using educational game

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Using Educational Game for Improving Students' Knowledge and Interest in Investing in the Capital Market

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Abstract: This study examines the impact of using a card simulation game named STOCKLAB to improve students' knowledge and interest in investing in the capital market. Additionally, this study examines the effects of adding explanation—where an instructor explains the educational contents of the game to the players—during the game. A total of 172 undergraduate students from three private universities in Indonesia participated in this study and a randomized control trial with a three-group pretest/posttest research design was used. The results showed that STOCKLAB with explanation is more effective than STOCKLAB without explanation in assisting students in acquiring knowledge about capital market, but it is as effective as traditional approach. The three approaches are equally effective for improving students' interest in investing in the capital market. However, both STOCKLAB with and without explanation group reported a significantly higher level of agreement that the game is an interesting way to study capital market compared to the traditional group. This study implies that STOCKLAB can be used as an alternative approach to introduce capital market to the students if it is coupled with explanation.

1 INTRODUCTION

Knowledge of financial literacy has an important role in improving an individual's well-being. However, the latest national survey shows that the Indonesian people's financial literacy index is relatively low at 38.03% (Otoritas Jasa Keuangan, 2020). From various financial sectors, public understanding of the capital market is one of the lowest, i.e. at an index of 4.9% in 2019. This index means that only 4-5 out of 100 Indonesians have knowledge, skills, and confidence about the capital market in 2019. To educate the capital market to the public, the government through the Financial Services Authority (OJK) has introduced a card simulation game called STOCKLAB since 2017. OJK in collaboration with the Indonesia Stock Exchange has even held various national student-level STOCKLAB competitions in many major cities in Indonesia. Although STOCKLAB has been widely recognized nationally, studies examining the effectiveness of this card simulation game in educating the capital market to college students are still very rare. This study aims to test the effectiveness of the STOCKLAB game to increase students' knowledge and interest in investing in stocks in the capital market.

Studies that test the effectiveness of simulation games in improving cognitive (Chen et al., 2014; Chuang & Chen, 2009; Keys et al., 2020; Morin et al., 2020; Soflano et al., 2015), psychomotor (Gopher et al., 1994; Whitehill & McDonald, 1993), and affective (Bai et al., 2012; Hwang et al., 2015; Knechel & Rand, 1994; Manero et al., 2015; Ruggiero, 2015; Tompson & Dass, 2000; Y.-T. C. Yang, 2012) abilities have been done extensively. In terms of affective learning, researchers have even tested how games can change attitudes (Ruggiero, 2015), increase self-efficacy (Tompson & Dass, 2000), motivation and interest of students (Bai et al., 2012; Hwang et al., 2015; Knechel & Rand, 1994; Manero et al., 2015; Y.-T. C. Yang, 2012). Studies that focus on increasing interest generally tests the

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effectiveness of simulation games in increasing learner interest in certain subjects. As an example, Knechel & Rand, (1994) compare basic accounting learning methods using traditional accounting exercises with the business simulation game Monopoly® in five Accounting Principles classes at a university in the United States. They found that students who studied accounting using Monopoly® showed a higher interest in completing accounting exercises compared to students who studied using traditional accounting exercises. Similar research results were obtained by Manero et al. (2015) who test the effectiveness of a simulation game in the field of theater arts. They found that students who studied using the simulation game method showed a higher interest in the world of theater than students who studied using traditional lecture methods (i.e., teacher-centered learning). They also found that the simulation game method was slightly less effective than the lecture method delivered by professional actors. These studies, however, do not focus on learning about the world of stock investing.

Very little studies have linked simulation games to stock investing learning. Albrecht (1995) used Monopoly® to teach students to make financial reports and company stock purchase decisions based on their financial performance. The survey conducted at the end of the lesson revealed that most students were satisfied in learning accounting and investment using Monopoly®. However, the survey conducted did not ask whether the students would be interested in getting to know the real world of stock investing or not. This study fills the literature gap by examining the effectiveness of a simulation game called STOCKLAB in increasing students' knowledge and interest in getting to know the world of stock investing.

This study also contributes to the simulation game-based learning literature by examining the effect of adding game explanations—the game instructor explains the educational content of the game—as long as the game progresses to players on the knowledge and interest of students investing in stocks in the capital market. The addition of explanations can help students understand the knowledge conveyed so as to increase the effectiveness of learning using simulation games (Garris et al., 2002). Although several studies have tested the effectiveness of simulation games with self-explanation (Adams & Clark, 2014; Hsu & Tsai, 2012; O'Neil et al., 2014), adaptive advice (Leutner, 1993), scaffolding (Barzilai & Blau, 2014), and supplemental materials (Miller & Hegelheimer, 2006) in increasing the student's understanding of the material, the effect of adding explanations by the instructor is still very rarely studied. Bagley & Shaffer (2015) in their study have used the assistance of an instructor to explain urban science material in a simulation game both virtual and face-to-face. Although the researchers found both approaches to be equally effective, this study has not proven that the use of instructors increases the effectiveness of learning because the control group (the group that does not use an instructor) is not used. Therefore, studies that specifically examine the impact of using instructors in game-based learning are still needed. Understanding the impact of adding explanations by the instructor is not only useful for STOCKLAB users to socialize the capital market, but also for users of simulation game-based learning to deliver learning materials effectively.

2 THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

2.1 Definition of Simulation Games

Simulation games have been interpreted in various ways, such as a combination of play and simulation with competition (Heyman, 1982). One definition of a fairly complete simulation game in an educational context is given by (Szczurek, 1982), who defines educational simulation games as: "an instructional method based on a simplified model or representation of a physical or social reality in which students compete for certain outcomes according to an established set of rules or constraints. The competition can be (1) among themselves as individuals or groups, or (2) against some specified standard, working as individuals or cooperating as a group" (p.27).

An educational simulation game is an interactive learning experience developed based on a model of the real world or imagination, which operates by a coherent set of rules. In games, participants or students compete with others to achieve certain goals, and experience joy when those goals are achieved (Van Eck & Dempsey, 2002). This definition of educational games is used in the context of this study.

2.2 Theoretical Framework for Simulation Games

Simulation games have several elements that make them capable of being a cognitive, psychomotor, and

affective learning tools. Malone's (Malone, 1981) Theory mentioned that challenge, fantasy, and curiosity are factors that make an educational game intrinsically motivating. Malone & Lepper (1987) develop this theory by adding elements of control, cooperation, competition, and recognition. Control and the three elements in the original model (challenge, fantasy, and curiosity) relate to individual motivation, while the other elements (cooperation, competition, and recognition) relate to interpersonal motivation. A systematic review conducted by Jabbar & Felicia (2015) regarding the impact of game features on learning performance concluded that there is not one element that specifically causes students to be motivated and interested in learning material in educational games. Thus, all elements in the game work together to influence the cognitive and motivation of students in order to acquire new knowledge, skills, and attitudes.

The STOCKLAB game used in this study has intrinsic motivating characteristics that are relevant to the individual and interpersonal motivators as stated by Malone. In terms of individual motivators, STOCKLAB gives players the control to determine the amount of money to be invested, the types of shares/mutual funds to buy or sell, and to decide when the shares/mutual funds they own will be sold. Players are challenged to get the largest net asset at the end of the game by means of decisions made. Players imagine themselves as stock investors who have to make investment decisions based on micro and macroeconomic conditions that occur during the game. These economic conditions, however, are highly dependent on the information provided by game cards or the actions taken by other investors (i.e., opposing players). Since economic conditions will affect the net worth of the players, any information from the cards and actions taken by other players will generally generate high curiosity. In terms of interpersonal motivators, STOCKLAB requires players to compete with other players to increase their net asset value, and at the end of the game, the owner with the largest net assets will be recognized as a winner or a reliable investor. The two intrinsic motivating elements of STOCKLAB—personal and interpersonal—are predicted to increase the effectiveness of conveying knowledge about stock investing to potential investors, which in turn increases their desire to know and even invest in real stocks.

2.3 Research Hypothesis

This study aims to determine whether the STOCKLAB card game can increase the knowledge and interest of the players towards the capital market in Indonesia. This study focuses on cognitive and affective learning (interest in stock investing), because there are two following main reasons: (1) Some of the share trading mechanism that occurs in games is the same as the share trading mechanism that occurs in practice. For example, in practice there are four sectors of shares traded on the Stock Exchange, i.e., consumer, agriculture, finance, and mining sectors. These four sectors can be found in the STOCKLAB game. Therefore, it is relevant to test the cognitive aspects (i.e., knowledge) of players, and (2) the main objective of the STOCKLAB game is to introduce the world of investment to potential investors. Through STOCKLAB, investors can familiarize themselves to the terms stocks, risks, and benefits of investing in stocks so that it is hoped that through this experience their interest in investing will increase. Thus, this game is said to be effective if it succeeds in increasing players' interest in getting to know the world of investment, especially the capital market.

Learning using simulation games is more effective than traditional learning because it can increase learner motivation. Malone's theory states that the individual and interpersonal intrinsic motivating features found in games make students more willing to invest their time, thoughts, and emotions in learning the knowledge being taught (Malone, 1981; Malone & Lepper, 1987). In addition, the pleasant learning climate created by simulation games helps students to more easily process the information provided. The theory of abstract-interactive cognitive complexity states that simulation games are more effective than traditional learning because they involve aspects of thought and emotion simultaneously (Tennyson & Jorczak, 2008). These advantages are predicted to be able to make STOCKLAB an effective method to open up students' insights about the world of stock investing, which in turn can increase their interest in getting to know the real stock investing. Studies show simulation games are effective in increasing knowledge (Cheng et al., 2014; Chuang & Chen, 2009; Soflano et al., 2015) and participants' interest in the material that has been studied (Knechel & Rand, 1994; Manero et al., 2015).

The literature, however, indicates that simulation games are not necessarily more effective at improving learning outcomes than traditional learning methods (Boyle et al., 2016; Perrotta et al., 2013). The

explanation of why simulation-based learning is not always effective in improving learning outcomes can be due to an intrinsic problem, i.e., that students generally have difficulty learning various complex relationships in simulations only from experience (De Jong & Van Joolingen, 1998). Studies show that game-based learning increases its effectiveness when there is instructional support (Wouters & Van Oostendorp, 2017). This study uses additional explanations by the instructor throughout the game as instructional support to increase the effectiveness of STOCKLAB learning. Adding explanations improves learning outcomes because it helps students connect experiences with the material STOCKLAB is trying to convey. For example, the instructor explains the benefits of a stock split when a player experiences a certain skyrocketing stock price increase. Bagley & Shaffer (2015) found that instructor explanations in a simulation game both virtual and face-to-face helped students learn urban science. However, their study has not compared simulation games with explanations to simulation games without explanations, so their effectiveness still needs to be tested. Therefore, this study uses three learning methods: STOCKLAB with explanations, STOCKLAB without explanation, and traditional presentations using power points to test the effectiveness of STOCKLAB with explanations in increasing students' knowledge and interest in investing in the capital market. Based on the theory and results of previous studies, the proposed hypotheses are as follows:

H1 *Students will have better knowledge of stock investing after playing STOCKLAB with Explanation compared to students who use the STOCKLAB without Explanation and Traditional approaches.*

H2 *Students will have a higher interest in stock investing after playing STOCKLAB with Explanation compared to students who use the STOCKLAB without Explanation and Traditional approaches.*

3 METHODS

3.1 STOCKLAB Educational Game

STOCKLAB is a commercially available card game created by Ryan Filbert and supported by the Financial Services Authority (OJK) made to support the capital market education program. The number of players are between three to six people including the banker who is in charge of managing the game and managing the bank's assets. The duration of the game lasts for ± 45 minutes for six rounds. In the game, players compete to develop assets through investing in stocks and mutual funds, and use various strategies optimally to become the most successful investors. The winner is the player with the most total assets (i.e.., money coins) at the end of the game.

Game materials consist of 1 mutual fund card, 4 stock sector cards, 4 price tokens, 5 street order cards, 5 cue cards, 5 debt cards, 10 split tokens, 36 economy cards, 58 cash coins, and 60 action cards. Each type of card has its own function. Mutual fund cards serve as an alternative investment for players other than stocks. The stock sector card aims to show four traded stock sectors, i.e., mining, agriculture, finance, and consumer. The road sequence card aims to determine which player will start first. The economic card functions to inform economic conditions (such as inflation and recession), which also determine stock price movements. Six economy cards are placed on each stock card. After all economy cards are opened, the game will end. Action cards are used by players to perform various actions such as buying shares, quick buys, acquisitions, trading fees, rumors, and stock exchange info. Quickbuy means each player can take 2 cards at once. Acquisition means that each player can acquire shares owned by other players on the condition that the share card ownership they own must be the same or more than the player whose shares will be acquired. Trading fee means that each player can immediately sell the card they have without having to wait for the sell phase. If it is saved, the player who takes this card must pay tax according to the number of card colors they have. Rumor means that each player can increase or decrease the value of the shares listed on the stock price board that contain the price token. Exchange info means that only players using this action can open 3 economy cards first before the action card is opened by the banker and may not be disclosed to other players.

Apart from cards, STOCKLAB also uses three types of coins, i.e., pricing coins, split coins, and cash coins. Pricing coins are used to show the price of a share. The initial share price will all be uniform, at the price of 5. The split coins will be used when the share price is too high so that it exceeds the value stated on the card. Stock split causes the number of shares owned to increase, but the value remains. Lastly, money coins serve as a measure of success in the game. The winner is the player with the highest number of coins at the end of the game.

STOCKLAB games are usually done in 6 rounds of ± 45 minutes. Each round consists of 4 stages. First is the Bidding Phase. At this stage, the player bids with closed hands, the banker will give an order to open the fist simultaneously to find out how many

Table 1: Participants' demographics.

Treatment	University			N	Gender		Median	Mean	SD
	S	M	W		M	F			
STOCKLAB with Explanation	20	18	20	58	23	35	20.00	20.00	1.24
STOCKLAB without Explanation	20	18	20	58	21	37	20.00	20.03	1.30
Traditional	22	17	17	56	20	36	20.00	20.09	1.56
Total	62	53	57	172	64	108			

coins each player is offering. The player with the highest coin bid will get a turn to take the first card followed by the second highest bidder, and so on. All coins used for bidding are submitted to the Bank. Second is the action phase. Each player takes a stock card according to the sequence number that has been determined during the bidding phase. The cards will be distributed with 2x players or each player has the opportunity to get a maximum of 2 stock cards. The action phase is carried out until the cards that have been dealt run out. Third is the selling phase. At this stage, all players have the opportunity to sell one sector of their shares without a maximum or minimum number of shares. Lastly, the economic phase. At this stage, the banker opens the economy card and executes card instructions which affect the stock price. Economy cards that have been used cannot be used again until the game ends. A description of how to play SOCKLAB can be found at https://www.youtube.com/watch?v=6-bpc6MCGJ 8.

3.2 Research Design

This study hypothesizes that students' knowledge and interest in the world of stock investing will increase after playing STOCKLAB with explanations. To test this hypothesis, the study used a randomized control trial with a three-group pretest/posttest research design. The three groups were 1) STOCKLAB with explanation, 2) STOCKLAB without explanation, and 3) Traditional (presentation using a power point) approach. Instructors and students who participated in this study were assigned to each group randomly.

3.3 Participants

One hundred and seventy-two students from three private universities that have the most active Indonesia Stock Exchange Investment Gallery (GIBEI) in West Java, Indonesia, participated in this research. Researchers contacted GIBEI managers at the three universities and asked for their help in recruiting students as research participants. Although students come from three different universities, all instructors are from M university. Table 1 provide information about the participants' university origins, gender, and age.

3.4 Instruments Assessment

This study used two instruments that were given before and after the treatment was given. The first instrument consists of 12 multiple choice question items which were developed by the research team to measure students' knowledge about stock investment in the Indonesian capital market. In order to increase the validity of the instrument, the question items were made in line with the objectives of the STOCKLAB game. Each correct response is assigned a point of 1, so the total points for all correct answers is 12. The Kuder-Richardson 20, person and item-reliability statistics for the knowledge test showed -.36 and .97 before and -.55 and .96 respectively after the intervention. The low person reliability value in the pre-test may be due to the low ability of the participants at the beginning of the experiment.

The second instrument consists of 10 survey items adapted from Nussbaum et al. (2015) to measure the student's interest in stock investing. The survey items used a 5-point Likert scale ranging from 1 (very uninterested) to 5 (very interested). Adaptation is needed because the original instrument asked students' interest in the context of climate change education, while this research is in the context of stock investment education. Nussbaum et al. (2015) found that the instrument had an internal consistency of .81 before and .86 after the intervention. This study found similar results, i.e., an internal consistency of .85 before and .86 after the intervention. In addition, a feedback survey consisting of 7 items with a 5-point Likert Scale that ranges from 1 (Strongly disagree) to 5 (Strongly Agree) was given after the intervention. This survey was also adapted from Nussbaum et al. (2015) who found the internal consistency value of .89, while the internal consistency value in this study was .82.

3.5 Procedure

Prior to the study, 11 instructors were trained to administer tests and treatments. Each instructor was

in charge of handling 5-6 students during the study. The researchers explained to the instructors that the research objective was to test the effectiveness of the three learning methods to educate the capital market. Instructors only described the methods assigned to them without explaining the other two methods. In order to familiarize the instructor with the method to be carried out, the instructors were asked to practice and were informed about the important features of the method. The test protocol was also described. In particular, they were informed that the type of test was closed books, that the study participants had to take the test individually, and that the instructor was not allowed to assist the participants during the test.

The study was conducted outside regular class hours and consisted of three main stages: pre-test, treatment, and post-test. In the first stage, students were asked to complete a pre-test questionnaire containing demographic questions and two instruments, each of which was used to measure students' knowledge and interest about stock investing in the capital market. Students were asked to work individually and were informed that the scores obtained during the study do not affect their course scores. This pre-test lasts twenty minutes.

The treatment stage lasts for one hour and forty minutes. Each researcher who was present acted as an observer and kept the interaction to a minimum with the instructors and the students in the three groups: STOCKLAB with explanation, STOCKLAB without explanation, and Traditional approach. STOCKLAB Group with explanation to learn to invest in the capital market using STOCKLAB accompanied by an explanation of the capital market material being experienced by the instructor. For example, the Instructor while distributing stock cards explains the sectors traded in the capital market. Likewise, when a player experiences a Stock Split, the instructor explains how this event causes the number of player shares to increase, but the overall share value does not change. In contrast, the STOCKLAB Group without explanation learns to invest in the capital market using STOCKLAB without obtaining an explanation regarding the capital market educational content contained in the game. Instructors in the STOCKLAB group with and without explanation act as bankers in charge of explaining the rules of the game and managing bank assets. In the Traditional approach group, students learn the capital market by listening to the instructor's presentation using power points. Students can also ask questions and discuss with the instructor if there is material that they did not understand.

The final stage of the research procedure was to conduct a post-test after the treatment stage had been completed. This test used the same instrument and duration as the pre-test. In addition, a survey aimed at obtaining information about their perceptions of the learning experience was conducted after the post-test ended.

4 RESULTS AND DISCUSSION

4.1 Learning Outcomes

Table 2 shows the mean, standard deviation, minimum, maximum, and results of the paired t-test for each experimental group. One-way ANOVA results showed that there was no significant difference at $p < .05$ level in knowledge: $F(2, 169) = 2.04$, $p = .13$ and interest pre-test scores: $F(2, 169) = .07$, $p = .94$ for all three groups. The ANOVA was performed after verifying that the assumptions of homogeneity of variance was satisfied (Pallant, 2016). Based on the results of the Levene's test of variance for knowledge $(2, 169) = 1.86$, $p = .16$ and interest pre-test scores $(2, 169) = 1.32$, $p = .27$, using ANOVA is appropriate. Furthermore, the paired t-test results showed a significant increase in knowledge and interest after treatment at STOCKLAB with Explanation (knowledge: $t = 4.30$, $p < 0.01$; interest: $t = 4.82$, $p < 0.01$), STOCKLAB without Explanation (knowledge: $t = 2.54$, $p < 0.05$; interest: $t = 6.30$, $p < 0.01$), and Traditional approach (knowledge: $t = 7.37$, $p < 0.01$; interest: $t = 4.54$, $p < 0.01$). This illustrates that these three methods can be effective. To test the research hypothesis that the STOCKLAB with Explanation learning method outperformed two other methods, One-way between-groups analysis of variance (One-way ANOVA) with Planned Contrast tests were performed. One-way ANOVA was performed after verifying that the assumptions of homogeneity of variance was satisfied (Pallant, 2016). Based on the results of the Levene's test of variance for knowledge $(2, 169) = .32$, $p = .73$ and interest post-test scores $(2, 169) = 2.71$, $p = .07$, using ANOVA is appropriate.

Table 2: Pre-test and post-test knowledge and interest scores for the STOCKLAB with Explanation group versus two comparison groups.

Group		Interest		Knowledge	
		Pre-test	Post-test	Pre-test	Post-test
STOCKLAB with Explanation (n = 58)	Mean	4.02	4.27	6.84	7.86
	SD	0.53	0.48	2.10	2.20
	Min.	2.10	3.10	3.00	2.00
	Max.	5.00	5.00	11.00	12.00
	*t value**	4.82***		4.30***	
STOCKLAB without Explanation (n = 58)	Mean	4.06	4.33	6.33	6.86
	SD	0.43	0.41	2.08	2.36
	Min.	2.40	3.40	2.00	2.00
	Max.	5.00	5.00	11.00	12.00
	*t value**	6.30***		2.54**	
Traditional Approach (n = 56)	Mean	4.04	4.30	6.11	8.09
	SD	0.40	0.36	1.83	2.25
	Min.	3.30	3.50	2.00	2.00
	Max.	5.00	5.00	10.00	12.00
	*t value**	4.54***		7.37***	

Note: **post – pre*; ***p* < 0.05; ****p* < 0.01

4.2 The Impact of the STOCKLAB Game on Students' Knowledge

H1 predicts that students will have better knowledge of the world of stock investing after playing STOCKLAB with Explanation compared to students who use the STOCKLAB without Explanation and Traditional approach. H1 was partially supported. Panel A of Table 3 shows a significant main effect in the knowledge post-test scores among the three groups, F (2, 169) = 4.74, p = .01. As shown in Table 4, planned contrasts revealed that the students' knowledge post-test scores of the STOCKLAB with Explanation were significantly different from the STOCKLAB without Explanation, t (169) = 2.37, p = .02. Meanwhile, no significant difference was found between STOCKLAB with Explanation and Traditional groups, t (169) = -.53, p = .59. These statistical results are supported by the effect size analysis comparing the knowledge post-test scores of the STOCKLAB with Explanation and controls groups. The effect size analysis shows a medium to large effect for the STOCKLAB with Explanation compared with STOCKLAB without Explanation, while it shows a negligible effect for the STOCKLAB with Explanation compared with Traditional. These results suggest that students in the STOCKLAB with Explanation group exhibited a greater level of improvement in knowledge about stock investment than those in the STOCKLAB without Explanation group, but the STOCKLAB with Explanation group's improvement is as high as the Traditional group.

Table 3: Effects of treatment groups on students' knowledge and interest post-test scores (Analysis of variance summary table).

Panel A: ANOVA-The effects of treatment groups on students' knowledge scores					
		df	Mean Square	*F*-statistic	*p*-value
Knowledge post-test scores	Between groups	2	24.49	4.74	.010
	Within groups	169	5.16		
	Total	171			
Panel B: ANOVA-The effects of treatments groups on students' interest scores					
		df	Mean Square	*F*-statistic	*p*-value
Interest post-test scores	Between groups	2	.10	.57	.57
	Within groups	169	.18		
	Total	171			

4.3 The Impact of the STOCKLAB Game on Students' Interest

H2 predicts that students will have a higher interest in stock investment after playing STOCKLAB with Explanation compared to students who use the STOCKLAB without Explanation and Traditional approach. H2 was not supported. Panel B of Table 3 shows insignificant main effect in the interest post-test scores among the three groups, F (2, 169) = .57, p = .57. Planned contrasts (see table 4) shows the interest post-test scores of the STOCKLAB with Explanation group do not differ significantly from the STOCKLAB without Explanation, t (169) = -.82, p = .42 and Traditional groups, t (169) = .20, p = .85. These statistical results are supported by the effect size analysis comparing the knowledge post-test scores of the STOCKLAB with Explanation and controls groups.

The effect size analysis shows a negligible effect for the STOCKLAB with Explanation compared with STOCKLAB without Explanation and Traditional. These findings suggest that the three approaches are equally effective for improving students' interest in stock investment in the capital market.

Table 4: Planned contrasts by dependent variable.

Dependent Variable	Experimental group (a)	Comparison group (b)	Mean difference (a-b)	Std. Error	*p* value	Cohen's d
Knowledge	STOCKLAB with Explanation (μ = 7.86)	STOCKLAB without Explanation (μ = 6.86)	1.00	.42	.02[a]	.44
	STOCKLAB with Explanation (μ = 7.86)	Traditional (μ = 8.09)	-.23	.43	.59	.10
Interest	STOCKLAB with Explanation (μ = 4.27)	STOCKLAB without Explanation (μ = 4.33)	-.06	.08	.42	.13
	STOCKLAB with Explanation (μ = 4.27)	Traditional (μ = 4.26)	.01	.08	.85	.07

Note: Significant at the 0.05 level.

4.4 Student Feedback Survey

In addition to knowledge and interest assessments, the present study surveys students' perceptions of the assigned approach. The means and standard deviations of the STOCKLAB with Explanation, STOCKLAB without Explanation, and Traditional groups on the five Likert-scale items (with some items reversed scored) are 4.26 (SD = .52, n = 58), 4.27 (SD = .43, n = 58), and 4.01 (SD = .52, n = 56), respectively. These indicate that students' perceptions of the assigned approach were generally positive. However, the results of ANOVA revealed a statistically significant difference at the $p < .05$ level in survey item scores for the three groups: $F(2, 169) = 3.08$, $p = .049$. Planned contrast indicates no statistical difference in the item scores between the STOCKLAB with Explanation and STOCKLAB without Explanation, $t(169) = -.19$, $p = .85$. Meanwhile, a significant difference is observed between the STOCKLAB with Explanation and Traditional, $t(169) = 2.06$, $p = .04$. These findings suggest that students learning through game approach (i.e., the STOCKLAB with and without Explanation) demonstrate a higher level of level of agreement that the game is an interesting way to study capital market compared to the Traditional approach.

4.5 Discussion

The main purpose of this study is to examine the effectiveness of STOCKLAB for improving students' knowledge (H1) and interest (H2) in investing in the capital market. To improve the internal validity of this study and determine which approach work best, the STOCKLAB with Explanation is compared with STOCKLAB without Explanation and Traditional approach with each having similar learning objectives.

This study finds the three methods can be effective in improving students' knowledge and interest in investing in the capital market. However, the results of this study exhibit partial support for H1. The students in the STOCKLAB with Explanation group scored higher on knowledge post-test than those in STOCKLAB without Explanation group. These findings are consistent with the review studies that show the effectiveness of the game approach can be enhanced when it includes instructional supports (Hays, 2005; O'Neil et al., 2005; Wouters & Van Oostendorp, 2017). The knowledge about capital market (e.g., capital gain, capital loss, stock split) explained by the instructor during the game might have prompted the students to form connections between the knowledge and game actions. In contrast, this study did not find the game approach with explanation is more effective than Traditional in enhancing students' knowledge. This result is contrary to the theory of abstract-interactive cognitive complexity (Tennyson & Jorczak, 2008). The inconsistent result is perhaps due to two factors. First, the nature of the experimental design requires students in the game groups to study more information in the same amount time (i.e., both the rules of STOCKLAB and the knowledge of the capital market). Second, the problems appearing on the test may focus on the lower-order thinking (i.e., memorization, understanding, and application. For instance, Mr. X invested in stock for Rp100 million in the beginning of year. If the stock has a fair value Rp90 million in the end of year, calculate the realized or unrealized profit/loss of Mr. X's stock investment.) rather than higher-order thinking (analyzing, evaluating, and creating). The education literature argue that educational simulation games are more effective than traditional teaching methods for fostering complex thinking skills (Bonner, 1999; Fowler, 2006) such as complex decision making (Pasin & Giroux, 2011), problem solving and critical thinking (Lovelace et al., 2016; Yang, 2015), and the higher-order thinking skills associated with Bloom's

taxonomy (Anderson & Lawton, 2009; Kuang et al., 2021; Zigmont et al., 2011).

The finding that students in the STOCKLAB with Explanation group scored equally on the interest post-test with students in the STOCKLAB without Explanation and Traditional groups, does not lend support to H2. The result is inconsistent with the previous studies showing game is more effective at increasing students' interest in materials learned than traditional approach (Knechel & Rand, 1994; Manero et al., 2015). Upon reflection, it is possible that the topic itself (i.e., stock investment in capital market) is interesting for the students. A national survey shows the young Indonesian (aged 17-29) considers a financial self-sufficiency is one of the most important factors for happiness (CSIS, 2017). A substantial financial return potential from stock investment may arouse students' enthusiast to learn more about capital market. A survey performed by Fintechnews Singapore, (2020) found that the young Singaporean (aged 18-23) ranked the bonds/stock (59%) as the most preferred investment followed by real estate (41%), and mutual funds (35%).

A feedback survey at the end of experiment shows that students in the STOCKLAB with and without Explanation group demonstrate a significantly higher level of enjoyment with and enthusiasm to continue to use the game than those in the Traditional group. Special features of game-such as challenge, competition, curiosity, and recognition- effectively produce the affective effects for the STOCKLAB. These effects, however, are insufficient to improve students' knowledge and interest higher than Traditional approach. The emotion may affect the long-term memory rather than the short one (Thomas & Hasher, 2006). Studies find simulation games are more effective than alternative learning methods in promoting knowledge retention (e.g., Brom et al., 2011; Curry & Brooks, 1971; Lucas et al., 1975). As this study only performed an immediate knowledge post-test, the long-term effect of the game was not known.

5 CONCLUSIONS

This study investigates the effectiveness an educational game called STOCKLAB for improving students' knowledge and interest in investing in the capital market. This study argues that the game is more effective than traditional approach (presentation using power point) if it is used with combination of explanation, —where an instructor explains the educational contents of the game to the players— during the game. The results show that STOCKLAB with Explanation is more effective than STOCKLAB without Explanation in assisting students in acquiring knowledge about capital market, but it is as effective as Traditional method. The three approaches are equally effective in improving students' interest in investing in the capital market. However, students learning through STOCKLAB with and without Explanation reported a significantly higher level of enjoyment with and enthusiasm to continue to use the game than those in the Traditional group.

Taken together, the findings of this study imply that STOCKLAB can be used as an alternative approach to introduce capital market to the students if it is coupled with explanation. The next steps include assessing students' higher-order thinking skills and knowledge retention, and replicating the findings with another simulation game, subjects, and topics. These are crucial to enhance our understanding about the efficacy of game-based learning and generalization of this study.

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