

Financial DreamScape: Puzzle Narrative Games for Financial Education

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ABSTRACT

Financial literacy is essential for personal and national economic well-being, demanding attention in today's dynamic society. However, a concerning trend persists where individuals may lack basic financial knowledge; this is common even among individuals with a high level of education. This gap is especially concerning for young adults, as it prevents them from making informed decisions, managing finances effectively, and securing a stable future. This paper presents the development and pilot evaluation of a serious puzzle game prototype to enhance financial literacy among young adults. The pilot evaluation (N=7) explores various game mechanics to deliver engaging financial education. Initial findings indicate promising potential for serious puzzle games in facilitating financial literacy. The research aims to contribute insights into pedagogical strategies and game design enhancements, fostering informed decision-making and economic stability among young adults.

CCS CONCEPTS

• **Human-centered computing** → **HCI design and evaluation methods**; • **Applied computing** → *Interactive learning environments*.

KEYWORDS

Financial Literacy; Young Adults; Serious Games; Education; Financial Behaviour

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1 INTRODUCTION

In today's dynamic society, financial literacy (FL) is a vital component of individual prosperity and national economic stability. It involves understanding financial concepts and risks and the confidence to make effective decisions in various financial situations [27]. However, De Bassa et al. [7] alert of a persisting troubling trend: many individuals lack fundamental FL despite their level of education. As highlighted by Hayei et al. [12], the financial decisions facing the younger generation, now and in the future, are expected to be more challenging than those of their parents due to the integration of new digital technology and new financial products.

As financial services grow more complex, developed nations, including those in the *Organisation for Economic Co-operation and Development*, emphasize the importance of FL [23]. In response to these emerging challenges, New Zealand launched its inaugural national strategy for FL in 2008. As outlined by Taylor et al. [23], this strategy aims to establish a high-level framework to coordinate initiatives in this field, identify existing gaps in coverage, promote flexibility through a variety of communication channels, provide appropriate financial education programs for those in need, and extend FL to as many New Zealanders as possible, sharing what works to improve the effectiveness of financial education. Similarly, Portugal launched a new plan from 2021 until 2025 that places FL education campaigns as a priority [8].

However, addressing the issue of financial education can be challenging since, for some cultures and societal norms, discussing finances is taboo, which can hinder an individual's ability to learn about financial concepts. Furthermore, since FL is many times not taught in the school context, individuals rely on trial and error to learn about financial concepts [18, 28]. One promising approach to engage younger generations in FL is through gamification and

serious games. As stated by Guigon et al. [11], serious puzzle games, such as escape rooms, have been appearing in this field, bringing many benefits such as organizational, reasoning, and implementation skills needed to tackle such concepts by challenging players or introducing alternative scenarios.

Drawing from previous research on serious games, including their impact on knowledge transfer and challenges in integrating game-based learning into formal education [2, 29], this work seeks to advance the discourse on FL and serious games. In particular, and since puzzle narrative games in educational contexts remain understudied [5], this project explores the impact and effectiveness of puzzle narrative games as an innovative educational tool to engage young adults and enhance their FL skills.

2 RELATED WORK

FL has been widely recognised as a crucial determinant of individual financial well-being. Numerous studies [4, 10, 16, 17, 20, 27] have underscored the correlation between low levels of FL and unfavourable financial outcomes. Current FL initiatives use didactic games, educational presentations, e-learning courses, and online quizzes [19, 24]. However, these approaches are still limited in terms of actively engaging in challenges, exploration, strategic thinking, critical analysis, and enhanced creativity [25]. As Rasco et al. [20] highlights, there is a limited number of FL programs targeting the youth demographic, and even fewer focus on engaging methodologies such as serious games.

Serious games, designed for educational purposes, offer unique opportunities to actively engage learners; they require players to respond to challenges and problem-solve within the game environment, promoting deep learning [2, 29]. We have encountered a series of commercial experiences that seek to leverage the potential of serious games applied to FL. For example, *Money Lessons* (recommended for ages 3+) [3], uses digital storytelling to teach about five key components of FL (earning, spending, saving, budgeting, banking); however, incorporating extensive information might overwhelm the player. *Money Masters* (recommended for ages 4+) [1] aligns financial lessons made by experts with gamification (quizzes, progress tracking, real-time investment game), favouring textual information over concept abstractions. In *Money Wise* (kids app) [9], players explore a city and roleplay as a character faced with quandaries about FL; while the game points out some intricacies in dealing with finances (e.g., online scams, terms & conditions), its rigid structure doesn't allow players to introduce their context in the gameplay. *Night of the Living Debt* (recommended for ages 4+) [15] is a zombie survival game, where players must make decisions about credit scores to survive attacks; while adopting a game approach makes play enjoyable, players might have difficulties in translating concepts into the real world context.

Cole et al. [4] emphasize the importance of FL in the growth process, emphasizing the significance of initiatives like FinCraft, an open-source gaming platform aimed at enhancing FL among the youth through gamification [20]; while this innovative approach aims to bridge the gap between financial knowledge and interest, addressing a critical aspect of youth development, no user evaluation was conducted, limiting our ability to determine which aspects

were beneficial or harmful to user engagement. While existing initiatives like FinCraft [20] and national education plans have made significant strides [8], as Rasco et al. [20, 21] highlights, the evolving nature of financial landscapes requires ongoing innovation in educational approaches. Therefore, there is a clear opportunity for research to explore novel methodologies and technologies that effectively promote FL, especially among young adults. As stated by Kim [14], “A puzzle is fun, and it has a right answer”; following this potential, our work proposes the design of an innovative puzzle game narrative that leverages puzzle mechanics to assess financial decisions made during the gameplay, impacting the direction of the narrative. By presenting users with difficulty-calibrated scenarios and requiring them to solve puzzles to progress in the immersive virtual world, we intend to cultivate essential skills crucial to FL.

3 METHODOLOGY

This section describes the development of an immersive and interactive puzzle narrative game aimed at communicating FL to young adults. The initial development phase focused on creating a low-fidelity prototype of the game, which laid the foundation for the game's narrative structure and mechanics, developed using Figma¹. We present a pilot evaluation and derive insights that feed the final proposed design of our puzzle narrative game.

3.1 Initial Game Concept

The chosen target audience is young adults, ages between 18 to 24 years old, attending higher education, since even though they might have a high level of education, these individuals may lack basic practical financial knowledge [7]. Furthermore, the prototype was developed for mobile platforms to effectively engage this demographic and broaden the amount of users.

In our game, *Financial DreamScape*, the user embarks on a journey to navigate the complexities of personal finance through a series of engaging puzzles to learn key financial principles, while experiencing the consequences of their decisions. The game, described through a first-person narrative, begins with the protagonist facing financial struggles and working on a coffee shop. As the character struggles with bills and lacking funds, they stumble upon a stroke of luck with a lottery win, only to face new challenges with irresponsible spending and frozen accounts. The core of *Financial DreamScape* lies in its mini-games, designed to educate players on essential financial concepts such as savings and budgeting. Each puzzle serves as a practical lesson, reinforcing the importance of FL in a dynamic virtual environment.

The first puzzle game starts in the player's dream. Unaware it's a dream and with no light, they navigate a corridor to find a lamp with missing pieces. These pieces represent how to budget your monthly income (the 50/30/20 budgeting rule [26]) – 50% for essential needs, 30% towards wants (like entertainment), and 20% for future savings. Each piece provides information about the rule, explaining what it is and how it works for the character.

Once the objects are inserted correctly, allowing the lamp to illuminate, the player proceeds to the kitchen, where a new puzzle game awaits. Here, the character attempts to get water but finds

¹<https://www.figma.com/>

none. The player's task is to rotate water pipes to fill buckets containing signs representing the budgeting rule: a bucket with an essential expenses symbol that the character must fill with 50% of water, a bucket with the entertainment expenses that the character should fill with 30% of water, and a bucket with the symbols of savings that the character should fill with 20% of water. While this information is also present in the previous puzzle, the game doesn't explain the budget rule in this puzzle. Upon completing this mini-game, the character wakes up. Depending on the results of the previous game, the narrative will change: if the player used the provided information to fill the buckets correctly, their account balance will stabilize; if the buckets were not filled correctly, the game will continue sending messages about unpaid bills and frozen balance. Players can repeat the puzzle to improve their FL and virtual finances.

Following this, while the character is awake, they will be led to the bank to discuss possibilities for a savings account; during this interaction, the banker will explain to the player what are compound and simple interests. Feeling overwhelmed, the character returns home to rest. Once asleep, a new puzzle game begins where the character must distinguish between compound and simple interest rates by connecting the interests with the correct rates. Once the mini-game is completed, the character wakes up, and depending on the result, the narrative will change: if the answers from the player were correct a savings account will be created, leading to a better future financial situation. The puzzle can be repeated to enhance FL and virtual finances.

Throughout these mini-games, the player observes how the decisions impact the virtual world and the character's finances, allowing them to have experiences with different approaches and outcomes. Hence, the goal of this game is to intertwine the narrative with FL-themed puzzles to give the player knowledge in areas such as savings, budgeting, and investments. The structure of puzzle games allows the game to be extended and incorporate more complex financial decisions for the player.

3.2 Preliminary Concept Evaluation

To gather feedback from the target audience about game concepts and mechanics, we conducted a user evaluation (N=7) with a low-fidelity prototype game.

3.2.1 Protocol & Measures. Participants were recruited using convenience sampling and were all college-age students (target audience). Sessions were conducted in our research institution. Each participant was provided with a consent form outlining the purpose of the study and the nature of their involvement, and their participation was contingent upon granting explicit consent. Firstly, participants completed a pre-game questionnaire to collect demographics and FL information. The demographic questions included their age, educational level, employment status, previous financial education, and financial goals. Additionally, we used a pre-game and post-game questionnaire to evaluate participants' FL perceptions, selecting FL questions based on Stella et al. [22].

Participants then interacted with the low-fidelity version of the game (figma prototype). The researcher took observation notes during the session. Due to the low fidelity nature of the prototype,

the researcher also adopted a Wizard of Oz approach [6], facilitating, completing, or explaining some of the game mechanics when needed to advance.

Following the interaction with the prototype, participants were asked to complete a post-game questionnaire with Likert items on a scale from 1 (strongly disagree) to 5 (strongly agree). This questionnaire included statements about the participant's experience with the prototype (e.g., enjoyment, challenge, frustration, etc.) and were based on the GEQ (Game Experience Questionnaire) from Ijsselstein et al. [13]. To conclude, participants engaged in a semi-structured interview, where they could freely express their opinions about the mechanics, game experience, and suggestions for improvement.

3.2.2 Sample. The evaluation was conducted with seven participants (5 males and 2 females) within the target audience. Participants' ages ranged from 22 to 36. All participants were enrolled in higher education (2 attending Doctoral degree programs, 4 attending bachelor's degree programs, and 1 attending a Masters's degree program). Participants reported no prior FL education.

3.3 Results

Quantitative and qualitative data are described in this section; due to the small sample size, we did not conduct a more thorough analysis process. From their pre-game questionnaire, all participants reported no prior FL education; however, their self-assessment scores of financial knowledge ranged from 2 to 4 out of 5. Most participants (N=6) emphasized the importance of saving, while most (N=6) also recognized the importance of understanding inflation. Few participants (N=2) acknowledged the importance of investments.

Compared with the post-questionnaire feedback from the FL questions. All participants stressed the importance of saving, and each one correctly answered a question about interest. Furthermore, some participants (N=4) demonstrated an improved understanding of the effects of interest rates and inflation after playing the game, suggesting a modest enhancement in comprehension compared to before playing.

In the post-questionnaire feedback about the game experience, some participants (N=4) expressed interest and enjoyment in the game's narrative, with ratings consistently ranging between 4 to 5 out of 5. Perceptions of challenge varied among respondents, with ratings extending from 3 to 5 out of 5. Regarding the time taken to achieve game objectives, most participants (N=6) rated it as moderate, scoring 3 out of 5. Opinions regarding the ease and effectiveness of the prototype mechanics for educational purposes ranged from 3 to 5 out of 5.

In the semi-structured feedback, all participants expressed that the user interface should be improved to enhance comprehension of mechanics, suggesting that animations would increase engagement. Most participants (N=6) recommended simplifying mechanics with pre-tutorials or a clearer user interface and supported incorporating everyday scenarios, rather than metaphors, into certain mechanics. When asked about their thoughts on how the financial topics were introduced in the game, all the participants mentioned that they were well introduced. However, three participants suggested that

it would be easier to understand them if the prototype attempted to explain them using methods other than text.

4 DISCUSSION AND PROPOSED RE-DESIGN OF FINANCIAL DREAMSCAPE

Results from the pilot evaluation indicate the potential for the *Financial DreamScape* game to introduce FL concepts in an engaging way since participants expressed interest and enjoyment in the game's narrative. However, the game still has room for improvement in the effectiveness of the game mechanics in delivering FL content (educational purpose), as seen from the medium score ratings. Another challenging issue pointed out by the participants is the user interface, the lack of freedom to move the character around the game, and the lack of pre-tutorials for the puzzle mini-games which would simplify the mechanics. Drawing from these insights gathered during the testing process, an iterative development was initiated to enhance the game's design and educational content, and a re-design is proposed in Figure 1.

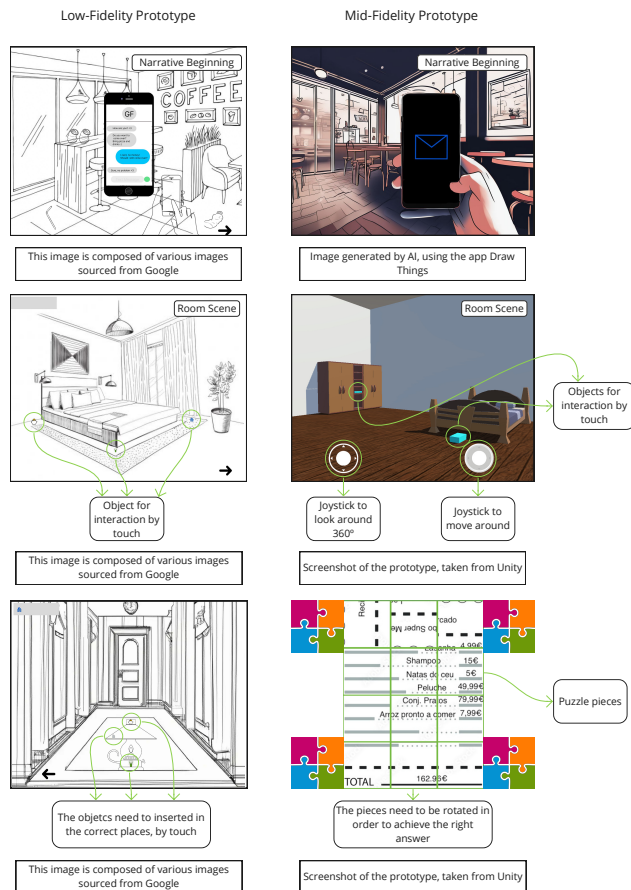


Figure 1: Comparison Low-Fidelity Prototype to Mid-Fidelity Prototype

This mid-fidelity prototype, which we are developing using the Unity game engine, departs from metaphorical approaches and employs realistic scenarios within the virtual reality environment to

effectively teach FL concepts. The puzzles were modified in alignment with user testing feedback to ensure a smoother and more engaging gameplay experience; this allows players to move around the game and explore scenarios more freely, enhancing player interaction with the scenarios. Additionally, touch interactions and animations were added to the puzzles, enabling users to visualize what is happening and improving their overall experience. Furthermore, the narrative was enriched by incorporating messages from bills and illustrating financial consequences, such as the bank balance, to enhance the player's immersion in the immersive educational journey.

In addition to study limitations (e.g., small sample, low fidelity of the prototype), we also acknowledge limitations to how story events emerge. For example, one notable limitation of our prototype is the inclusion of certain game events, such as the lottery, which may not lead players to take good financial precautions. In the mid-fidelity prototype, this game event has been removed to focus on more realistic scenarios like interacting with your phone and banking apps.

5 CONCLUSION AND FUTURE WORK

This work focuses on developing an educational game using Unity, aimed at teaching FL concepts. The game mechanics engage players in decision-making through interactive puzzles integrated with metaphors to enhance learning. Preliminary evaluations through user testing have provided valuable feedback for refining the game's mechanics, user interface clarity, and narrative coherence. Moving forward, we aim to conduct another evaluation with the mid-fidelity prototype to identify areas for improvement.

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