Wealth Creation: Serious Game Development to Improve Financial Literacy for High School Students

Kittiphan Wiboonsin and Wandee Kasemsukpipat
Kasetsart University, Bangkok, Thailand
k.wiboonsin@gmail.com
feduwdk@ku.ac.th

Abstract: Serious games simulate events in a virtual world to allow players to interact with the game's elements and other players within the game. In the field of health, transportation, economics, and finance, serious games were used as simulators in training. By playing a serious game, learners gained experience in making meaningful decisions through trial and error to solve problems in the virtual world. In this research article, the authors developed a board game to introduce concepts of Wealth Creation and studied the characteristics of board games suitable for developing high school students' financial literacy. The four steps of the development process included content and game mechanic development, game mechanic testing, content validity and communication of game elements evaluation, and usability testing. The game was tested and verified by experts in terms of its mechanics, communication, financial content, and implementation in two cycles. The experts included two gamers, two game designers, a finance professor, and two instructors as well as three high school students. The information from the first cycle will be used to improve the game, and the game was retested again in the second cycle. The qualitative data gathered through observations, informal interviews, and focus groups were analyzed using content analysis to determine the game's characteristics that were appropriate for classroom use and the effects of the game on students' skills and understanding of financial concepts. The results showed that the nature of the game should include a variety of gameplay options, each of which must be balanced to allow students to evaluate the worthiness of each choice made. The mechanics and components of the game must clearly demonstrate the relationships between the elements of financial concepts. Students were able to express their understanding of financial concepts and recognize their relationships. Additionally, the students expressed the use of mathematics in analysis and illustrated good decision-making during playing the game. The findings shed more light on the roadblocks that game developers will face and how to overcome them. Educators and teachers interested can apply the findings in this article to develop their serious games.

Keywords: Educational game development, Financial Literacy, Serious game, Fostering Financial concepts

1. Introduction

Nowadays, people have early access to financial services and financial products, such as paying for goods and services online, using a credit card, and taking out an education loan. Furthermore, financial products and technologies developed by financial organizations have become more complicated (OECD, 2012). Young people need financial literacy to solve current and future issues. Some countries, such as Australia and Canada, focus on improving financial literacy in schools by integrating it into mathematics and economics subjects. Thailand also modified the Basic Education Core Curriculum by including financial content into mathematics and economics classes. This change making it more conducive to the development of financial literacy. According to a survey conducted by the Bank of Thailand in 2020, Thai young people have more financial literacy than those in 2018. However, their financial behaviors, such as financial decision-making and appropriate money allocation for expenditures and investments, financial attitudes, regular savings, and setting long-term goals as the financial well-being are still issues (Bank of Thailand, 2020). Although the Bank of Thailand notes that financial literacy can be developed through informal education, such as studying from the internet or from telling by an experienced person, a study by Fürstenau and Hommel (2019) found that informal education does not impact on students' financial literacy if they lack foundation knowledge. Because the information is limited, their financial decisions are made based on experience by comparing with basic information. It is not in-depth processed and integrates new data and existing information. Therefore, school-based education that aims to provide students with the necessary financial knowledge and skills, as well as the ability to apply that knowledge in real-life situations, is still essential in developing students' financial literacy. Schools must provide quality tools and resources to develop students' financial literacy. These tools and resources must be consistent with the curriculum and flexible enough to adapt to students' abilities and backgrounds. These resources will help instructors implement them into their classrooms and allow students to learn from real or virtual circumstances in order to acquire financial literacy (OECD, 2012).

Simulation games are an effective tool for improving financial knowledge and abilities (Pfändler Andrea, 2021; Brennan and Vos, 2013; Cheng, Yeh, Chao, Lin, and Chang, 2020) because they allow players to practice making decisions in real-life situations that help students to develop the necessary skills for living and cultivating a

positive attitude. This includes understanding both the details and the big picture of social processes and the interrelationships between the various components that logically and systematically represent real-life situations (Stadsklev, 1974). Gaming can also trigger emotions such as curiosity, frustration, fun, trial and error, failure, and success (Kim, 2012; Buckley et al., 2016) and ponder every time you play. This is due to the fact that games can be replayed multiple times, resulting in the development of gameplay and a better understanding of the phenomena that occur within the game to achieve the game's objectives (Gee, 2011). The simulations used in the game should be accessible to students (Kiili, 2007), as they may have direct practical or educational experience, or indirect experience from what others say. As a result, the authors created a simulation game based on the assumptions outlined below.

1. Income, expendituresand investments refer to the options available in Thailandand the amount received and paid is based on the average amount and cost of living in Bangkok.
2. The financial literacy that students will gain from playing the game is considered when develop this game. In this game, the player must recognize the financial components' relationships and use the results of their actions to mathematically analyze and conclude the concepts they obtained.
3. The game must engage players to concentrate on making decisions.

This research aimed to develop and study the characteristics of simulation games that can promote financial literacy and can be appropriately applied in the classroom.

2. Background

2.1 Financial Literacy

Financial literacy can be defined in two areas: knowledge and understanding of financial concepts and the application of financial literacy (Huston, 2010; Remund, 2010). Financial knowledge can be considered in terms of the financial content and the cognitive level (Hill, Meszaros, and Tyson, 2011), and financial knowledge application can be considered as an aspect of competence that includes the ability to communicate a financial concept, aptitude for managing personal finances, the skills to make appropriate financial decisions, and confidence in effectively planning for future financial needs (Remund, 2010). The OECD defines the widely used definition of financial literacy as "financial literacy is knowledge and understanding of financial concepts and risks, and the skills, motivation, and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life" (OECD, 2020, p. 43). Therefore, it is the capacity that enables individuals to plan, implement, and effective control over financial decisions. Factors affecting decision-making include financial knowledge and skills, motivation, interests, attitudes, values, financial status, and environment. Both worldwide and domestic financial organizations have divided the content framework to establish standards that are income, purchases of goods and services, savings, credit and debt, investments, risk management, insurance, and financial decision-making (OECD, 2020; Jump$tart Coalition, 2007; CEE, 2011). This framework was used to design our 4 games to promote financial literacy: Wealth Creation, Saving and Investment, Credit and Loan, and Risk and insurance. In the game design, the financial decision-making model is considered as a key element in the development of financial literacy, as shown in Figure 1.

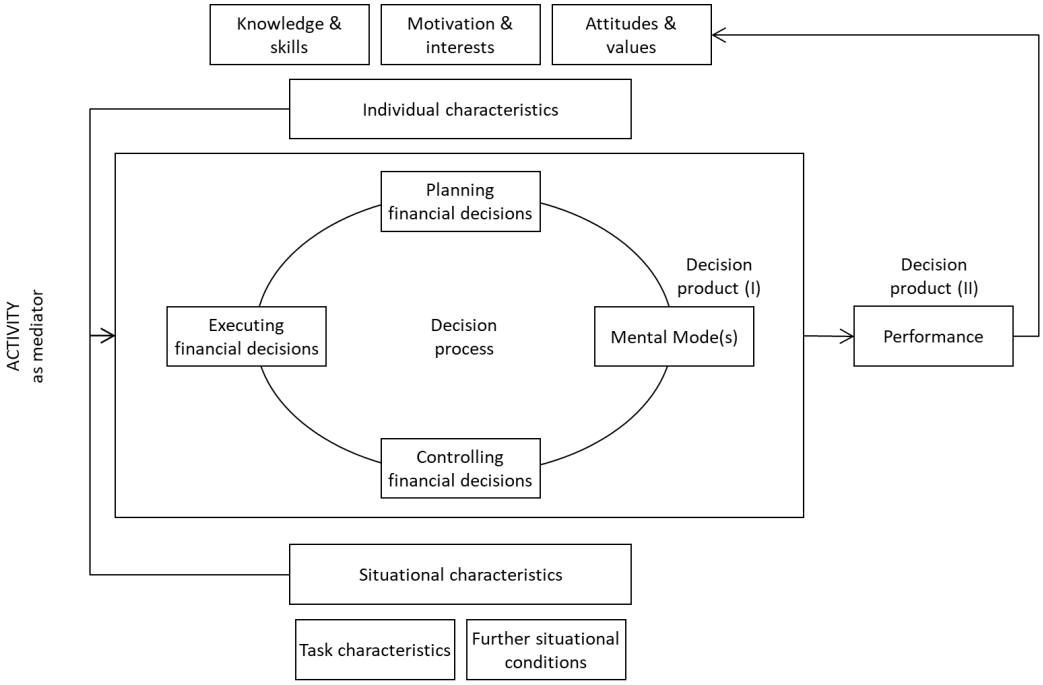

Figure 1: Game Components Competence-oriented working model of financial decision making (adopt from Ebner 2005)

2.2 Game-Based Learning

Game-based learning is the concept of using games for teaching and learning (Wilson et al., 2013) with a focus on interactive problem solving to achieve specific objectives while utilizing essential competencies. The students will receive immediate feedback after acting in uncertain situations in games to promote learning (Eseryel et al., 2014). Game-based learning is a student-centered approach to learning that combines content with games to allow students to develop various skills while learning content (Gee, 2014). Furthermore, while playing the game, players gain benefits in the following areas: cognitive (attention), motivation (flexibility in the face of failure), and emotional (emotional management), as well as social advantages, such as social behavior (Granic et al., 2014). Therefore, using games in the classroom is more effective in learning and long-lasting than other teaching methods (Woters et al., 2013). Games generally consist of mechanics, elements, stories, aesthetics, and technology (Schell, 2008). Game mechanics are game processes and rules that determine the game's goals, how the game is played, the story and sequence of events within the game, and the outcome of the player's actions.

The use of game mechanics with learning depends on the context of each player. Hence, learning games may not be attractive and motivating for all players Hamari (2014). Flow analysis examines a player's concentration and interest in what is happening while they are playing a game. It can be used to determine whether a game is suitable for a particular player. A player enters a state of flow when 1) they believe they are on their way to achieving a goal state, 2) they receive feedback on the outcome of their action, and 3) they are able to overcome the game's challenges due to their ability (Cziksentmihalyi, 1990; Schell, 2008). In a practical game, the game mechanics should have the following characteristics: 1) clear rules of play, 2) clear objectives and game complexity appropriate for the players, 3) interesting stories or themes according to methods of play, 4) difficulty level growing in accordance with the player's skill in the game, 5) interaction with players, 6) uncertainty level that the player cannot reasonably predict, 7) direct control, 8) providing feedback immediately after player actions, and 9) learning curve appropriate to the player (Aprea and Schultheis, 2019; Perotta, 2013; Shute and Ke, 2012; Cziksentmihalyi, 1990)

When compared to other one-way learning tools, games are one method for promoting financial literacy that is effective. Especially multi-objective educational games that encourage interactive play (Kalmi and Rahko, 2022). Many board games available today use the storyline within the game to explore the theme of personal finance. They can be divided into two groups based on the date of publication, classic board games and contemporary board games. The classic board games, such as Monopoly (1935), Game of Life (1960), and Cashflow 101 (1996), have a similar focus on managing income, expenses, investments, and savings for expenses from unforeseen

events, but with different emphasis. For instance, Monopoly emphasizes real estate investments and mortgages on land. The Game of Life centers on lifestyle decisions in education, career, marriage, and childbearing that affect income, expenses, and debt. Cashflow 101 emphasizes recording financial statements, which include income, expenses, assets, liabilities, cash flow, and asset management. Roll and move are frequently used as the primary gameplay mechanics in classic games, with additional gameplay mechanics like events, auctions, and loans. As a result, the main theme of the game revolves around the role that luck plays. Contemporary board games, such as Charge Large (2009), Stockpile (2015), and Pursuit of Happiness (2015) focus on complex cash and resource management and multi-step exchange based on the financial situation. Players must use strategies for both short-term and long-term play. Each game uses different mechanics as appropriate for the content used within the game. The Charge Large focuses on managing credit card debt and upholding credit. The Stockpile focuses on stock market news and investing in common stocks as well as assessing the worthiness of investments. The Pursuit of Happiness emphasizes allocating resources to achieve happiness in life. Many mechanics used in contemporary games require players to make the best assessments, plans, and decisions possible. Examples include worker placement, auctions, commodity speculation, markets, stock holding, loan investments, and open drafting. However, these games were all made with the intention of being enjoyable to play. Therefore, the purpose of this study is to create a game that can be used in the classroom and has a mechanism that is appropriate for promoting financial literacy in students.

3. Methodology

3.1 Requirements for the Specific Game Design

The game was developed based upon the characteristics of a game that promotes financial literacy, which was found in the literature (Aprea and Schultheis, 2019; Perotta, 2013; Shute and Ke, 2012; Cziksentmihalyi, 1990). It was as follows:

1. The content of the game is related to financial literacy development.
2. The game's mechanics and elements can be used to simulate real-world financial scenarios.
3. The game's difficulty level is suitable for the target group.

3.2 Aim of the Game and Game Structure

Wealth Creation is a game that demonstrates how to accumulate financial wealth. The game's goal is for players to collect as much wealth as possible. A player's wealth grows by investing their income to make a profit. Investments in each asset will have different returns and risks and its own set of liquidity. Each round of play will represent a different stage of life. The players can see the amount of expense compared to the amount of income in each round. The allocation of expenses in each round will affect the growth of players' wealth in the following round. In the beginning, the players will spend most of their earnings on necessities. As a result, the players' investment options are constrained. In the middle of the game, since the players earn more money by working and investing, the number of investment options has increased. Asset trading is a common practice for moving funds into higher-yielding assets. Finally, at the end of the game, the players can choose to sell high-risk investments to maximize their profit or decide to keep certain assets that are higher expected returns.

3.3 Game Mechanics

Wealth Creation is a resource management game that includes roll and move, open drafting, event, income, investment, and loan mechanics. Playing equipment consists of cards and dice that are used to perform activities related to income, expenses, stock prices, land prices, and unexpected events. The arrangement of equipment is shown in Figure 2.

Every player begins the game with 30,000 baht and three cubes to place on their income cards. The income cards separate into three types of employment: full-time, freelance, or temporary. The game is played in 4 rounds and each round is divided into five phases: 1) Expenditure phase is when players purchase goods and services cards, which each card having disc(s) and/or cube(s) representing working experience, knowledge and skills, and facilities. The cube is used for earning income and the disc is used for investment. Some goods and services cards can also provide social connections, opportunities to buy insurance, and financial wealth. The players must allocate their earnings to expensing and investment. 2) Investment phase is when players choose to buy or sell assets by using the discs. The assets that players can invest in include real estate, common stock, bonds, and gold. After the players used all their discs or all players pass their turns, the players can choose to place the cubes on the income cards they prefer. The number of cubes affects the credit limit for purchasing real estate. 3) Event phase is when the players are confronted with incidents, such as sickness, social connection

cost, asset disaster, and change in their investments. The Players, who have the opportunity to buy insurance initially choose to purchase health or asset insurance to transfer potential risks. After purchasing insurance, the dice are rolled. The value of the purple dice indicates the unanticipated expenses from the incidents. The yellow dice's value indicates the increase in real estate prices, and the blue dice's value indicates the change in common stock and gold prices. 4) The income phase is when players receive income from various sources, including working, real estate rental, dividends, and interest., 5) The loan interest phase is when players pay interest on real estate investment loans and credit card interest. When every player completes five phases, it is assumed that they finish one round., The new round is will begin. After four rounds, the points will be determined based on the value of the goods and services cards and the asset value. The player with the highest points will be the winner.

The authors designed the game mechanics to be consistent with the financial elements so that players can make decisions in the simulated scenario of creating financial wealth. A description of the design's mechanism can be found in Table 1.

Table 1: Details on the game mechanics in Wealth Creation

Mechanic	Financial concept	Action
Draw and select	Individuals must allocate their income for expenditure, investing, saving, and hedging.	Player selects three out of the five cards drawn for each round. Each card outlines actions relating to income, investments, insurance, and wealth.
Open drafting	Individuals can choose to invest in assets that match their risk tolerance and investment budget.	Players have access to a variety of asset options in a pool. Each type of asset has limits.
Income	People can make money in a variety of ways, including working and investing.	Players generate income from their invested asset cards and working cards.
Loan	Loans can be used for a variety of purposes, including basic living expenses and real estate investments. The interest rate on each type of loan varies.	Players may borrow money to use for events or to invest in real estate cards, but they must return the loan's interest before the end of the round.
Stock holding	Individuals can become wealthy by investing some of their income.	Players will receive returns in terms of dividends, interest, or capital gains.
Market	Common stock trading prices on stock exchanges are influenced by market demand.	When you purchase or sell stocks, the value of stocks will vary. When purchasing demand increases, the price increases, and vice versa.
Event	Spending and investment are influenced by the economy and government policies.	Players can purchase insurance to cover the cost from illness or property damage.
Protection	People can protect themselves against the possibility of losing their assets by purchasing insurance.	Players can purchase insurance to protect payouts from illness or property damage.
End game scoring	Wealth is defined as the accumulation of valuable economic resources that may be assessed in terms of either actual products or monetary value.	At the end of the game, the score will be accumulated from the value of cash and assets, such as real estate, common stock, bonds, and gold.

The design's financial features are based on the content structure displayed in Figure 3.

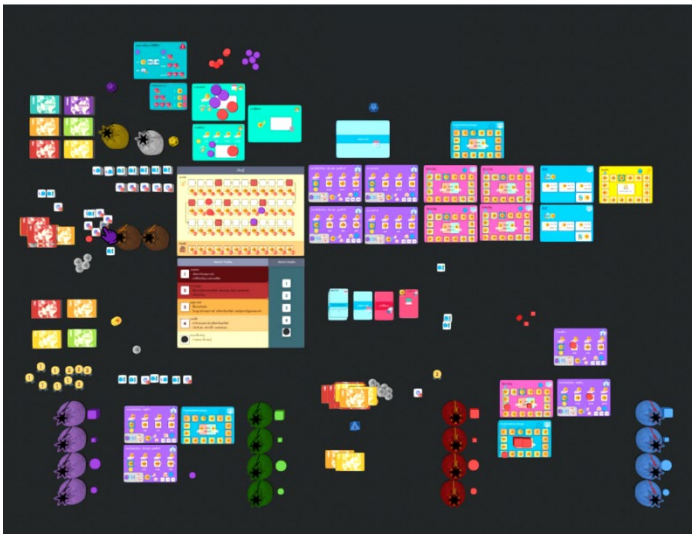

Figure 2: Game Components and Setting of Wealth Creation

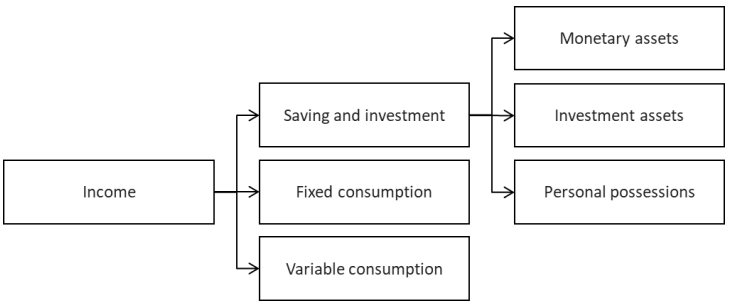

Figure 3: Content structure of Wealth Creation

3.4 Development of the Wealth Creation and Expert

The development and testing process is divided into four parts, as illustrated in Figure 4, with the following details:

1. Content and game mechanic development is a process in which the developers researched financial literacy and game mechanics and used them to design the game.
2. Game mechanic testing is a process that aims to test the game's flow and balance. The respondents were two gamers, aged 36 and 38, with bachelor's degrees. Both of them have played more than 100 different board games.
3. Content validity and communication of game elements evaluation is a process aiming to verify the financial content carried in the game. For content validity, the informant was a 38-year-old university professor from the Faculty of Economics. For testing the interpretation of financial elements and actions within the game, the informants were two game designers, aged 29 and 36, with master's degrees. They are game designers who have experience in designing more than 20 educational games and are trainers for developing an educational games.
4. Usability testing is a process aiming to test the suitability of the game for use in the classroom. The informants were two mathematics teachers at the school level, aged 29 and 27. To test the interest and knowledge gained from playing the game, the informants were three high school students, aged 16-17, studying at the upper secondary level. All three students never study economics and finance at the high school level.

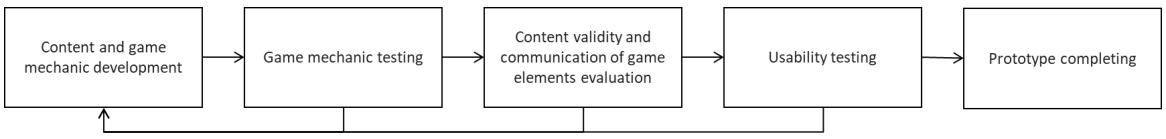

Figure 4: The development process

3.5 Data Collection

Researchers gathered information from the informants during and after playing the game through observations, interviews, and group discussions. The data were analyzed to characterize the game that suitable for implementation in the classroom and the influence of the game on students' financial abilities and knowledge. The coding scheme was based on the Serious Game Usability Evaluator (SeGUE) developed by Moreno et al. (2012). SeGUE is a method for assessing games based on the characteristics of serious games, which are divided into two dimensions: 1) The system dimension is divided into two sections: the interface section, which includes content, layout/UI, and technical errors, and the design section, which includes game flow and functionality. 2) The user dimension system is divided into positive feelings like pleasant, frustrated, reflecting, satisfied, excited, learning, and negative feelings like annoyed, confused, frustrated, unable to continue, and neutral feelings like giving advice. Furthermore, Ericsson's (1993) Thinking-Aloud method, which requires players to speak their thoughts and choices is used to determine the appropriateness of game elements during implementation and keep track of the players' moods and interests while playing the game.

4. Results

The authors encoded and categorized the data according to the system dimension in SeGUE, which is separated into interface and design. The authors also included the results of the students' responses. The results are as follows:

4.1 Results of the interface analysis

This section's analysis included content, layout/UI, and technical errors.

4.1.1 Content

There were seven positives, five negatives, and four neutral events discovered. On the positive event, the players revealed that they could learn how to play the game and attain goals within a single round of play. Because the game has a lot of content to be communicated, the players learned how to play through trial and error. When the players can link the elements of the game to the outcomes of their actions, they could continue playing the game without the assistance of the game master. A student player said, “in the first round, I didn't exactly know what to do, and needed an explanation from the teacher. However, after the first round, I had figured out the game's strategy and could continue the second round by myself". On the negative side, the intended message of the game was unclear to the players. The player could not perceive the whole picture of the scenario that should have been presented. As a result, the authors revised the game by using more specific words and using symbols to classify investments and expenses. For an unbiased opinion, the authors were suggested to balance the game and adjust the return on investment to make it more reasonable, such as "increase the attractiveness of investing in bonds and gold", "make real estate harder to sell due to asset liquidity conditions", and "adjusts common stocks to increased risk of loss as it is a high-yield investment".

4.1.2 Layout/UI

There were two positives, seventeen negatives, and eight neutral events discovered. On the positive side, the symbols for revenue and expenses are immediately understood by the players. The authors used the hand receiving the money symbol to represent revenue. The yellow coin represents the amount of revenue, and the red coin represents the expenditure paid in each round. This allows players to see where they can increase their earnings and where they must spend money in each round. On the negative side, the players were confused about the symbol representing the value of common stocks that show the price movement. Consequently, it took the players a while to notice the price movement. The authors then modified the game by using straight lines and symbols to represent the position of the trading price, including inserting arrows to determine the direction of price changes.

4.1.3 Technical error

There were three negative events. The players were bored and confused about the result of in-game actions and game balance, such as borrowing money to invest. The authors designed a short-term, high-interest loan mechanism in the case that the players do not have enough cash to deal with unanticipated events. However, because there were no clear terms of use and loan limits, some players borrowed money to invest in stocks and could win the game. While it is technically possible, content professionals did not want students to learn content in this manner. As a result, the authors determine the maximum loan amount that players can use each round and optimize asset liquidity and investment risk so that students can see for themselves why playing in this manner is not a good idea.

4.2 Results of the design analysis

This section's analysis includes the game flow and functionality.

4.2.1 Game flow

There were four positives, eight negatives, and three neutral events discovered. On the positive side, the players were excited with the return on investment because the game was designed for players to quickly increase their income. Thus, the players could invest money at the beginning of the second round. That the players could invest in assets multiple times allowed them to earn yields and still had money left for the next round. On the negative side, the players viewed that they could obtain the resource too easily, so it made the game uninteresting. Thus, they played the game without considering the value of their investment. "Why isn't it as easy to make money in real life as in the game?" is an example of a quote made by a gamer player. The authors modified the game by increasing the payout for every action in the game. It made the players have to plan every action more carefully. Every price for action results has an opportunity cost. For an unbiased opinion, content experts noted that players could easily create wealth in the game. In fact, there are other factors that affect wealth creation that prevents people from having good financial wealth in real life.

4.2.2 Game functionality

There were three positives, nine negatives, and three neutral events discovered. On the positive side, the players who made an early mistake can quickly correct their errors and rejoin the game because the game's objectives are clear. When a player was affected by an action that does not bring them closer to the target, they would be able to immediately change their strategies to minimize the disadvantage to other players. On the negative side, the players obviously see how to win the game, so they felt that the game was not interesting. For example, they increased their income from full-time work and then invested the money earned to enlarge their income. The player who makes the most money at the beginning is more likely to win. For an unbiased opinion, focusing only on earning and saving money for investments can make the game uninteresting. According to one gamer, "the game lacks variety in terms of playing technique. You have to follow the pattern of the game or you will lose". The authors revised the game by shortening the time required to build the salary base and expanding the sorts of jobs available base on their nature, allowing the player to select different types of income. In addition, the authors clarified the balance of return and investment risk and included a more diverse asset price range to enable the players more flexible investment plans. For an unbiased opinion, the authors were recommended to make multiple options in each component. As the development of financial literacy requires students to practice evaluation and decision-making in real-world situations, providing options is critical.

4.3 The results of the analysis of students' data.

The authors also had students test the game in order to evaluate its content communication. According to the data, the students exhibited their knowledge in 18 events. They were able to demonstrate their understanding of wealth creation in the exact way the author was designed. Examples of what a student says are, “in the beginning, it was not possible to invest much because income and expenses are almost equal. We will have more income in the middle of the game that allows us to invest more.” “Each investment gives a different return”. “Real estate is difficult to sell. In contrast to common stock and gold”. “There are certain commodities that give wealth, such as collectibles, watches, jewelry”. “We should have health insurance because medical expenses are expensive.” When the authors asked the students to clarify how they chose investments, they could demonstrate their value by using ratios and percentages to show the relationship between the principal invested and the return received, as well as the suitable investments for income level.

5. Discussion and Conclusion

In this article, the authors presented the results of the development of Wealth Creation, which is one of four series of financial literacy games for high school students. This series aims to teach the integration of financial literacy and mathematical knowledge. For Wealth Creation, the authors designed the game intending to give players a way to create wealth. The key concept is that wealth creation begins with properly allocating income and expenses to make money available for investment to increase returns. There must also be protections against wealth that may occur due to unexpected events. The study's findings revealed that the game's nature should include various gameplay options. Each option must be balanced for students to evaluate its worth. The game's mechanics and elements must demonstrate the relationship between the financial concepts’ elements. According to a study with students, the games engaged students to focus on the game, which resulted in the seriousness of evaluating various options within the game. It is one indicator of the game's integrity. In addition, the authors chose experienced board game players to be informants because we would like information to

improve the game in terms of game mechanics and its content. Hereafter, more extensive testing will be needed in other contexts, such as students with no prior experience playing board games and students from low-income families. The lean process is then used to cut unnecessary elements to make the game more concise and accessible. The necessary manuals, lesson plans, materials, and equipment will be supplied to assist teachers to implement board games in the classroom.

6. Limitation

However, there are some limitations in collecting data from testing during the development of this game. The authors created the game during the pandemic. Therefore, the authors had to put the game through its paces with an expert in an online setting, and the data collecting could only save data in audio format. If it could be a face-to-face interview, the author would be able to gather more information from the players' facial expressions and gestures—a more detailed analysis of data about emotions and feelings.

References

Aprea, C. and Wuttke, E. (2016) Financial literacy of adolescents and young adults: Setting the course for a competence-oriented assessment instrument, International handbook of financial literacy (pp. 397–414). Springer.

Aprea, C. and Schultheis, J. (2019). Entwicklung und Validierung eines Schmas zur Evaluation von Serious Games im Kontext von Financial Literacy, Jahrbuch der berufs- und wirtschaftspädagogischen Forschung 2019 (pp. 91–108). Opladen.

Bank of Thailand (2020) 2020 Financial Literacy Survey Report, [online], Bank of Thailand, https://www.bot.or.th/Thai/PressandSpeeches/Press/2021/Pages/n7764.aspx.

Brennan R, Vos L. (2013) Effects of Participation in a Simulation Game on Marketing Students' Numeracy and Financial Skills, Journal of Marketing Education, 2013;35(3):259-270.

Buckley, P., Doyle, E. and Doyle, S. (2016) Game on! Students' Perceptions of gamified learning, Educational Technology and Society, 20(3), 1–10.

Cheng P-H, Yeh T-K, Chao Y-K, Lin J, Chang C-Y. (2020) Design Ideas for an Issue-Situation-Based Board Game Involving Multirole Scenarios, Sustainability, 12(5):2139.

CEE. (2011) National Standards for Financial Literacy, New York: The Council for Economic Education.

Cziksentmihalyi, M. (1990) Flow: The psychology of optimal experience, Harper and Row.

Ebner, H. G. (2005) Instruktionstheoretische Grundlagen der Gestaltung wirtschaftsberuflicher Lernumgebungen, Manuskript zur Vorlesung an der Universität Mannheim.

Eseryel, D., Law, V., Ifenthaler, D., Ge, X. and Miller, R. (2014) An investigation of the interrelationships between motivation, engagement, and complex problem solving in game-based learning, Journal of Educational and Society, 17(1), 42–53.

Fürstenau, B. and Hommel, M. (2019) Developing financial competence about mortgage loans by informal learning using banks' online calculators, Empirical Research in Vocational Education and Training.

Gee, J. P. (2003). What video games have to teach us about learning and literacy, Computers in Entertainment, 1(1), 20–20.

Gee, J. P. (2008) Learning and games, The ecology of games: Connecting youth, games, and learning, Cambridge, MA: The MIT Press.

Granic, I., Lobel, A. and Engels, R. C. (2014) The benefits of playing video game, American Psychologist, 69(1), 66–78.

Hamari, J. K. (2014) Does Gamification Work? —A Literature Review of Empirical Studies on Gamification, Proceedings of the 47th Hawaii International Conference on System Sciences.

Hill, A. T., Meszaros, B. T. and Tyson, B. (2012) Evidence of student achievement in a high school personal finance course, University of Delaware, Department of Economics, Alfred Lerner College of Business and Economics.

Huston, S. J. (2010) Measuring financial literacy, The Journal of Consumer Affairs, 44(2), 296-316.

Jump$tart Coalition. (2007) National standards in K-12 personal finance administration with benchmarks, knowledge statements, and glossary (3rd ed.), Washington, DC: Jump$tart Coalition.

Kiili, K. (2007) Foundation for problem-based gaming, British Journal of Educational Technology, 38(3), 394–404.

Kim, B. (2012) Harnessing the power of game dynamics - why how to, and how not to gamify the library experience, College and Research Libraries News, 73(8), 465–469.

OECD (2012) OECD INFE Guidelines on Financial Education in Schools, [online], OECD, http://www.oecd.org/daf/fin/financial-education/2012%20Schools%20Guidelines.pdf.

OECD (2020) PISA 2018 Results (Volume IV): Are Students Smart about Money?, PISA, OECD Publishing, Paris.

Kalmi, P. and Rahko, J. (2022) The effects of game-based financial education: New survey evidence from lower-secondary school students in Finland, The Journal of Economic Education, 53(2), 109-125.

Perotta, C. (2013) Game-based learning: Latest evidence and future directions, In NFER Research Programme: Innovation in Education. NFER.

Pfändler, A. (2021) Development and Pilot Testing of a Financial Literacy Game for Young Adults: The Happy Life Game.

Remund, D. L. (2010) Financial literacy explicated: The case for a clearer definition in an increasingly complex economy, Journal of consumer affairs, 44(2), 276-295.

Schell, J. (2008) The Art of Game Design: A book of lenses (1st ed.), CRC Press.

Shute, V. and Ke, F. (2012) Games, learning, and assessment. Assessment in Game-Based Learning, 43–58.

Stadsklev, R. (1974) Handbook of Simulation Gaming in Social Education, Part 1: Textbook. University: Institute of Higher Education Research and Services, University of Alabama.

Wilson, A., Hainey, T. and Connolly, T. (2013) Using scratch with primary school children: An evaluation of games constructed to gauge understanding of programming concepts, International Journal of Game-Based Learning, 3(1), 93–109.

Wouters, P., van Nimwegen, C., van Oostendorp, H. and van der Spek, E. D. (2013) A meta-analysis of the cognitive and motivational effects, Journal of Educational Psychology, 1–17.