Can Gamification in Financial Games Improve Financial Literacy?

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Abstract. Financial games are one method that can be used to improve the financial literacy level. This research was conducted to find out how financial games affect people's financial literacy. The purpose of this research is to identify a method that can use financial games to improve financial literacy. A group of high school students were recruited to participate in this study by playing the Robert T. Kiyosaki financial game Cashflow 101 Board Game. To measure the degree of financial literacy, Lusardi (2008) created a simple scale to quantify the skill. The final scores before and after playing the game are then compared to see whether there is a difference in the financial literacy level. Based on these results, playing financial games can improve individual's degree of financial literacy. The classic character of the game, player interaction, communication, learning while playing, the ability to know finance or investing, respecting money, and an understanding of investment goals were a few aspects that piqued their interest in the game.

Keywords: gamification, financial literacy, financial games, board games

Introduction

Low financial literacy is one of the problems in Indonesian society (Xu & Zia, 2012). If not managed properly, this problem can lead to bigger problems in the future because financial literacy has a positive impact on levels of inclusion and financial behavior (Hidajat, 2015).

Financially literate individuals are more likely to plan retirement programs (BOISCLAIR et al., 2017), have capital market accounts (Spataro & Corsini, 2013), and trade derivative products (Hsiao & Tsai, 2018). Conversely, illiterate people have little savings (Jappelli & Padula, 2013), are more likely to borrow money at high interest rates (French & McKillop, 2016), and are even more likely to fall into illegal investment schemes (Hidajat, 2016).

Improvements in financial inclusion and education have received a lot of attention. Financial literacy is becoming a national program in various nations (Hidajat, 2015). Jones & Chang (2011) claim that using games to teach finance is one alternative. Some businesses utilize games to teach people about money. For instance, VISA collaborates with the NFL and FIFA to create instructional games like Financial Football and Financial Soccer. Additionally, Visa and Marvel Comics collaborated to create a Saving the Day comic.

Other online games that teach financial literacy include *Fruit Shoot Coins, Peter Pigs Money Counter, HIP Pocket Change, Wise Pockets, Chair The Fed Game, Stock Market Game, Zoo Tycoon, Get Rich, Hay Day* and *The Sims*. For board games, these include *Game of Life, Cashflow 101, Charge Large, Monopoly, Stocklab,* and *Payday*. This indicates that the financial world has developed its image through the metaphor of games (Hutton, 2014).

Board games are better student learning tools (Taspinar et al., 2016). Games make financial education more fun. Teaching children and adolescents about finance is a big challenge because most have no money experience (Liu et al., 2011). Several studies have shown that games can affect financial literacy (Harter & Harter, 2010; Hinojosa et al., 2010; Maynard et al., 2012).

However, to our knowledge, there are still few studies discussing the gamification of financial games for financial education in Indonesia. Based on this, the question to be examined in this research is how to raise the level of financial literacy through financial games.

The main goal of this research is to improve financial literacy, especially for Generation Z. Generation Z was chosen because they grew up in today's digital environment. They also

live in environments that demand existence, so they need a lot of money to "exist." According to Ameritrade's findings, Generation Z has a millennial lifestyle that tends to be extravagant. They spend an average of $838 per month on unnecessary spending (Hasibuan, 2019).

This research is essential. This is due to Indonesians' still-low level of financial literacy, notwithstanding recent improvements. Additionally, there are a huge amount of Indonesian players. More than 52 million people in Indonesia use mobile devices for gaming. Esports are expanding quickly in Indonesia as well. Because there are more players, Indonesians are more interested in financial games.

This study is unique in that it offers a technique for enhancing financial literacy through Gen Z financial games. The impact of gamification on financial literacy and factors that can improve the requirements for features or attributes in financial games are the expected outcomes.

Literature Review

Gamification

Gamification is a term that describes how game design ideas are applied in contexts other than games (Deterding et al., 2011). Gamification is a technique for integrating game features into non-game activities to increase engagement.

By influencing motivation, skills, and behavioral triggers, gamification can influence human behavior (Hamari et al., 2014). This happens because playing games, which often offer prizes, rewards, or other types of payment, makes the brain feel satisfied. Gamification can be employed as a marketing and business approach to boost customer loyalty and retention (Dubois & Tamburrelli, 2013).

It was Burawoy (1985) who first proposed playing games at work. The employees' desire to put in hard work for the organization amazes Burawoy. He discovers that the "game" of work is to blame for what transpired. The employees strive to correctly carry out the "mission" of the organization. The business issues and completes new assignments as they are finished, doing it all over again.

In a study of Lyft and Uber drivers, Mason (2018) found that organizations use technology-enhanced gaming when the driver's motivation to drive is high. When the evaluation is low, the driver pushes harder to move forward.

An application for investing portfolios that uses gamification is FuteBank (Rodrigues et al., 2013). Player placements on the field are determined by the level of risk associated with each mutual fund and by important connections between football teams and portfolio mutual funds. This program tries to improve mutual fund selection and purchase in an intriguing way.

The blood donation app Reblood is a prime example of a social application service that has been gamified in Indonesia. Regular blood donations are possible for donors thanks to this application. Donors are awarded points that can be exchanged for gift cards to stores. Garbage collecting apps like Rapel and Bank Sampah are another program that have become very successful. These applications have points and rewards as game elements that delight users.

Even though attention in gamification research is growing, there is still little research on how games improve learning, judgment, and financial security (Julia & Aurora, 2019). Indeed, a variety of studies have demonstrated that gamified activities, notably in the financial industry, can be enjoyable (Rodrigues et al., 2016).

The majority of online financial services, like mobile banking and internet banking, were just intended to be transactional in nature and were not intended to be enjoyable or engaging. If some elements make users pleased, such as when they see others using these services to play games, customers will favor banking software (Baptista & Oliveira, 2017).

Financial Literacy

Despite being a relatively new idea in finance, financial literacy has a long history. On August 23, 1787, John Adams wrote to Thomas Jefferson to emphasize the importance of financial literacy. Financial literacy has many various definitions throughout history, ranging from financial awareness and knowledge to financial skills and competence, but in practice, these concepts usually overlap (Xu & Zia, 2012).

Hung et al. (2009) observed several studies on financial literacy. They found that the definition of financial literacy consists of (a) a particular form of knowledge, (b) the ability or ability to apply that knowledge, (c) perceived knowledge, (d) good financial behavior, and (e) financial experience". In addition, Huston (2010) also shows that several financial literacy studies define financial literacy as knowledge, ability and a combination of knowledge-ability.

Only eight studies define financial literacy, according to Huston's (2010) analysis of 72 literacy studies from 52 research groups using four assessments: structure, content, structure, and evaluation. The definition of financial literacy is not standardized among the eight research that provide it because two studies place more emphasis on abilities, three on knowledge, two on knowledge and skills with additional conditions, and one on abilities and knowledge. In fact, the majority of research even use the terms "literacy" and "knowledge" interchangeably.

Financial Literacy and Financial Behavior

Financial literacy levels influence financial behavior. One of which is selection or ownership of financial instruments. This is easy to understand as a literate person can easily use their knowledge to achieve their financial goals by choosing the right instrument.

Research by Cole et al. (2009) in India and Indonesia revealed a link between financial behavior and financial literacy. Financial literacy can be a predictor of demand for financial services, with low financial literacy acting as a deterrent to utilizing financial services and vice versa, according to Cole et al. (2009). This assertion is in line with Guiso & Jappelli's (2008) finding that lack of financial literacy can make portfolio diversification fragile.

To better understand the connection between financial literacy and elements of financial decision-making, a number of studies on financial literacy have been carried out. For instance, Nye & Hillyard (2013) examined individual financial behavior using four factors that affect financial (financial) behavior: financial mathematical literacy, subjective computing, materialism, and impulse consumption. The results indicate that financial behavior is positively influenced by subjective numeracy and financial quantitative literacy, while impulsive consumption, which acts as a moderator between materialism and financial behavior, has a negative impact on behavior. Other studies have examined the impact of financial literacy on choices related to savings (Beckmann, 2013), retirement planning (Bucher-Koenen & Lusardi, 2011), insurance (Mahdzan & Victorian, 2013), and stock markets investment (Tullio Japalelli & Mario Padula, 2013), among many other financial decisions.

Research Method

Respondents in this study were a group of high school students who were given the task of playing the Robert T. Kiyosaki financial game *Cashflow 101 Board Game.* This game was chosen because it was created so that players can understand the basic functions of investing, the difference between assets and debt, and the basic financial statements of personal financial accounting. One board game can be played by 6 (six) people.

To measure the level of financial literacy, a basic level of financial literacy measurement is used Lusardi (2008) which includes knowledge about interest rates, the effects of inflation and the concept of risk diversification, namely:

i. *If you have IDR 1,000,000 in a savings account with an interest rate of 5% per year. After 5 years, how much did you get for the savings : a. more than IDR 1,050,000; b. IDR 1,000,000; c. less than IDR 1,050,000?*
ii. *If the interest rate on your savings account is 1% per year and the inflation rate is 2% per year. After 1 year, your purchasing power is : a. More than the previous year b. Same as the previous year ; c. Less than the previous year.*
iii. *True or false: "Buying stock in a single company usually provides a better return than buying stock in mutual funds."*

The percentage of right responses to these questions reveals how financially literate a person is. The respondent's financial literacy will be shown by a greater (lower) score. For the three questions, the scores for financial knowledge range from 0 (poor) to 3 (high). Twelve groups of Generation Z high school students took part in the competition. We will compare the final financial literacy ratings before and after the game to confirm the difference in financial literacy levels between the two times. To verify the difference in financial literacy levels before and after the game, we will compare the final financial literacy scores before and after the game.

This study aims to investigate how financial games affect financial literacy and to create new techniques that may be applied to improve financial literacy through gamification. Phase 1 used the paired-samples t-test to compare financial literacy grades or scores obtained before and after participating in a financial game. Whether or not two paired samples have significantly different means, this is an exact test for them. The factors that affect a player's decision to play a financial game are investigated in Phase 2 using factor analysis. One method for combining data from several variables (data summarization) and breaking them down into smaller groups or factors is factor analysis (data reduction).

Discussion

Effect of Financial Games on Financial Literacy

The Paired-Samples t-Test is used to examine the degree of financial literacy between before and after playing financial games. To determine if two paired samples have significant other means or not, a paired-sample t-test is utilized.

The result of statistical experiments taken on twelve people showed that playing financial games improved participants' financial literacy scores. After playing, the overall literacy score increased from 1.1 to 2.3.

Table 1. Pre and Post Test

Responden	Pre	Post
1	2	3
2	0	2
3	2	2
4	1	3
5	2	3
6	0	1
7	1	3
8	1	2
9	0	1
10	2	2
11	2	3
12	1	3

The test results show that there is a correlation between the two variables 0.6. This indicates that the correlation between the two average transactions before and after training is

quite strong. The calculated t value is -5.6 with a significance below 0.05 which can be concluded that Ho is rejected or the average financial literacy score before and after playing the financial game is significantly different.

Table 2. Paired Two Sample for Means

t-Test: Paired Two Sample for Means

	Pre	*Post*
Mean	1,16666667	2,33333333
Variance	0,6969697	0,60606061
Observations	12	12
Pearson Correlation	0,60612813	
Hypothesized Mean Difference	0	
df	11	
t Stat	-5,6307977	
P(T<=t) one-tail	7,6562E-05	
t Critical one-tail	1,79588482	
P(T<=t) two-tail	0,00015312	
t Critical two-tail	2,20098516	

According to these findings, playing financial games can improve financial literacy. Games combined with formal and informal instruction can improve the level of financial literacy. The findings of this study support Harter & Harter's (2010) finding that playing stock market games improves students' financial literacy levels.

Since financial literacy is still not covered in Indonesia's basic curriculums, there is a chance to start teaching from an early age. Older kids also received less formal financial education. Some studies claim that kids learn more about money than their parents do. According to a PISA assessment conducted in 2015, one in five American teenagers aged 15 lacked fundamental financial literacy and understanding of the key ideas underlying sound financial judgment. Many students do not learn about financial and money management in school, which is the cause of this gap. Their parents teach them. Many American students learn about money management through learning and watching from their parents (Norton, Kara, 2022).

Teaching financial literacy early is also a challenge because children and youth have no experience with money (Liu et al., 2011) and generally like games. Through games, teaching finance becomes more fun. They will get hands-on experience that is carried out in a fun way through games.

Factors Influencing Player Choices

From interviews with game player respondents, information was obtained about several things that made them interested in *Cashflow 101 Board Game*, namely 1) classic, 2) interaction between players, 3) communication between players, 4) learning while playing, 5) being able to understand finance or investing 6) respecting money and 7) understand investment priorities. A total of 7 statements of reasons that interested respondents in this financial game were then made with ratings ranging from strongly disagree (1) to agree (5) strongly. Based on the list, questions were asked to 91 other board game players online via the Google form.

Bartlett's Sphericity test was conducted to test the null hypothesis that these variables are not correlated in the population. If this hypothesis cannot be rejected, then the suitability of

factor analysis must be questioned. In this case, an MSA value of 0.660 (> 0.5) is obtained, which means that this variable can be predicted without error by other variables and thus can be used in subsequent analysis. The SPSS output also produces Bartlett's Test of Sphericity with an estimated chi-square of 116,296 with a significance of 0.000 (smaller than 0.05). Thus, the null hypothesis is rejected.

Table 3. KMO and Bartlett's Test

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.660
Bartlett's Test of Sphericity	Approx. Chi-Square	116.296
	df	21
	Sig.	.000

Communalities

	Initial	Extraction
s1	1.000	.881
s2	1.000	.725
s3	1.000	.683
s4	1.000	.346
s5	1.000	.744
s6	1.000	.709
s7	1.000	.628

Extraction Method: Principal Component Analysis.

Table 4. Total Variance Explained

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.515	35.923	35.923	2.515	35.923	35.923	2.000	28.567	28.567
2	1.163	16.612	52.535	1.163	16.612	52.535	1.515	21.639	50.206
3	1.039	14.837	67.372	1.039	14.837	67.372	1.202	17.166	67.372
4	.877	12.526	79.898						
5	.572	8.172	88.070						
6	.505	7.216	95.286						
7	.330	4.714	100.000						

Extraction Method: Principal Component Analysis.

Total Variance Explained contains the number of factors extracted, eigenvalues, the percentage of the total variance for each factor, and the cumulative percentage of the total variance. If the seven variables analyzed are summarized into 1 factor, then the variance is 35.923%. If the seven variables analyzed are summarized into two factors, the variance of the first factor is 35.923%. And the variance of the second is 16.612% (the two factors explain 52.535% of the variability of the seven variables), and so on. Using the Eigenvalue criteria equal to or greater than 1, only three factors are included. The variance of the three factors explains 67.375% of the variability of all variables.

Table 5. Component Matrix

Component Matrix[a]

	Component		
	1	2	3
s6	.786		
s7	.742		
s5	.741		
s3	.574	-.551	
s4	.474		
s1		.836	.395
s2	.465		.709

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Table 6. Rotatex Component Matrix

Rotated Component Matrix[a]

	Component		
	1	2	3
s5	.852		
s6	.807		
s4	.584		
s2		.848	
s7	.505	.610	
s3		.599	-.547
s1			.934

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 4 iterations.

Table 7. Component Transformation Matrix

Component Transformation Matrix

Component	1	2	3
1	.801	.566	-.197
2	.347	-.170	.922
3	-.488	.807	.333

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

The rotated Component Matrix contains a matrix of the seven factors after rotation (Varimax). Factor 1 consists of variables 5) understanding finance or investing, 6) respecting money, and 4) learning while playing. This first factor can be grouped or named the "learning finance or investing while playing" factor. Factor 2 consists of variables 2) interaction between players, 7) understanding investment priorities, and 3) communication between players. This second factor can be grouped as the "interaction and communication between players" factor. Factor 3 consists of variables 3) communication between players and 1) classics. This third factor can be grouped or named the "classic communicative game" factor.

These results indicate that an attractively designed game will attract people's interest in playing, even though the game is a serious one. According to Noemí & Máximo (2014), some

'serious' games, namely educational games that aim to provide entertainment and training, can affect the learning process.

To make it more interesting, serious games can be gamified. Gamification makes players feel at home while playing. Gamification makes activities fun, although it can also be done to exploit a job, as with ride-hailing drivers (Hidajat et al., 2021).

The study by Bitrián et al. (2021), which combines self-determination theory (SDT) and the technology acceptance model (TAM), shows that gamifying personal finance applications can meet users' needs for competence and autonomy and increase their motivation to use them. Through financial games, financial knowledge can be taught in a fun way. Knowing how to manage finances early will help anyone avoid getting into debt and manage cash flow effectively.

Conclusion

Based on the test results, playing financial games can improve financial literacy. Fun and interactive games, official and informal education, and financial literacy may all be improved. Fun games are "traditional games with player interaction and communication that can teach finance or investment."

It takes a lot of work to improve people's awareness and comprehension of how money is used. People who are financially literate will not only be able to recognize the worth of money, but they will also be able to change their consumption habits and adopt wise financial practices like saving and investing.

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