suggests that although personalization can enhance the user experience, it may not be a standalone factor in driving engagement. Supporting this, literature from Koivisto & Hamari (2019) suggests that immersion and customization elements are designed to enhance the sense of relatedness and personalization but may not significantly impact other critical factors for engagement, such as competence and autonomy.

2. Conclusion

This thesis explored the effect of different gamification factors on user engagement, specializing in the factors of competition, social relationships, feedback, progression, rewards, and immersion. The analysis revealed that competitive, social, feedback, progression-based, and reward-based elements all have a significant positive effect on consumer engagement. In contrast, immersive factors, while enhancing consumer enjoyment, no longer have a significant effect on user engagement.

These results underline the importance of designing gamification systems that meet users' psychological needs for competence, autonomy, and relatedness. The integration of multi-player modes, group challenges, immediate feedback systems, progress indicators and reward systems help to maintain and increase consumer engagement.

In this way, this research contributes to a better understanding of how the various dimensions of gamification can be optimized to maximize engagement. It also offers concrete avenues for designers and entrepreneurs looking to improve user interaction and satisfaction in a variety of digital contexts.

However, there are some limitations to this study. One significant limitation is the sample size of 76 participants. While this number may seem small, it is sufficient for the analysis conducted, as indicated by the strong Cronbach's alpha results and which demonstrated high reliability and internal consistency of the survey, but also the very high significance of the simple and multiple linear regressions conducted. Nevertheless, future studies with larger sample sizes could

provide more generalizable results and further validate these findings, and I plan to conduct additional tests in the context of my application's development to deepen this research.

In the future, the integration of artificial intelligence (AI) into gamification structures should open up new perspectives. AI should enable even greater personalization of the consumer experience, by adapting gamification factors to characters' options and behavior in real time. This could not only improve engagement, but also provide richer, more immersive experiences for consumers. Ultimately, this thesis highlights the importance of gamification as an effective means of enriching the consumer experience and encouraging active and sustained participation.

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APPENDIX

APPENDIX A - Item-Total Statistics for Evaluating Scale Reliability (independent variables)

Item total statistics

	Scale average for element deletion	Scale variance on element deletion	Complete correlation of corrected elements	Cronbach's Alpha for item deletion
6. I find it useful to have a reward system within the application (e.g. points, badges, etc.).	65,45	68,862	,449	,846
8. The existence of a reward system allows me to be more effective in my learning.	65,82	69,204	,272	,855
9. I find it useful to have a ranking system within the application.	65,68	72,774	,098	,860
11. The existence of a grading system allows me to be more efficient in my learning.	65,95	70,886	,211	,856
12. I find it useful to have a system of individual challenges within the application.	65,33	67,057	,604	,841
14. The existence of a system of individual challenges helps me to be more effective in my learning.	65,53	66,975	,504	,844
15. I find it useful to have progress indicators in the application (progress bars, difficulty levels, etc.).	64,93	68,926	,489	,845

17. The existence of progress indicators enables me to be more effective in my learning.	65,16	68,250	,473	,845
18. I find it useful to have feedback within the application (e.g. visual/audio messages that comment on my results and come back to my mistakes).	65,27	66,674	,514	,843
20. Feedback helps me to learn more effectively	65,33	65,863	,515	,843
21. I find it useful to have personalized learning paths within the application that dynamically adapt to my progress and performance.	65,22	68,312	,497	,845
23. The existence of personalized learning paths enables me to be more effective in my learning.	65,30	66,241	,626	,839
24. I find it useful to be able to exchange or cooperate with friends or a community within the application.	65,58	63,748	,576	,840
26. The possibility of exchanging or cooperating with friends or a community allows me to be more effective in my learning.	65,71	63,597	,635	,837
27. I find the integration of multiplayer modes (competitions, group challenges...) useful.	65,40	68,576	,373	,849

29. The integration of multiplayer modes allows me to be more efficient in my learning.	65,74	64,417	,618	,838
30. I find it useful to be able to create a customizable avatar or profile within the application.	66,04	65,040	,475	,845
32. Being able to create a customizable avatar or profile allows me to be more effective in my learning.	66,77	65,987	,403	,850

APPENDIX B - Item-Total Statistics for Evaluating Scale Reliability without item 8,9,11 (independent variables).

Item total statistics

	Scale average for element deletion	Scale variance on element deletion	Complete correlation of corrected elements	Cronbach's Alpha for item deletion
6. I find it useful to have a reward system within the application (e.g. points, badges, etc.).	54,63	59,986	,386	,870
12. I find it useful to have a system of individual challenges within the application.	54,51	57,615	,606	,861
14. The existence of a system of individual challenges helps me to be more effective in my learning.	54,71	57,902	,475	,866
15. I find it useful to have progress indicators in the application (progress bars, difficulty levels, etc.).	54,11	59,543	,471	,867
17. The existence of progress indicators enables me to be more effective in my learning.	54,34	58,839	,463	,867
18. I find it useful to have feedback within the application (e.g. visual/audio messages that comment on my results and come back to my mistakes).	54,45	56,446	,580	,861
20. Feedback helps me to learn more effectively	54,51	55,503	,589	,861

21. I find it useful to have personalized learning paths within the application that dynamically adapt to my progress and performance.	54,40	58,076	,565	,863
23. The existence of personalized learning paths enables me to be more effective in my learning.	54,48	56,281	,680	,858
24. I find it useful to be able to exchange or cooperate with friends or a community within the application.	54,75	54,355	,589	,861
26. The possibility of exchanging or cooperating with friends or a community allows me to be more effective in my learning.	54,89	54,516	,627	,859
27. I find the integration of multiplayer modes (competitions, group challenges...) useful.	54,58	58,664	,401	,870
29. The integration of multiplayer modes allows me to be more efficient in my learning.	54,92	55,049	,627	,859
30. I find it useful to be able to create a customizable avatar or profile within the application.	55,22	55,146	,512	,865
32. Being able to create a customizable avatar or profile allows me to be more effective in my learning.	55,95	57,247	,363	,875

APPENDIX C – Principal component analysis (independent variables).

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5,511	39,366	39,366	5,511	39,366	39,366
2	1,868	13,343	52,709	1,868	13,343	52,709
3	1,221	8,723	61,432	1,221	8,723	61,432
4	1,043	7,449	68,881	1,043	7,449	68,881
5	,905	6,463	75,344			
6	,740	5,286	80,630			
7	,695	4,963	85,594			
8	,558	3,987	89,580			
9	,446	3,186	92,766			
10	,251	1,793	94,560			
11	,243	1,733	96,293			
12	,222	1,588	97,880			
13	,189	1,346	99,227			
14	,108	,773	100,000			

Extraction Method: Principal Component Analysis.

APPENDIX D – Varimax rotation with Kaiser normalization (independent variables)

Rotation of the component matrix

	component				
	1	2	3	4	5
6. I find it useful to have a reward system within the application (e.g. points, badges, etc.).	,038	-,013	,178	,762	,135
12. I find it useful to have a system of individual challenges within the application.	,341	,131	,173	,737	,135
14. The existence of a system of individual challenges helps me to be more effective in my learning.	,216	,195	,234	,711	-,103
15. I find it useful to have progress indicators in the application (progress bars, difficulty levels, etc.).	-,043	,159	,778	,369	,067
17. The existence of progress indicators enables me to be more effective in my learning.	,017	,041	,790	,341	,157
18. I find it useful to have feedback within the application (e.g. visual/audio messages that comment on my results and come back to my mistakes).	,227	,875	,197	-,007	,147
20. Feedback helps me to learn more effectively	,243	,872	,001	,158	,145

21. I find it useful to have personalized learning paths within the application that dynamically adapt to my progress and performance.	,542	,219	,700	-,050	,021
23. The existence of personalized learning paths enables me to be more effective in my learning.	,682	,277	,429	,195	,037
24. I find it useful to be able to exchange or cooperate with friends or a community within the application.	,820	,199	-,047	,138	,280
26. The possibility of exchanging or cooperating with friends or a community allows me to be more effective in my learning.	,823	,145	,002	,280	,176
27. I find the integration of multiplayer modes (competitions, group challenges...) useful.	,131	,241	-,013	,003	,866
29. The integration of multiplayer modes allows me to be more efficient in my learning.	,292	,186	,241	,155	,752
30. I find it useful to be able to create a customizable avatar or profile within the application.	,058	,528	,177	,147	,326

Extraction method: Principal component analysis.

Rotation method: Varimax with Kaiser normalization.

a. Convergence of rotation in 9 iterations.

APPENDIX E - Item-Total Statistics for Evaluating Scale Reliability (dependant variables).

Item total statistics

	Scale average in case of element removal	Scale variance on element removal	Complete correlation of corrected elements	Cronbach's Alpha for item removal
7. Such a reward system motivates me in my learning process.	30,75	16,577	,382	,669
10. Such a grading system like this motivates me in my learning process.	31,07	19,176	,020	,739
13. Such a system of individual challenges motivates me in my learning process.	30,74	15,417	,638	,622
16. The existence of progress indicators motivates me in my learning process.	30,47	17,752	,300	,684
19. The existence of feedback motivates me in my learning process	30,86	16,148	,402	,665
22. The existence of personalized learning paths motivates me in my learning process	30,75	17,105	,404	,667
25. The possibility of exchanging or cooperating with friends or a community motivates me in my learning process.	31,07	15,398	,537	,636
28. The integration of multiplayer modes motivates me in my learning process.	30,92	16,021	,475	,651

31. Being able to create a customizable avatar or profile motivates me in my learning process.	32,05	16,275	,294	,692

APPENDIX F - Item-Total Statistics for Evaluating Scale Reliability without item 10 (dependant variables).

Item total statistics

	Scale average in case of element removal	Scale variance on element removal	Complete correlation of corrected elements	Cronbach's Alpha for item removal
7. Such a reward system motivates me in my learning process.	26,99	15,930	,324	,734
13. Such a system of individual challenges motivates me in my learning process.	26,97	14,444	,635	,676
16. The existence of progress indicators motivates me in my learning process.	26,70	16,547	,323	,732
19. The existence of feedback motivates me in my learning process	27,10	14,727	,460	,707
22. The existence of personalized learning paths motivates me in my learning process	26,99	15,764	,455	,710
25. The possibility of exchanging or cooperating with friends or a community motivates me in my learning process.	27,30	14,186	,571	,684
28. The integration of multiplayer modes motivates me in my learning process.	27,15	14,935	,486	,702
31. Being able to create a customizable avatar or profile motivates me in my learning process.	28,29	15,291	,287	,750

APPENDIX G – Principal component analysis (dependent variables).

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,860	40,858	40,858	2,860	40,858	40,858
2	1,237	17,678	58,537	1,237	17,678	58,537
3	,872	12,464	71,001			
4	,722	10,315	81,315			
5	,519	7,410	88,725			
6	,464	6,623	95,348			
7	,326	4,652	100,000			

Extraction Method: Principal Component Analysis.

APPENDIX H - Varimax rotation with Kaiser normalization (dependent variables)

Component matrix

	Component	
	1	2
7. Such a reward system motivates me in my learning process.	-,036	,858
13. Such a system of individual challenges motivates me in my learning process.	,403	,746
16. The existence of progress indicators motivates me in my learning process.	,164	,639
19. The existence of feedback motivates me in my learning process	,812	-,010
22. The existence of personalized learning paths motivates me in my learning process	,560	,270
25. The possibility of exchanging or cooperating with friends or a community motivates me in my learning process.	,674	,325
28. The integration of multiplayer modes motivates me in my learning process.	,773	,075

Extraction method: Principal component analysis.

Rotation method: Varimax with Kaiser normalization.

a. Convergence of rotation in 3 iterations.

APPENDIX I – Linear regression analysis

APPENDIX I.1 – Linear regression between motivation and multiplayer modes

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8,505	1	8,505	43,245	<,001[b]
	Residual	13,964	71	,197		
	Total	22,469	72			

a. Dependent Variable: Motivation

b. Predictors: (Constant), Multiplayer modes

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,430	,250		9,706	<,001
	VariableMultiplayerModes	,418	,064	,615	6,576	<,001

a. Dependent Variable: Motivation

APPENDIX I.2 - Linear regression between motivation and collaboration

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12,576	1	12,576	90,258	<,001[b]
	Residual	9,893	71	,139		
	Total	22,469	72			

a. Dependent Variable: Motivation

b. Predictors: (Constant), Collaboration

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	2,091	,210		9,968	<,001
	Collaboration	,501	,053	,748	9,500	<,001

a. Dependent Variable: Motivation

APPENDIX I.3 - Linear regression between motivation and feedback

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7,754	1	7,754	37,412	<,001[b]
	Residual	14,715	71	,207		
	Total	22,469	72			

a. Dependent Variable: Motivation

b. Predictors: (Constant), Feedback

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	2,491	,259		9,623	<,001
	Feedback	,376	,061	,587	6,117	<,001

a. Dependent Variable: Motivation

APPENDIX I.4 - Linear regression between motivation and progress indicators

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9,710	1	9,710	54,033	<,001[b]
	Residual	12,759	71	,180		
	Total	22,469	72			

a. Dependent Variable: Motivation

b. Predictors: (Constant), Progress Indicators

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1,395	,363		3,839	<,001
	ProgressIndicators	,613	,083	,657	7,351	<,001

a. Dependent Variable: Motivation

APPENDIX I.5 - Linear regression between motivation and rewards

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10,803	1	10,803	65,747	<,001[b]
	Residual	11,666	71	,164		
	Total	22,469	72			

a. Dependent Variable: Motivation

b. Predictors: (Constant), Rewards

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1,569	,309		5,087	<,001
	Rewards	,620	,076	,693	8,108	<,001

a. Dependent Variable: Motivation