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EVALUATING THE EFFECTS OF A BOARD GAME IN COGNITION IN LEARNING SHIPPING MANAGEMENT FOR HIGHER EDUCATION

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Abstract:

This study proposes the use of board games for teaching and learning shipping management in higher education and examines its effects on cognition. It employs a game-based learning approach to engage students with real-life experience in shipping management so that students are able to experiment with the causes and effects of their decisions based on the theory they have learned. An instance of a shipping management game was developed from the board game framework which stands on the discreet event simulation of a realistic shipping process and activity. A quasi-experimental research design was adopted to measure the effectiveness of the board game in giving students some understanding of shipping operations. Data were gathered from a sample of 67 undergraduate students, using a non-equivalent control group design. Students who received the game-based method performed better in the post-test assessment. A performance comparison indicated that there was a difference in students' achievement for the tramp services and liner services contents. The use of board game aims to expose students to the best learning experience when they immerse themselves in solving problems and making decisions in the game. Moreover, the board game provides a transparent learning space, which encourages students to make knowledge discovery at their own pace in a non-threatening environment.

Keywords:

Board Game, Shipping Management, Game-Based Learning

Introduction

In recent years, the provision of higher education has expanded, so too the variety of methods used for teaching and learning. There has been movement towards using more active based learning. One of those techniques that has gained attention is one that might entwine within the term of games. The purpose of this paper is to propose the use of board game approach in the teaching and learning of shipping management for higher education and to analyse the effects in terms of cognition to the employment of such techniques.

The shipping industry is a global industry in which most trade and commerce presently take place (UNCTAD, 2015). The industry enables a global supply chain to source products from all over the world, which is regarded as the top priority in the global industry (Allate, 2015). Hence, making shipping management a crucial discipline, particularly the operation management of the shipping industry. Shipping management focuses on the management aspects of the shipping operation. These aspects include technical management, quality and safety management, procurement, crewing and financial management services, and functions (Jahn & Bussow, 2013).

Commonly, traditional learning methods that feature lecture in shipping management class are abstract and passive and have been used in the teaching and learning in higher education for years (Kunieda, Kashima, Kido, & Murai, 2017). Although traditional teaching is still relevant, it is often criticized by business practitioners and students because it focuses too much on theory and lacking to address real life and practical problems in management education sufficiently (Balamurugan & Dharsini, 2017). Management skills are of high importance for modern organizations that have faced crucial changes over the past decades caused by such tendencies i.e. globalization or technological innovations. Therefore, the success of management education helps companies to react better to new competitive challenges as well as involve in international business.

In order to fulfill the need, such teaching methods need an integration with other learning tools to support the teaching and learning process because students prefer more active and inductive learning (Aburahma & Mohamed, 2015). Furthermore, lectures do not adequately prepare students with the learning process and more novel approaches are required to highlight the shortcomings of the traditional approach (Farashahi & Tajeddin, 2018). This also applies on the learning process for shipping management course especially when cognition and knowledge retention become visible as the specific measures that are needed to be achieved. Students who attend the course possess no experience on the operation of ships in the global trading business. Thus, students are facing difficulties to visualize processes that occur during the operation of ships hence creating a bridge between theory and knowledge making the application to real situation quite difficult. The effect also brings about problems for the students during problem-based learning (PBL) sessions. Although PBL can highlight the application towards the theory, students are unable to solve the questions provided in the case study due to the lack of experience and basic background knowledge (Abdelkarim, Schween, & Ford, 2018).

The answer to the argument comprises the main issue which is to combine engaging activities with learning outcomes. Hence, the use of game-based learning (GBL) from a board game was proposed. This GBL must meet certain learning outcomes highlighted in the course in order for it to be useful in education. Additionally, adapting the game to those outcomes requires

various challenges, array of steps or levels, numerous quests with various difficulty levels to run the game. The second issue is that most board games in the market provide fictional gameplay that does not align with the educational structure for learning shipping management; moreover it also does not reflect the reality in shipping operations (Auerochs, 2013; D'Orey, Sentieiro, & Soledade, 2014; Delonge, Ewert, & Nesbitt, 2018; Suchý, 2009). In addition, it is difficult to expose students to the shipping operation and process with the authentic scenario within the industry itself. Therefore, the board game developed from this study is proposed as a medium of learning in shipping management course. As to proof the learning effects, this research provides empirical evidence to support the use of board games which implement simulations that occur within the board game developed for the learning of shipping management in higher education.

Despite the endless efforts by the lecturer in revamping active learning during lectures and post-learning, it has been less successful without proper learning tools. These constraints were also felt by lecturers in delivering lessons due to the lack of an appropriate innovative teaching medium to represent the applications in reality that would require the involvement of students (Viera, 2008). In spite of focusing on what teach and how to deliver the knowledge meaningfully to the students, the question of how to improve the cognition still lingers among lecturers. Multiple streams of information, besides quick and frequent interaction with content and implementation of inductive reasoning, are required to successfully deliver information in lectures (Oblinger & Oblinger, 2008; Prensky, 2005). In this case, the implementation of GBL by using board game as a learning medium matches all the criteria listed. Hence, Shipping Management Game was proposed to be used as a learning medium in shipping management for higher education.

Literature Review

The Theory of Progressive Education
Most simulation games provides a good representation of realism for players especially when the game designer tried to create the immersion for players to experience during game session (Canning, 2013; Drover & Wallace, 2005; Pearson, 1976; "The liner shipping game [Serious game]," 2014; "Transocean: The shipping company [PC game]," 2014). Realistic scenarios were represented using the suitable game mechanics and components which provide a problem space for players to tackle the scenarios hands-on during the game session.

What is more, the potential of immersive learning space created by the game has triggered progressive education during learning session which uses game as the medium of learning. Progressive education focuses on hands-on approach or learning by doing to deliver education (Dewey & Dewey, 1915). Dewey & Dewey (1915) emphasize that education should focus on the journey of experience that the students build along the learning session. In addition, Dewey (1963) addressed that experience, specifically hands-on activities, were important in the education process to improve cognition and knowledge retention. Students would be able to blend the theory with practice, experience the success and failure and connect between the environment of school and society into mental foundation for future thought (Dewey, 1963). Thus, the learning session was not entirely depending on students to learn and memorize facts which they soon will forget gradually.

Dewey (1980) added that activities from the hands-on practice allowed students to see, raise, and seek out solution which enable them to conduct knowledge discovery within their own pace. In addition, any mode of skill that was achieved from an activity with deepening of knowledge and perfecting of judgement should be ready to be used in new environment (Dewey, 1980). Hands-on approach that enable knowledge discovery which improves cognition and knowledge retention creates both a physical and mental optimum learning structure and contended physical operations; which in the end create feedback of learning that allow students to see what exactly happens in reality (Bruner, 1966). Experience and theory are reinforced and defined by another; yet an experience without any theory is difficult to be described, retrieved and integrated, meanwhile a theory without any experience tends to have a limited meaning (Lipson & Fisher, 1983). Hence, emphasizing that hands-on approach is meaningful to achieve better cognition and gain knowledge retention.

The use of hands-on practice during learning session drives students to get involved in the activity actively and delve into the problem progressively (Aldrich, 2005). Furthermore, the practice enables the creation of an environment of collaborative learning that enables teamwork, critical thinking, and creative problem solving in learning sessions. In the end, making schools and higher learning institutions a place of learning rather than a place for teaching. Even though computer simulations has the potential sophistication and realism through the immersion of game play, board game is able to offer unique advantages that makes the game play from the board game quite appropriate in certain settings (Fjællingsdal & Klöckner, 2020; Radzi, Ying, Abidin, Ahmad, & Zainol, 2017) . One of the notable advantages of board game is the transparency of a board game spread on the table. Moreover, the process of gameplay in the board game requires players to conduct transactions between the process which suggests no mystery within the transactions and operations thus inviting all players to experience how it works. This advantage is useful to trigger progressive learning environment in the learning session which emphasizes more towards the hands-on approach. Without doubt, GBL from the board game offers a learning space with dedicated scenario for students to test their knowledge from the theory that they have learnt in the lecture (Dancz, Parrish, Bilec, & Landis, 2017). Moreover, students were exposed to what really happens in the theme represented by the board game through the game session. Accordingly, students were able to conduct problem solving to face the challenges included in the board game and make the best decision to become the best player in each game session (Battini, Faccio, Persona, & Sgarbossa, 2009; Shih, Jheng, & Tseng, 2015; Taspinar, Schmidt, & Schuhbauer, 2016; Usart, Romero, & Barberà, 2013). Conclusively, empirical evidence that the board game may improve cognition and knowledge retention of course material can be measured thus proving the learning space in the board game as one of the hand-on approaches in delivering knowledge to students.

Contributions of GBL in Teaching and Learning Shipping Management
Shipping Management is one of the advance courses offered by most higher education institutions that offer logistic program (Radzi, Tan, & Yusoff, 2019). Therefore, the complexity of the course is quite high based on past result of students who undertook the course. The content of the course exposes students to complex and real-life problems which incorporate with complex solutions that require higher level thinking process (Eckhaus, Klein, & Kantor, 2017; Rajasulochana, Heggede, & Jadhav, 2019). Hence, students are required to equip themselves with additional complex thinking such as evaluating and justifying opinions as well as synthetizing concepts or ideas. Thence, students should be able to develop skills that are

used in everyday life decision making, such as generating and supporting hypotheses which is required as part of the learning outcome.

Gardner (2006) claims that humans have eight intelligences and clarifies that when exploring a certain topic of interest, it can be approached in six different ways as to maximize the chances of reaching all students. Gardner refers the method as 'the personal way' where its ultimate objective is to observe if it is possible to be applied when approaching a specific through the utilization of role play, simulation, or any other interaction (Gardner, 2006). Furthermore, Armstrong (2009) highly promotes the use of board games as a teaching strategy. He claims that the implementation of GBL by using board games might suit students with interpersonal intelligence as it provides a perfect problem space and an excellent environment for interaction among the students (Armstrong, 2009). Thus, as students learn the concept of shipping management, they were also provided with a problem space that could be a platform to test their understanding towards the lecture that has been given (Eckhaus et al., 2017; Fjællingsdal & Klöckner, 2020). It is a good practice where students can simulate the outcome of their decisions towards the challenges and opportunities exposed by the game either collaboratively or competitively.

In fact, different learning strategies can be applied to GBL, one in particular is progressive education which is learning through observation and experience (Wong, Yatim, & Tan, 2014). This research will apply progressive education strategies as well. Progressive education is beneficial in regard to the context of the course which were applied, and it can help to recreate the scenario of processes that occur in real life especially in teaching and learning shipping management. Which in advance, provides students with a learning space that allows students to conduct experimentation with the judgement with the challenges and problems that they encounter from the game play sessions. In addition, progressive education includes simulations and hands-on training as its learning strategies (Buck, 2017; Lackéus, Lundqvist, & Williams-Middleton, 2016; Radzi et al., 2017). Therefore, students should be able to assume the role of actors, experiencers, observers, and analysts in which envelops the elements the theory of progressive education (Dewey, 1980).

As shipping management is an important part of logistic field, it is important that students are able to grasp the fundamental concept of shipping management. Therefore, the GBL was suggested to be used in the teaching and learning of shipping management as to support traditional teaching in lecture. Obviously, GBL has the ability to create a realistic environment, non-threatening problem space and active engagement during learning session and after learning session. GBL also draws students into the complexity of any particular targeted subject while maintaining the engagement and participation. It is accomplished by relating the subject or topic with activities that involve the students' lifestyle.

As a record, the utilization of GBL which emphasizes the constructivist approach enables students to attempt to construct knowledge from various resources and make sense around the abstract structure that helps them understand new information interactively (Silva, Macedo, Teixeira, Lanzer, & Graziani, 2017). GBL is able to highlight the interactivity and collaboration either among the students or among the interface. In addition, GBL ensures that the motivation of students are intact as during each session as they go through the game and experience new learning outcomes. Thus, as GBL offers great interactivity within the game session, the

researcher also believes that GBL might be able to improve and enrich the teaching and learning of shipping management courses experience for both lecturers and students.

As a matter of fact, there are various benefits that incorporate the use of GBL in the teaching and learning of shipping management. The main benefit would be progressive education and improving intrinsic motivation (Eckhaus et al., 2017; Hung, Sun, & Yu, 2015; Radzi et al., 2017; Yusof, Radzi, Khalid, & Din, 2016). Although both benefits seem trivial, it would be a great addition to enrich and improve the experience of students in learning shipping management.

Methodology

A quasi-experimental research design was adopted for this study. A non-equivalent two group pre-test post-test design was used in order to measure the effectiveness of board game learning.

Participant of the Study

This study researched post-learning activities using a medium of game-based learning in higher education. The participants were students enrolled in a logistic program, offered by a higher institution which is located at northern part of Peninsular Malaysia. The participants of the study were 67 students comprising 19 males and 48 females. The age range for the participants were between 20 and 25 years old. The research design involved a pre-test and post-test activities that were constructed to determine the effects of cognition from the use of a board game. For the purpose of this study, two groups were created from one class; a control group and an experimental group. The assignment for the groups were done randomly using a computer random number generator; the control group (n = 35) and the experimental group (n = 32). All participants in this research received a consent form to give permission to the researcher to include them in the experiment; those who did not sign the consent form were excluded.

Instruments

15 multiple choice questions were selected from the question bank to be used as the pre-test and post-test. The tests were conducted to evaluate the effects on learning shipping management for the control group and the experimental group. Five of the questions were from the topic of general logistics (sea transportation) (GLQ), three from tramp services (TSQ), four from liner services (LSQ) and the remaining three questions were from tramp and liner services (T&LSQ). In order to control the testing effect, the order of the questions for the pre-test and the post-test were changed. Moreover, the duration between the pre-test and post-test, and the number of questions tested were sufficient to prevent students from memorizing the questions. The list and classification of the questions were shown on the Table 1.

Table 1: Test Tems Included In the Data Collection Instrument for Pre-Test, Post-Test and Time Series Test

Classification / Topic	Question	Alignment to Feature in Shipping Management Game
General Logistic (Sea Transportation) (GLQ)	What is the definition of port in terms of maritime? What is not a factor for choosing location and design of port? Which of the following is not the role of government in port development? Which of the following is not a factor in choosing a port in a country by user and ship owner? Which of the following features are not true for port competition?	Selection of port, classification of other port in the game environment, identifying route and connectivity of shipping line and planning for the best profitable port to head first in making delivery (financial management, technical management and quality and safety management)
Tramp Shipping (TSQ)	Which of this statement provides the best definition of tramp services? Choose the criteria which fit tramp ships. Which of the following regarding the bareboat chartering system is true?	Perform tramp shipping when fulfilling shipping contracts, planning for future delivery, organize tramp shipping for highest profit. (technical management, crewing, procurement, quality and safety management)
Liner shipping (LSQ)	Which statement here is true regarding the liner shipping? During harbouring at ports, liner ships usually takes precedence over tramp ships. Which of the following is true regarding the reason of this harbouring rule? A ship that operates within a schedule and has a fixed port rotation with published dates of call at the advertised port is a … Choose the criteria which fit liner ships.	Planning route of selection for liner shipping, perform liner shipping when fulfilling shipping contracts, integrate shipping line among other ships. (technical management, crewing, procurement, quality and safety management)
Tramp Shipping And Liner Shipping (T&LSQ)	Which of the following concerning liner and tramp ships is true? In terms of vessel operation, liner and tramp vessel have similarities in which … What is the advantage of flag discrimination?	Identifying the best services of shipping method with highest profit, optimising ships load when making delivery. (technical management, crewing, procurement, quality and safety management)

Procedure

The study was conducted within 10 weeks, the intervention session which was playing the board game was delivered 10 times within each week. The pre-test was administrated during the first week of the study and the post-test at the last week. The delivery of the board game was conducted in the first week for the experimental group in which they were exposed to the components of the game and how it represented the realistic elements in the shipping environment. A brief game play sample was conducted after the introduction. The game play session of the board game was conducted starting from the second week in which the students were given a comprehensive oral instruction regarding the game's rules by two instructors. The instructors only explain the rules of the board game without disclosing any strategies or suggesting any move for player to take in the game session.

Development of the Simulation Board Game

The development of the board game was developed to cater for the use of simulation in the application of GBL in which case board games was used as a tool in implementing hands-on simulation with a minor modification. Accordingly the design of the board game, follows the design methodology of simulation modelling (Law, 2003). In addition, the design process should also follow the stages of game design process to enforce the implementation of developing a medium for GBL (Adams & Dormans, 2012).

Framework

The board game focuses on two main areas in the shipping management domain which are tramp shipping and liner shipping.The framework of the board game was developed based on the information regarding the content of shipping management and the realistic process in the shipping industry. The framework acts as a raw sketch for the game play for the board game. Hence, it consists of process flow that occurs in the shipping management environment. The framework was then validated by the content expert which consist of practitioners and lecturers who lecture shipping management.

The validation process was important as the main goal for the study was to provide the students with a real-life practice in a controlled environment therefore creating the medium of learning towards apprenticeship. A thorough discussion with the content expert was done in order to determine which realistic elements in the gameplay to be included or eliminated, especially those with non-ethical or negative effects. Realistic element helps boost the gameplay experience in terms of enforcing meaningful play in each gaming session (Hartevald, 2011). It can be done with the implementation of the right game mechanics that could represent such realistic element closely. Therefore, players would be able to acquire the experience in such domain indirectly thus applying the concept of learning by doing. Figure 1 shows the framework for the game play of the board game.
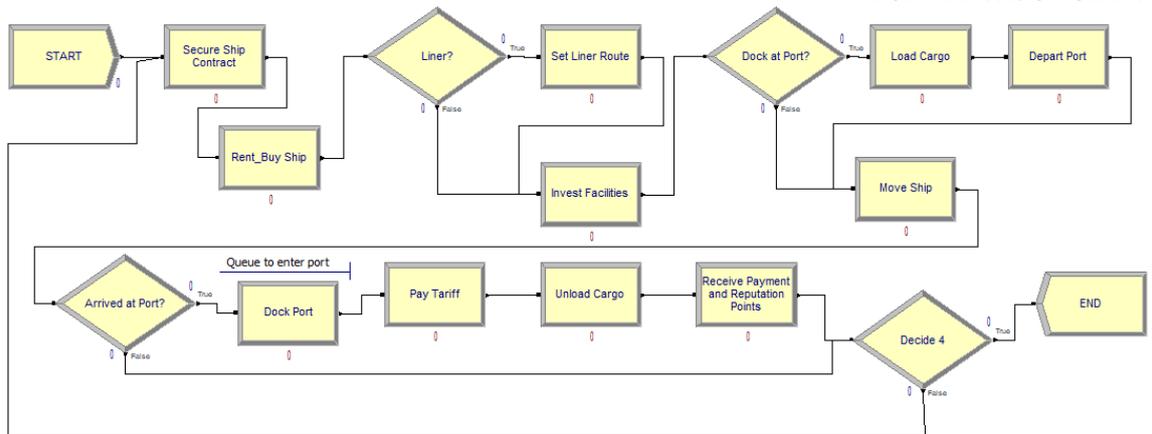
Figure 1: The Framework for the Gameplay of the Board Game

The Shipping Management Board Game

The board game was designed based on the anatomy of choice (Salen & Zimmerman, 2004). The anatomy of choice is a method of how the game uses choice to create a dynamic and engaging experience. The anatomy of choice comprises five stages of a choice; the five stages that occur every time an action and outcome transpire in a game.

Table 2: Anatomy of Choice (Salen & Zimmerman, 2004)

Stage	Anatomy of a Choice
1	What Happened Before The Player Was Given The Choice?
2	How Is The Possibility Of Choice Conveyed To The Player?
3	How Did The Player Make The Choice?
4	What Is The Result Of The Choice? How It Will Affect Future Choices?
5	How Is The Result Of The Choice Conveyed To The Player?

Within each stage, an event might occur as internal event or external event. An internal event is related to the systematic processing of a choice given to the player meanwhile an external event is related to the representation of the choice to the player. Both events make a distinction between the moment of action as handled by the game state and the manifestation of that action to the player.

In 'The Shipping Management Game', players have an exposure of numerous choice that might contribute to different outcomes in their shipping company. Using the anatomy of choice, the board game implements action-outcome unit which is the vehicle of enforcing meaningful play for its players (Table 3).

Table 3: Anatomy of Choice for 'The Shipping Management Game'

Stage	Anatomy of a Choice	Shipping Management Game
1	What Happened Before The Player Was Given The Choice?	Represented By The Current State Of The Main Board And Player Area Which Consists Of How Much Capital In Hand, Ships Owned, Contracts Secured, Reputations Gained And Specific Event Inflicted To The Player.

2	How Is The Possibility Of Choice Conveyed To The Player?	The Possible Action Is Conveyed Through The Possibility Of Ship Ownership Or Securing More Contracts As To Operate The Shipping Company.
3	How Did The Player Make The Choice?	The Player Makes A Choice By Performing The Action In Each Game Phase.
4	What Is The Result Of The Choice? How It Will Affect Future Choices?*	Each Action Affects The Placement Of Ships In The Main Board As Well As Opening The Availability Of New Contracts To Be Secured.
5	How Is The Result Of The Choice Conveyed To The Player?	The Result Of Choice Is Then Represented To The Player Via The New Arrangement Of Ships On The Main Board And Their Own Player Area.

Based on Table 3, stages one, three, and four are identified as internal events meanwhile stages two and five are known as external events. The layers of event which are specified by the anatomy of choice contributed to the specific actions that players can take during their turn. The game phase of the board game consists of four sequential phase which are preparation of a new round, planning phase, action phase, and payment phase.

Findings

The findings were presented as to achieve the objectives which was highlighted in this study. Particularly, it proposed a simulation-based board game that was associated with the learning experience of a realistic shipping operation. The objective, which is specified from the proposed board game, was to measure the effectiveness of board game in enhancing cognition.

Homogeneity test

The assumption of homogeneity of variance from the pre-test scores for both group was tested and satisfied via Levene's test, $F(1,65) = .436$, $p = .511$. Therefore, it was concluded that the data was homogeneous.

Comparison of Performance for Overall Score

The split-plot ANOVA (SPANOVA) was used to investigate whether a significant difference exists in regards of the effect on performance in two different timeframes, which is during the pre-test, and during the post-test. Split-plot ANOVA tested whether groups change differently over time; either the control group or the experimental group may change more rapidly or in different direction from pre-test to post-test. The alpha level 0.05 was applied ($\alpha = .05$). If the test is significant, then plotting the interaction will reveal the nature of the differential change. The split-plot ANOVA analysis for the sample is shown on Figure 2 and Table 4.
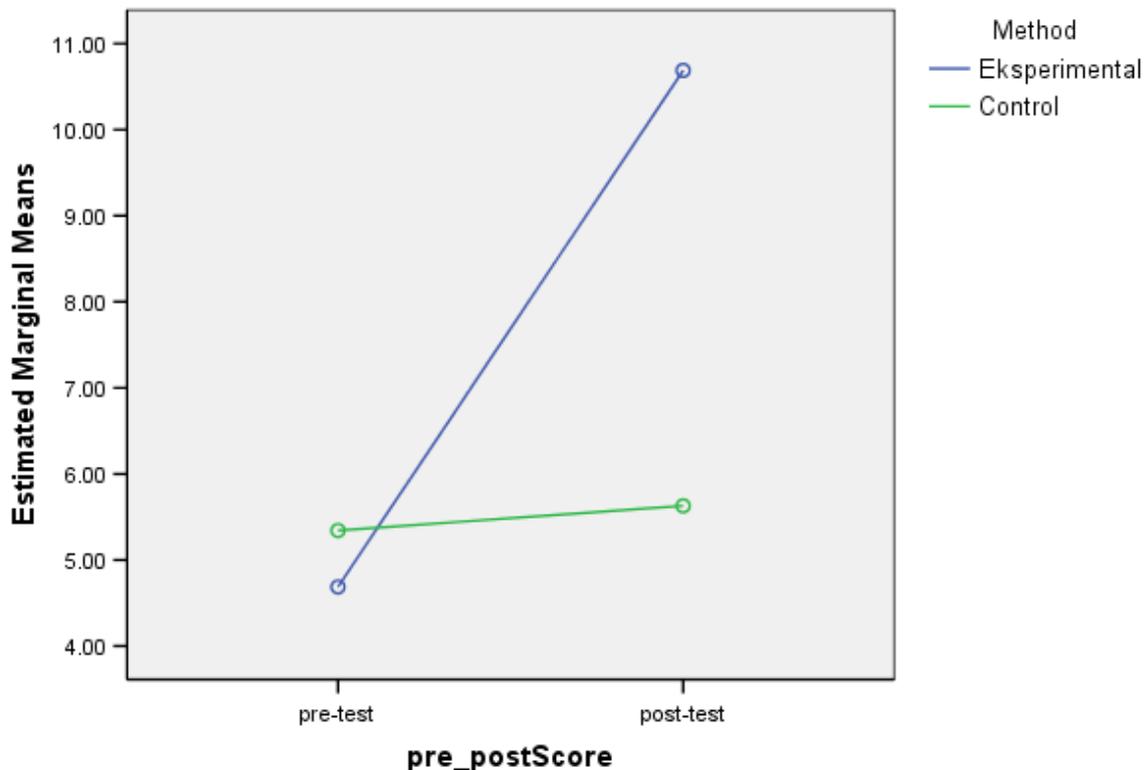
Figure 2: Split-plot ANOVA between the Experimental Group and the Control Group

Based on Figure 2, the control group shows very little difference in the test scores between the pre-test and post-test. In fact, the increment of the test scores are small as compared to the experimental group (from M = 5.343, SD = 1.608 in the pre-test to M = 5.629, SD = 1.416 in the post-test). In contrast, the experimental group was moving upwards substantially from the pre-test to the post-test (from M = 4.688, SD = 1.424 in the pre-test to M = 10.688, SD = 1.804 in the post-test).

Table 4: Split-plot ANOVA for the Pre-test Scores and Post-test Scores between the Control Group and the Experimental Group

Test of Within-Subjects Effects

	Sum of Squares	df	Mean Square	F	Sig,
Post-test	272.921	1	272.921	147.132	.000

Based on Table 4, the result of the analysis indicates that the interaction effect is statistically significant with $F(1,65) = 147.132$, p=.000 (p<.05). Hence, the hypotheses from the first research question was rejected. Conclusively, the performance of students in the experimental group improved significantly after the GBL session, specifically through the use of the board game Shipping Management Game.

General Logistic (Sea Transportation) Question

In overall, five questions that consist of general logistic questions were asked during the pre-test and the post-test. They are the same questions used in the first phase of the study. The rationale of the use of these questions is to test the retention of knowledge for general knowledge of sea transportation. It is imperative as the content for sea transportation is the prerequisite for the domain knowledge targeted in this study. Additionally, the questions also should be able to prove that the board game delivered during the intervention is flexible for the general content in sea transportation. All participants answered the questions for the pre-test and the post-test (see Table 5).

Table 5: Correct Answer Count of the Pre-test and Post-test General Logistic Questions for the Control Group and the Experimental Group

	Control Group				Experimental Group			
	Pre-test	f	Post-test	f	Pre-test	f	Post-test	f
Nil	0	0	0	0	0	0	0	0
1 Correct Answer	0	0	2	2	1	1	2	2
2 Correct Answers	1	2	3	6	8	16	9	18
3 Correct Answers	4	12	10	30	11	33	16	48
4 Correct Answers	21	84	18	72	11	44	4	16
5 Correct Answers	9	45	2	10	1	5	1	5
Total	35	143	35	120	32	99	32	89

The comparison of the performance in the pre-test and post-test for both the control group and the experimental group were conducted using the split-plot ANOVA (see Figure 3 and Table 6.
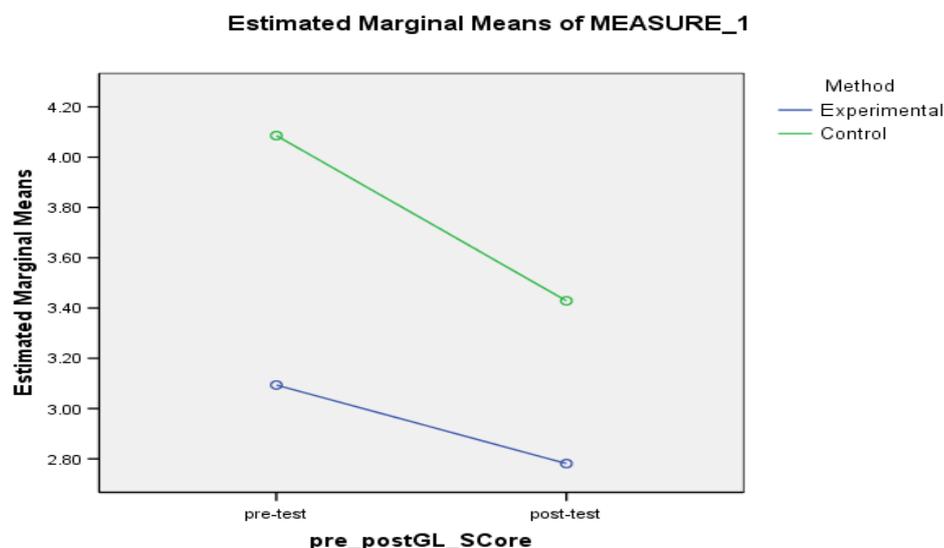

Figure 3: Split-plot ANOVA between the Experimental Group and the Control Group for the General Logistic Questions

Based on Figure 3, both the control group and the experimental group show a little decline in the test scores between the pre-test and post-test for the general logistic questions. In fact, the decline of the test scores in the control group is slightly large compared to the experimental group (from M = 4.086, SD = 0.702 in the pre-test to M = 3.427, SD = 0.948 in the post-test). In contrast, the experimental group was moving downwards as well from the pre-test to the post-test (from M = 3.094, SD = 0.928 in the pre-test to M = 2.781, SD = 0.870 in the post-test).

Table 6: Split-plot ANOVA for the General Logistic Questions Pre-test and Post-test Scores between the Control Group and the Experimental Group

Test of Within-Subjects Effects

	Sum of Squares	df	Mean Square	F	Sig,
Post-test	.993	1	.993	1.488	.227

Table 6 presents the result of the analysis indicating that the interaction effect is statistically significant with F(1,65) = 1.488, p=.227 (p>.05). No significant difference has been found which indicates that the intervention did not provide a significant improvement in students' cognition towards the general logistic (sea transportation) content for students.

Tramp Shipping Question
Apart from the general logistic questions, three questions from the tramp shipping were asked in the pre-test and the post-test. The rationale of these questions is to test whether the board game is able to deliver the specific content during the game session. All participant answered the question for the pre-test and the post-test (see Table 7)

Table 7: Correct Answer Count of the Pre-test and Post-test Tramp Shipping Questions for the Control Group and the Experimental Group

	Control Group				Experimental Group			
	Pre-test	f	Post-test	f	Pre-test	f	Post-test	f
Nil	15	0	14	0	13	0	0	0
1 Correct Answer	11	11	18	18	14	14	8	8
2 Correct Answers	8	16	3	6	5	10	15	30
3 Correct Answers	1	3	0	0	0	0	9	27
Total	35	30	35	24	32	24	32	65

The comparison of the performance in the pre-test and post-test for both the control group and the experimental group were conducted using the split-plot ANOVA (see Figure 4 and Table 8).
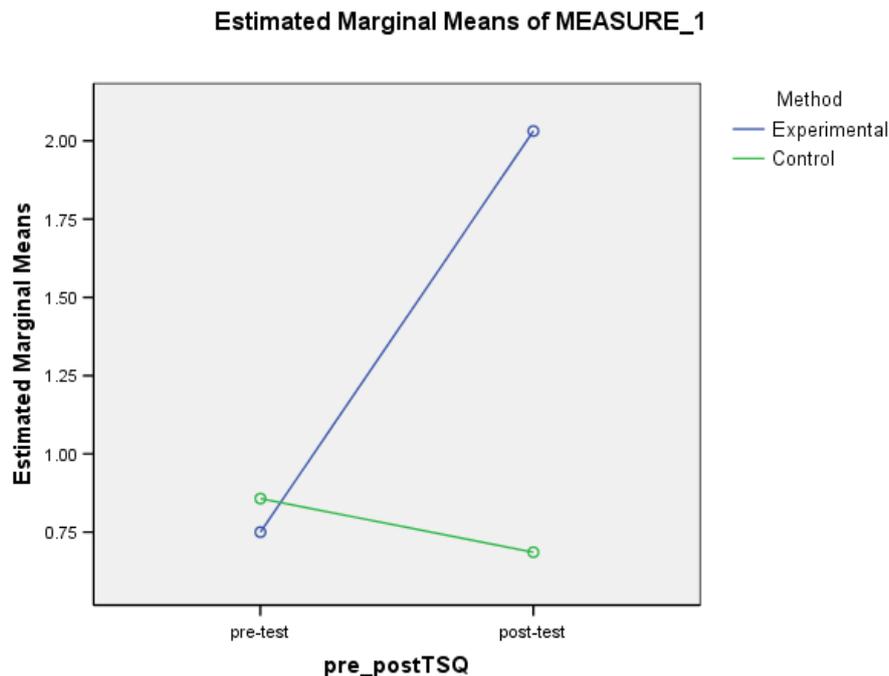
Figure 4: Split-plot ANOVA between the Experimental Group and the Control Group for the Tramp Shipping Questions

In Figure 4, the control group shows a little decline in the test scores between the pre-test and post-test for the tramp shipping questions. In fact, the decline of the test scores is small (from M = 0.857, SD = 0.879 in the pre-test to M = 0.686, SD = 0.631 in the post-test). In contrast, the experimental group was moving upwards substantially from the pre-test to the post-test (from M = 0.750, SD = 0.718 in the pre-test to M = 2.031, SD = 0.740 in the post-test).

Table 8: Split-plot ANOVA for the Tramp Shipping Questions Pre-test and Post-test Scores between the Control Group and the Experimental Group

Test of Within-Subjects Effects

	Sum of Squares	df	Mean Square	F	Sig,
Post-test	17.638	1	17.638	38.576	.000

Table 8 shows the result of the analysis indicating that the interaction effect is statistically significant with $F(1,65) = 38.576$, p=.000 (p<.05). A significant difference has been found which indicates that the intervention did provide a significant improvement in students' cognition towards the tramp shipping content.
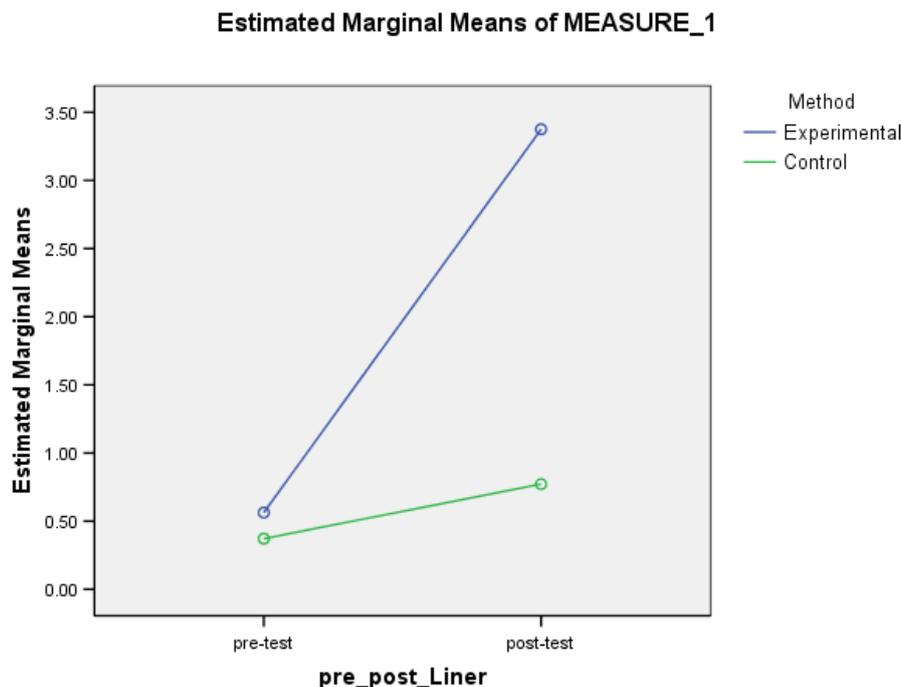
Liner Shipping Question

Four questions from the liner shipping were asked in the pre-test and the post-test. The amount of the question differs because liner shipping content differs with the tramp shipping. Therefore, one extra question was taken from the question bank as to maintain the coverage of content for testing the board game. The rationale of these questions were to test whether the board game was able to deliver the specific content during the game session. All participant answered the question for the pre-test and the post-test (see Table 9)

Table 9: Correct Answer Count of the Pre-test and Post-test Liner Shipping Questions for the Control Group and the Experimental Group

	Control Group				Experimental Group			
	Pre-test	f	Post-test	f	Pre-test	f	Post-test	f
Nil	24	0	12	0	21	0	0	0
1 Correct Answer	9	9	19	19	5	5	0	0
2 Correct Answers	2	4	4	8	5	10	5	10
3 Correct Answers	0	0	0	0	1	3	10	30
4 Correct Answers	0	0	0	0	0	0	17	68
Total	35	13	35	27	32	18	32	108

The comparison of the performance in the pre-test and post-test for both the control group and the experimental group were conducted using the split-plot ANOVA (see Figure 5 and Table 10.

Figure 5: Split-plot ANOVA between the Experimental Group and the Control Group for the Liner Shipping Questions

In Figure 5, the control group shows a little difference in the test scores between the pre-test and post-test for the liner shipping questions. In fact the increment of the test scores were small compared to the experimental group (from $M = 0.371$, $SD = 0.598$ in the pre-test to $M = 0.771$, $SD = 0.646$ in the post-test). In contrast, the experimental group was moving upwards substantially from the pre-test to the post-test (from $M = 0.563$, $SD = 0.878$ in the pre-test to $M = 3.375$, $SD = 0.751$ in the post-test).

Table 10: Split-plot ANOVA for the Liner Shipping Questions Pre-test and Post-test Scores between the Control Group and the Experimental Group
Test of Within-Subjects Effects

	Sum of Squares	df	Mean Square	F	Sig,
Post-test	48.646	1	48.646	106.689	.000

Based on Table 10, the result of the analysis indicates that the interaction effect was statistically significant with F(1,65) = 106.689, p=.000 (p<.05). A significant difference has been found which indicates that the intervention did provide a significant improvement in students' cognition towards the liner shipping content.

Tramp Shipping and Liner Shipping Question
The last part of the question consists of three questions which comprise the tramps services and liner shipping content in the pre-test and the post-test. The rationale of these questions was to test whether the players who plays the board game should be able to differentiate between both services. The result will indicate whether the board game is able to deliver the specific content during the game session. All participants answered the question for the pre-test and the post-test (see Table 11)

Table 11: Correct Answer Count of the Pre-test and Post-test Tramp Shipping and Liner Shipping Questions for the Control Group and the Experimental Group

	Control Group				Experimental Group			
	Pre-test	f	Post-test	f	Pre-test	f	Post-test	f
Nil	34	0	14	0	25	0	0	0
1 Correct Answer	1	1	16	16	5	5	2	2
2 Correct Answers	0	0	5	10	2	4	12	24
3 Correct Answers	0	0	0	0	0	0	18	54
Total	35	1	35	26	32	9	32	80

The comparison of the performance in the pre-test and post-test for both the control group and the experimental group were conducted using the split-plot ANOVA (see Figure 6 and Table 12.
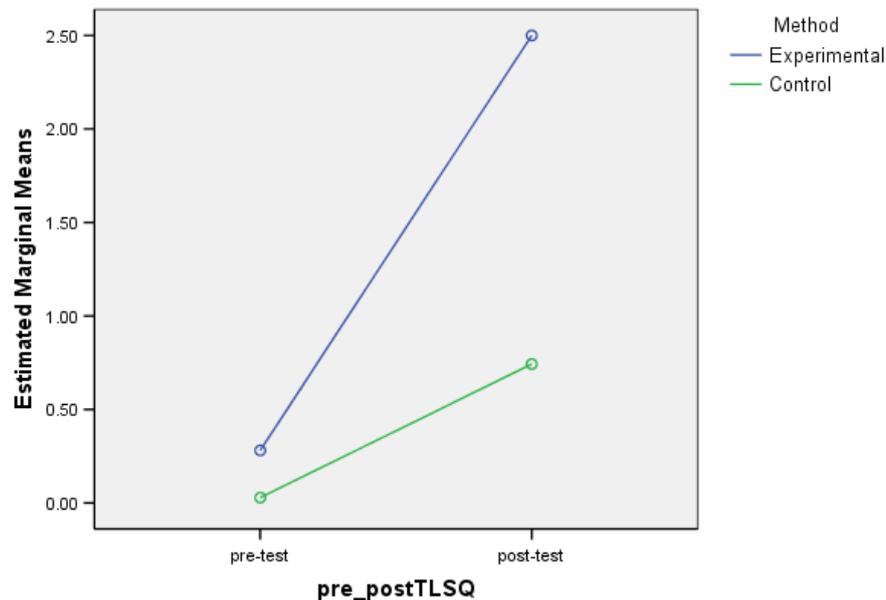
Figure 6: Split-plot ANOVA between the Experimental Group and the Control Group for the Tramp Shipping and Liner Shipping Questions

According to Figure 6, the control group shows a little difference in the test scores between the pre-test and post-test for the tramp shipping and liner shipping questions (from M = 0.029, SD = 0.169 in the pre-test to M = 0.743, SD = 0.701 in the post-test). In fact the difference of the test scores is small as compared to the experimental group which shows an increment of the test scores. In contrast, the experimental group was moving upwards substantially from the pre-test to the post-test (from M = 0.281, SD = 0.581 in the pre-test to M = 2.500, SD = 0.622 in the post-test).

Table 12: Split-plot ANOVA for the Tramp Shipping and Liner Shipping Questions Pre-test and Post-test Scores between the Control Group and the Experimental Group

Test of Within-Subjects Effects

	Sum Of Squares	df	Mean Square	F	Sig,
Post-test	18.918	1	18.918	57.715	.000

Based from Table 12, the result of the analysis indicates that the interaction effect was statistically significant with $F(1,65) = 57.715$, p=.000 (p<.05). Conclusively, players were able to differentiate between both services at the end of the intervention. A significant difference has been found which indicates that the intervention did provide a significant improvement in students' cognition towards the tramp shipping and liner shipping content.

Discussion

The proposed board game, The Shipping Management, was developed from the content of tramp shipping services and liner shipping services. Although it simulates the comprehensive shipping operation within a game play session, it is much simpler that the shipping operations in reality. The development of the board game was designed based on the intended learning

outcomes from the shipping management course. The content of the board game only includes the fundamental elements of how to connect the shipping line, ports, and its consignee and supplier. In general, the board game does include the key processes of tramp shipping services and liner shipping services, which considers the type of ships, shipping services, liner route, home ports, rules of docking, flag discrimination, and a few minor policies. Alternatively, the board game omitted the shipping policy in detail, the detailed process of shipping contract, warehousing, and safety procedures in shipping operations as to maintain the simplicity of the board game. The board game proposed in this study records the achievement of players within the game session by awarding points for each assets that the players' hold, the amount of money collected at the end of the game and points for each successful delivery of shipping contract. Therefore, the board game covers a comprehensive assessment of players' achievement during the gameplay or while the players managed their shipping company.

There are three notable characteristics of the board game that reflect the intended learning outcome for the content of tramp shipping services and liner shipping services in shipping management. Firstly, it highlights the difference of operation in tramp shipping services and liner shipping services. Thus, the players are able to understand the benefits and drawbacks of both services during and by completing the ship contract bound to the ships that they owned. Secondly, the movement of ships that the player managed as to compete with their competitor. The board game simulates the movement of ships based on the size and load that the player managed. Hence, smaller ships with few loads will move faster compared to large ships that carry very high loads. On the other hand, the continent for the board game was designed using a modular board which offered an adequate challenge for ship movement form one location to another. Within this activity, the players are able to plan the optimal route for their ship to pick up and deliver contracts, which are able to provide them with the highest return and reputation points. Additionally, transparent experimentation is triggered where players experience the outcome for each of their action. The last characteristics is the revenue and loss gain as well as the reputation points from the completed shipment. Players are able to observe the flow of cash and the reputation gained for their company through hands-on practise from the board game. Therefore, players are able to make better investments in future game turns.

The result of the field testing for the board game 'The Shipping Management Game' was consistent with the literature (Az-zahroh et al., 2019; Cardinot & Fairfield, 2019; Sato & Haan, 2016; Wait & Frazer, 2018; Willet, Boltz, Greenhalgh, & Koehler, 2018) which highlighted the effectiveness in using game-based learning for the achievement of participants. Conclusively, the comparison of performance for the overall scores showed that the interaction effect was statistically significant. The result also proved that the interaction effect for the experimental group was moving upwards substantially from the first week to the tenth week compared to the control group which showed a very little difference in the test scores. The analysis was then expanded to the four categories of question, which were GLQ, TSQ, LSQ and T&LSQ. The analysis showed that the interaction effect for TSQ, LSQ and T&LSQ was statistically significant. Only GLQ showed a non-significant interaction effect. This was due to the background of the participants in this study. The participants in this study were students who enrolled in logistic programme. Hence, they have already frequently been exposed to the domain of general logistic during their period of study. Although only one category showed a decline in the test scores, the other three categories showed otherwise; i.e. the experimental group showed a better result than the control group. Even If the results did not support the effectiveness of empowering learning of general logistics in the context of sea transportation,

it did provide a slight improvement from the normal post-learning activities. Therefore, this study supports the usage of 'The Shipping Management Game' as a medium for post-learning activities on shipping management.

Conclusion

This study found that the use of a board game as a game-based learning tool for learning shipping management in higher education produced greater gain in cognition. The use of board game in game based-learning practise helps to bridge the gap between theory and practice which is highly acclaimed by most management education. Accordingly, this paper makes several contributions. Firstly, it highlights the gap between the traditional shipping management education and shipping management practice. Based on the simulation from the board game, this study provides a platform for hands-on scenario that assimilates the concept and strategies discussed in lecture. Secondly, this study provides empirical evidence that the game improved students' understanding of course material, serving as an alternative tool for educators. Board game is able to provide a transparent learning space for students to conduct experimentation of their judgement with the challenge and problems from the game play which sparks learning towards apprenticeship. Additionally, it motivates players to compete among each other to become the winner in each game session. Therefore, the practise of playing the board game can be considered as a practise of managing a shipping company which able to drive the management skills of players towards mastery. It should be noted that the finding of this study only relates to cognition. Further research might be useful towards knowledge retention of the content; in which to determine the impact of learning whether students really know the content, or it was just a mere guessing. Additionally, the board game would also be a valuable alternative to profile the students. As such, the analysis of the actions taken by players during each turn and the pattern of decisions made by students determine whether the students were goal driven, risk taker, risk avoider, or he or she belongs any other classification.

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