ATLANTIS PRESS

Advances in Social Science, Education and Humanities Research, volume 377

1st International Conference on Applied Economics and Social Science 2019 (ICAESS 2019)

Improving Knowledge of Stock Market in Batam through Gamified Mobile App

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***Abstract*—The awareness of young people of investment in the stock market is still low. Lack of knowledge in investment stock market is one example of financial illiteracy. Furthermore, the development of financial application with a game element has given a new trend in the investment sector. Thus, we proposed a gamified application as a learning media to improve the knowledge about stock market investment among young people. A nonequivalent comparison, pretest-posttest group design was used in this study to test the impacts of using gamification to improve the knowledge about stock market investment. Our findings contribute overall to a better understanding of stock market investment among young people.**

Keywords—financial illiteracy, gamification, investment, stock market

I. INTRODUCTION

As one of the developing countries, the awareness of youth Indonesians of investment in the stock market is still low. Whereas investment is the critical element in the economic growth of a country. People still have the perception that stocks are something that is haram (unlawful), complicated, seems expensive and high risk. A study conducted by [1] showed that the level of financial literacy and inclusion of the Indonesian people in the capital market was still very low, even when it compared to pawnshops, insurance, and banking.

Since millennials grow up surrounded by technology, the effort of financial literacy confront a challenge to find a way for engaging and interacting with this generation. Research on Children's preferences reveals that millennials opt for technology, games, and rewards to ordinary lectures. Some financial institutions have started seeing gamification as the future of financial literacy as it can help the financial institution to transform traditional tedious movement into more interesting, pleasing and sightly ones. Gamification was defined as a method of using game elements in non-gaming environment to improve user experience and user engagement.

Most gamification systems revolve around adding points, levels, achievements, or badges to a real-world setting in order to attract people to engage with the real world to achieve these rewards. Applying a reward-based gamification system is relatively simple. A designer choose the behaviors to be rewarded and establishes points. These points can then be converted into levels and may also be used in a leaderboard to encourage competition between subjects. This concept of adding badges, levels, achievements, and points to a real-world setting is defined as reward-based gamification. Reward-based gamification increases the engagement of the user to the system and finally fulfill the system's goal [2].

This study aims to enhance the knowledge of Indonesian youth of stock market through gamified technique. The gamification technique implemented in this study was delivered through a mobile application.

II. LITERATURE REVIEW

A number of prior studies offering gamification as a technique to improve the knowledge of user have recently been conducted. In [3], gamification was used to improve the ranking of knowledge workers in the banking industry. A gamified system was designed to transform the way in which the process of assessment was developed. It provides access to information resources for employees to demonstrate their learning.

Previously, [9] used structural equation modeling (SEM) to examine the contribution of gamification to increase the knowledge of employees in their workplace. It indicated that rewardability, competition, and visibility of achievement influenced the knowledge contribution. Correspondingly, the findings of the study conducted by [4],[5],[6] strengthened it by providing indications about the potential improvements in learning more knowledge through gamification. [4] used splitting and combination as a gamification method to stimulate students to complete the action of learning structured knowledge. Moreover, [5] indicate that gamification approach was useful for knowledge base construction. The results provide applicable data to improve the knowledge.

III. METHODS

A nonequivalent comparison, pretest-posttest group design was used in this study. Quasi-experimental designs are characterized by two or more existing groups. The experimental group received a treatment (using gamified mobile application) while the comparison group receives an

alternative intervention (using video). This study was conducted at Batam.

A. Instruments and Participants

This study was conducted at Batam, Riau Islands. Batam was selected as the location of the study because it was included as Special Economic Zones (SEZ). SEZ is considered as one of the positive steps to regain Indonesia economic growth. Batam has a long history of being a manufacturing base and part of a growth triangle involving Singapore, Indonesia, and Malaysia [7].

The participants of this study are a non-economic college student of a public vocational institution in Batam. Two groups were considered in this study. Group A (experimental group) consists of 26 students and group B (comparison group) consists of 24 students. Furthermore, the instrument which is used in this study was an online test assessment. Testing is a model of instrument that is used for measuring the study result (cognitive domain). Each of the questions in the test was differentiated as pretest questions and posttest questions due to the prior knowledge of the participants (participants have no prior knowledge about the stock market). Online test was a multiple-choice form that consists of 25 questions.

In order to ensure the quality of each question, an analysis of item difficulty and discriminator were conducted. It aims to identify a good item of the question, a medium item, and a bad one. This study used a quantitative approach and paired sample T-test for the analysis. Saphiro-Wilk normality testing was conducted to identify the distribution of data. While the normality test was calculated using SPSS 16.0 for Windows.

B. Hypothesis

Overall, the gamification approach offers both social and online interaction. It means that information systems are being developed to change users' perception, knowledge, and behavior. Therefore, we explore the hypothesis that there is a significant effect of using the gamified application while learning about stock market investment on the knowledge of young people in Batam.

IV. RESULTS AND ANALYSIS

The testing of question item quality was conducted by difficulty and discriminatory criteria. The results were as follows:

1) Difficulty level of pretest questions consists of: easy item, 24% (6 items); medium item, 52% (13 items); and difficult item, 24% (6 items). It illustrated that the difficulty level was fairly good due to the balance of its difficulty. Meanwhile, discrimination testing generated good discriminator criteria as follows: medium level, 16 items; good level, 9 items.

2) Difficulty level of posttest questions consists of: easy item, 28% (7 items); medium item, 48% (12 items); and difficult item, 24% (6 items). The results represented that the quality of the test was good as it has a balanced difficulty level. Whereas the discriminator testing resulted in good discriminator criteria as follows: medium level, 13 items; good level, 12 items.

The results of normality testing using SPSS 16.0 for Windows were depicted in Table 1.

TABLE I. THE RESULTS OF NORMALITY TESTING OF CONTROL AND EXPERIMENT CLASS

	Test of Normality					
	Kolgomorov-Smirnov[a]			*Saphiro-Wilk*		
	Statistic	*df*	*Sig.*	*Statistic*	*df*	*Sig.*
Control	0.120	24	0.20*	0.961	24	0.450
Experiment	0.146	24	0.20*	0.954	24	0.322

[a] Lilliefors Significance Correction
* a lower bound of the true significance

Table 1 shows the results of the test of normality using Shapiro-Wilk. It indicates the significance value of control and experiment class, namely 0,450 and 0,322 which is less than 0,05 (significance value) that means the data from both control and experiment class were distributed normally. Furthermore, hypotheses testing was managed using paired sample T-test. The results are illustrated in Table 2.

TABLE II. THE RESULTS OF HYPOTHESES TESTING OF CONTROL AND EXPERIMENT CLASS

Paired Samples Test									
Paired Differences									
Pair 1	Control - Experiment	Mean	Std. Dev.	Std. Error Mean	95% Conf. Interval of the Difference		t	df*	Sig. (2-tailed)
					Lower	Upper			
		-4.917	4.763	0.972	-6.928	-2.905	-5.059	23	.000

*df=degree of freedom

Table 2 shows the value of t was 5.059 while the T_{table} was 2.069 (significance value=0.05 and the value of df=23). It indicates that t value was greater than T_{table}, 5,059 > 2.069. It concludes that the hypothesis was approved. Overall, it can be summarized that the difference between the online test results of people who learn about stock market investment via the gamified application and people who do not use it as a learning media are significant. These findings were strengthened by the average value of experiment class study results as showed in Table 3.

TABLE III. THE AVERAGE OF ONLINE TEST RESULTS OF CONTROL AND EXPERIMENT CLASS

	Class Type	Mean	N	Std. Dev.	Std. Error Mean
Pair 1	Control	60.83	24	3.567	0.729
	Experiment	64.92	24	3.009	0.615

The results of this study were supported by [8]. It shows that having experience with a money-savings/financial mobile

app impacts individuals subjective financial knowledge. Data revealed a marginally significant difference in that individual with (vs without) financial app experience had lower objective knowledge.

V. CONCLUSION

Investment knowledge is important to an individual, especially young people. This study provides an initial investigation into how gamified application influences the knowledge improvement of young people on stock market investments. This study also has some limitations that could give an opportunity for future research. Even though the gamification study literature is vast, future work is still needed to understand how it contributes to individual and organizational decision making on financial aspects. Thus, we argue for the importance of developing the gamification as the prominent factor to increase financial literacy.

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