

## Financial literacy decision tree game: A system development exposé

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### **Abstract**

*Poor financial literacy has significant economic implications, with limited savings, insufficient retirement provisions and higher dependency on debt. Concerns about the level of financial literacy among the youth or young graduates motivated this study. The study describes the design of a game to educate young graduates while imbibing life-long personal financial management skills. A system development approach was used to present the information. Scenarios and decisions were developed to guide the student (player) in planning and making decisions about their budget with real-life events or cases. The study will be beneficial to university students to transition smoothly into the workforce and take control of their finances. University authorities and stakeholders can also implement the game design to assist students in gaining financial education before venturing into the working world.*

**Keywords:** *Education; financial literacy; game design; system development; universities; young graduates.*

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## **1. Introduction**

There is a strong focus on financial literacy, specifically on younger individuals and university students who graduate and need to be financially independent. The decisions made in the early working years may predict the financial well-being for the future, where one wrong financial decision can lead to another. Offering financial education at a young age is necessary as this impacts many areas - the economy, organizations, families, communities and the individual. With adequate financial literacy, working employees can positively attend to, make decisions and control their personal finances in the short and long term (Pearson et al., 2017).

Financial illiteracy during the first working years is identified through the lack of the most basic economic and financial concepts, which can have an unfavorable impact (Lusardi & Michigan, 2007). Therefore, students will benefit from a sound understanding of financial concepts including inflation, compound interest, savings, debt, and retirement planning, among others and avoid economic implications, insufficient savings and retirement provisions, and higher dependency on debt. Subsequently, there is more reliance on financial education's impact on financial literacy levels. Therefore, it is equally important to introduce financial literacy education and measure its effectiveness, as success is sometimes limited (Frijns et al., 2014). Improving financial literacy levels is a priority for the economy at large, and tertiary institutions have an opportunity to offer financial education to improve students' financial literacy.

Therefore, the study's objective was to describe the design of a game-based financial education program that positively impacts students' financial literacy. A detailed and systematic approach through a system development methodology (systems thinking) to create a solution to a problem (Nunamaker et al., 1990). Knowledge is created about the development process itself, and deeper understanding emerges about the problem that the system is designed to solve (Hasan, 2003). The paper focuses on the conceptual framework and game content, to produce knowledge and illustrates how students can acquire financial education to prepare them for the world of work. The technical development of the game by the developers falls outside the scope of this study.

## **2. Conceptual framework**

### ***2.1. Game-based learning and theories***

Gamification research in the field of finance has been limited although it has become common in the sector (Bitrián et al., 2021). The game-based learning approach has grown exponentially in recent years in different disciplines. Academics have explored the use of gamification to enhance the transfer of knowledge and learning experiences (Nieto-Escamez

& Roldán-Tapia, 2021). The learning approach has grown significantly into a popular instructional approach due to its power to motivate and engage students in complex learning, problem solving, critical thinking and decision making (Aprea & Ifenthaler, 2021). Integrating game design elements into non-game activities enhance user engagement and has a great potential to motivate players and impart knowledge to them (Hoffmann & Matysiak, 2019). Incorporating gamification has gained momentum since the impact of COVID-19, resulting in learning outcomes (Nieto-Escamez & Roldán-Tapia, 2021).

Games are designed in different formats, types and strategies. Several theories have been identified in gamification, self-determination, goal setting and the flow theory (ibid.). Self-determination theory includes basic needs in terms of autonomy, relatedness, and competence, where at least one should be addressed (ibid.). Taking ownership of your behavior can be equated with autonomy, which is associated with financial behavior and decision making (Richter et al., 2015). The goal-setting theory includes student commitment, feedback, game complexity, and situational constraints. In comparison, the flow theory focuses on optimal enjoyment and engagement with the game (Nieto-Escamez & Roldán-Tapia, 2021). Sufficient planning is required in the game-based learning to maximize participation by students and increase student knowledge. For this study, the focus was on improving financial literacy.

## ***2.2. Motivation to engage the content***

Students think and learn differently, especially Generation Y (millennials) and Z (the students of today). For millennials, the largest generation, motivating and engaging to learn is very hard since they consider the traditional teaching methods as boring compared to their experience with digital technology (Woods et al., 2011). Gamification techniques in financial education can effectively enhance student engagement and learning for Generation Y, as demonstrated by Poole et al. (2014), using traditional lectures and game-like techniques. Nicholas (2020) found that 51% of Generation Z students prefer learning by doing (working through examples), 38% by seeing and 12% by listening. Generation Y students exposed to the gamification method of instruction perform better in assessments and experience higher levels of involvement, while Generation Z is more exposed to technology from a young age. Hence, motivation and the mode of offering are vital to engaging students in financial content.

Platz and Jüttler (2022) found that motivated students in finance have a positive link to the game experience. The success of financial education depends on “learning from doing”. Such programs should be implemented in a manner with the most significant impact (Massey et al., 2016). Therefore, tertiary education has a unique opportunity to introduce financial education that will promote and improve financial literacy by learning from doing in line with the preferred learning style of Generation Z.

Further, studies have shown a positive link between gamification and improved financial knowledge. Hoffmann and Matysiak (2019) found that gamification of financial education increased the motivation to engage in an investment topic. Kalmi and Rahko (2022) and Sari et al. (2022) applied augmented reality (AR) to school children who improved their financial knowledge more than was observed in the control group (traditional program). Johnson et al. (2021) evaluated the effectiveness of a free online financial educational program where financial knowledge improvement was significant. Nordin et al. (2022) investigated AR gamification technology use; 93% of the students reported that it was a better learning media.

Therefore, gamification can be considered a valuable tool for Generation Y and Z, motivating students for improved interactivity, engagement, and learning. However, necessary planning is required to ensure the effectiveness of the game. The right strategy and media will offer the best potential for financial education (Sari et al., 2022).

### ***2.3. Game design and financial literacy influencers***

In developing the conceptual framework to improve financial literacy, gamification was selected where learning from doing is the preferred learning style for students. Factors that influence financial literacy were incorporated into the game. Studies established the impact of life experiences on financial literacy. Liu and Lin (2021) demonstrated that including students' real-life experiences and choices in the teaching content promotes learning interest while teaching financial knowledge and improving literacy. Hoffmann and Plotkina (2021) found that intervention during an experiment where consumers recall and reflect on experiences regarding their personal finances promotes higher financial efficacy. Therefore, game-based learning that simulates real-life experience was developed in this study to improve knowledge and prevent decisions that have potentially negative impacts on personal finances.

## **3. Game methodology**

System development was implemented to design the game prototype. The game methodology was applied to develop game-based learning that would simulate a life experience through the consequences of events. The basis of the game concept is the ability to process a life experience, adapt to new conditions with budget adjustments, make impactful decisions and readjust the budget, while successfully responding to existing game rules, which implies modification, here and now in a limited time. A similar methodology was used by Kubina et al. (2021), who designed a budget game model with illustrative elements in real-life scenarios; players had to adjust and make changes according to the changing conditions in a limited time. The advantage of gaming is experiencing the impact of a decision or reaction, copying a life event that adds to life experience.

A system development methodology systematically organizes efficient financial education in a game. The fundamental role of system development is the process of the developed system and then as an object (the game) that becomes the focus of further and continued research (Nunamaker et al., 1990). Therefore, system development was suitable in this study as it efficiently presented an optimal mode to include various elements, descriptions, and rationale. In developing the game, autonomy in self-determination theory was applied where the students must manage their finances and budgeting decisions, as suggested by Kubina et al. (2021).

#### **4. Game description – Financial literacy decision tree game**

The game starts with the student graduating from university and being employed for the first time. Four real-life scenarios were selected that may severely impact a young graduate if not prepared; thus, relevant situations are often experienced in the local and real context. These include allocating the budget between wants and needs, black tax (financial dependency of family members), wealth creation and theft, discretionary 13th cheque and retrenchment.

The game was designed with the following scenarios presented in Table 1 and Figure 1. You are a young graduate who is the first family member to graduate from a university, with the support of the entire family that relies on you for financial support in times of need. You get your first payslip from a big corporate entity. You have accommodation, transport, study loan, and credit card expenses. You must make provisions for needs and wants (groceries, toiletries, clothes, airtime, entertainment, eating out and credit card debt). Further specific information is provided regarding lunch at the office canteen, your current office outfits, data bundle expenses, streaming channels costs, your current savings and credit card debt, lack of insurance and medical aid and the monthly costs to make provision for it.

The students are then expected to consider all the information provided and draft a budget of their expected spending, how often they eat out or buy takeaways, their savings behavior and any other relevant information considering the information provided. They can enter R0 for entries that they are not utilizing or that do not apply to them. Once the student finalizes their budget based on the information provided, they are faced with four scenarios presented in table 1. Each scenario represents a real-life event that could impact a young graduate's finances if they do not plan accordingly. The four scenarios will have financial implications for the student. Each scenario will test their preparation for the unknown and how well they planned and managed their personal finances. The student makes another decision based on the specific scenario, which requires adjustments to the existing budget. The student also has an opportunity to reassess each line entry and consider the importance of their wants, needs, and financial well-being. Before they move to the next scenario, the student reviews and makes changes to their budget.

**Table 1. Game decisions and scenarios.**

Scenario 1 (budget, savings, emergency fund)	Scenario 2 (budget, wealth creation, insurance)	Scenarios 3 (surplus) & 4 (retrenchment)
<p>Three months later, you have a family emergency; your mom needs to replace a burst geyser during winter and relies on you for assistance. Options: 1) you have allocated savings from your budget (savings per month x 3), which can be used. If not enough, use the credit card (with increased payments) and reduce another expense; 2) you did not save and need to use your credit card.</p>	<p>Four months later, you are robbed and need to replace your stolen laptop. Options: 1) you have insurance and are covered entirely; 2) you did not take out insurance and have no funds. You can buy a second-hand laptop or take out a personal loan with a higher interest rate. Consider wealth creation, debt, interest rates and insurance to readjust your budget.</p>	<p>At the end of the year, you received a 13th cheque. Options: 1) save the funds in a savings vehicle for an emergency fund; 2) pay credit card; 3) pay student loan; 4) spend it on a holiday. Readjust your budget. Two months later, you are retrenched. You find another employment two months later, resulting in one month without any income. Consider your current savings, fixed expenses and necessities.</p>

Content for the specific scenario is then presented; this gives the student additional information to assess their decisions and how they could better manage their finances. Subsequently, the student has control over their personal finances and has to take responsibility for decisions. When a situation occurs, they can take ownership of it and consider available options (Kubina et al. 2021). That way, they gain financial experience to help them make decisions in real life. These views were expressed by Frijns et al. (2014), who found that financial experience positively impacts financial literacy and promotes improved financial knowledge. The game dynamics also help students to recall and learn by doing, as supported in previous studies (Massey et al., 2016; Hoffmann and Plotkina, 2021).

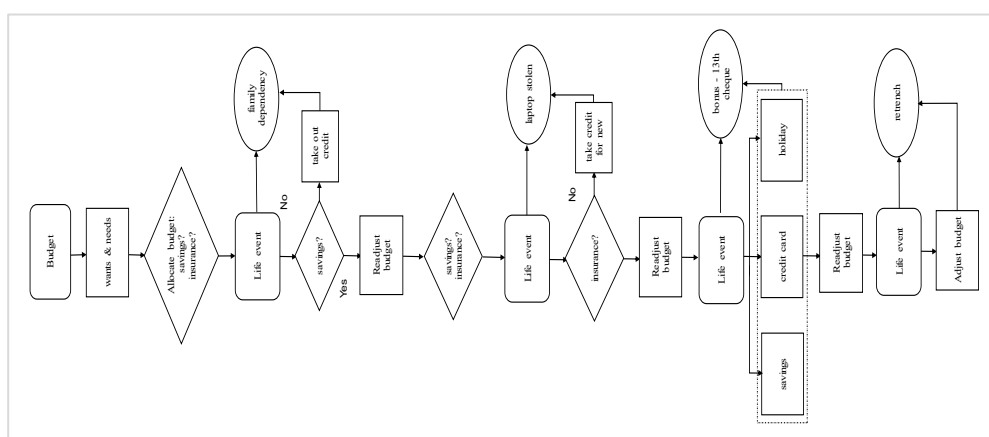


Figure 1. Scenario and decision tree.

## 5. Conclusion

Life experience positively impacts financial literacy, and where a gamified experience can be simulated, the individual may gain knowledge to make better decisions. Subsequently, a game was developed to allow students to improve their financial literacy before they start working. Game-based learning is generally effective, and it can promote financial literacy. If presented to university students, it will enhance the importance of the content as they transition from students to employees. However, this study did not explore the impact of the gaming experience on students' financial literacy. It only includes the description of the design of the game prototype to be used for further investigation. Future research will include testing the effectiveness and measuring if it adds to the students' experience of gaining financial knowledge.

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