

The Use Of Minecraft Education Edition As A Gamification Approach In Teaching And Learning Mathematics Among Year Five Students

Goh Kok Ming

Abstract- The purpose of this study is to test the effectiveness of using Minecraft Education Edition as a gamification approach in improving Year Five students' understanding and skills in learning the topic of probability. Minecraft Education Edition is integrated into teaching and learning process to help students understand and determine the probability correctly. Using the Minecraft Education Edition is one of the gamification approaches to make learning delivery more interesting. The selection of the respondents was based on the analysis of the document and the results of the diagnostic test for the lowest scores of students. This study respondent was consisted of three male and a female student of Year Five. This study instruments were consisted of the Pre and Post-Test, observations, and topical exercises used to collect data. The data obtained is presented in the form of tables, graphs and performance improvements for data analysis purposes. The findings show that the use of Minecraft Education Edition successfully enhances Year Five students' understanding of the topic of Probability through gamification. The aim of the next study is to make improvement by conducting a quasi-experimental study.

Key Words - Minecraft Education Edition, Gamification, Mathematics, Probability

I. INTRODUCTION

Basic mathematical operating skills are lifelong learning skills that are important for children to face in the future. There are researchers who claim that basic mathematical operations can be easily solved using calculators. However, these computational tools do not provide children with the confidence and basic skills to deal with future challenges.

Hamizi and Pumadevi (2010) state that there are researchers who use concrete materials to ensure that children master the probability concept correctly. However, it is found that some children cannot solve the add-on questions without using concrete materials. This learning problem becomes serious when children are required to answer additional questions that are High Order Thinking Skills (HOTS) involving probability concept. Hence, this issue caught my attention and prompted me to conduct an action research on the learning probability with Minecraft. As such, I took the initiative to create a learning world to help my students to learn probability effectively through gamification process.

Students are now in the learning era known as Edutainment era when the advent of various games based

learning such as SimCityEDU, Math Blaster and Minecraft (Farber, 2015). Toppo (2015) states that Minecraft is a popular game-based learning among pupils as well as parents' choice (Asselstine et al., 2015). In this regard, the study of Rohwati (2012), Sayed Yussof, Tan and Muhammad Zaffwan (2013), Farozi (2016) and Prasetyo (2016) has shown that the gamification approach has a positive and positive effect on student learning. Therefore, researchers have taken the initiative to use the Minecraft gamification application as an alternative learning approach to enhance students' understandings of probability.

II. PROBLEM STATEMENT

This learning about problems concerning probability contributes to the quality of mathematical reasoning, encourages students to think mathematically about everyday problems, stimulates pupils' interest and desire for study mathematics, and increases their attention and concentration. Based on teaching experience, the researcher was entrusted to teach the topic of Probability for Year 5 students. Five students were identified who have problems with their focused skills through observation and review of the students' worksheets. Students could not be able to apply the probability concept in answering daily life questions. There were different opinions among researchers about early learning of probability. Some of them had opinion that it is important for children learn and master probability concept in early school years, while others do not share such opinion (Tsakiridou & Vavyla, 2015). Hence, this situation prompted me to integrate Minecraft as a gamification tool in teaching and learning probability among Year Five students.

III. RESEARCH OBJECTIVE

1. Enhance understanding of Year Five students in probability through the use of the Minecraft gamification application.

IV. LITERATURE REVIEW

Probability is a particular measure, a function that maps set of events into a real interval $[0,1]$, which means that it assigns a number to the event. It is difficult to explain appropriately to children in primary school. Many students in secondary school find it difficult to understand concept of probability. If they have basics knowledge about probability in primary school, they would have strong mathematical foundations and they will understand complex concepts in

probability. As we can see, probability connects many areas of mathematics for example algebra, set theory and functions and so on. Thus, with strong mathematical foundation, children will have strong learning capacity to learn complex mathematics. Clements, et al. (2013) stated that mathematical thinking is cognitively foundational, and children's early knowledge of math strongly predicts their later success in math.

The importance of introducing probability at an earlier age is recognised by Bryant and Nunes (2012). In their research, they conclude that research on learning probability in primary school requires attention and time. Gurbuz, et al. (2010) show that children who were provided with discussion between pupils and teachers performed better than those children who were provided with traditional approach. The concrete experience helps children understand probability concept if they gain experience via experiment (Andrew, 2009). HodnikCadez and Skrbe (2011) support that concrete experience helps children to develop their understandings of probability and apply it in real-life situation.

Booth and Newton (2012) and Huinker (2002) state that learning methods need to be modified. The application of Minecraft gamification has been proven to be one of the most effective digital games-based learning in student academic achievement (Ellison, Evans & Pike, 2016). Integration of ICTs based on gamification in this method can structure ideas and strengthen students' conceptual and procedural understanding of probability. students need to be given the opportunity to learn the volume topic by using the Minecraft gamification app to build visuals before the calculations are translated into abstract forms (Hodges & Hunger, 2011; Shin & Diane, 2013). Based on the situation, the researcher took the initiative to develop a gamification-based method to create an exciting and enjoyable PdPc process for students in the school. Therefore, students' knowledge and skills can be improved through this method.

III. METHODOLOGY

This study is an action research and it cannot be fully generalized as it is limited to specific contexts. This study was based on Kurt Lewin's model (1946) which consists of four phases in a cycle. The phases introduced in this model have been implemented. In this study, the application of Minecraft gamification was used as an intervention to help respondents improve their understanding and skills in probability during the action phase. The data collection process is done after the action phase with the study instrument including paper and pencil tests, observation checklists and document analysis checklists. The data collected has been analyzed and interpreted in graphical form. Thus, the objectives of the study can be determined whether or not it is achieved based on the findings of the study.

IV. FINDINGS

Paper and Pencil Test

The first research instrument used was the paper and pencil test which included the Pre and Post Examination to assess the respondents' achievement in understanding Probability. The results obtained are as shown in Table 1:

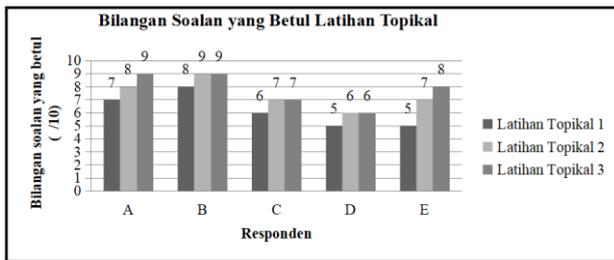
TABLE 1 COMPARISON OF THE RESULTS OF THE PRE AND POST-TEST

Bil.	Responden	Ujian Pra		Ujian Pasca		Perbezaan Bilangan Soalan Betul Ujian Pra dan Pasca (/10)
		Bil. Soalan Betul (/10)	Gred	Bil. Soalan Betul (/10)	Gred	
1.	A	3	C	10	A	7
2.	B	2	D	9	A	7
3.	C	2	D	7	A	5
4.	D	0	E	6	A	6
5.	E	1	E	9	A	8

The analysis showed that there was an increase in respondents' performance in terms of the number of questions answered correctly. In the Pre Test, it was found that most of the respondents achieved poor performance with less than 4 questions answered correctly. Only 1 respondent answered 3 questions correctly and 2 respondents answered 2 questions correctly. Followed by 1 respondent answered 1 question correctly and 1 respondent did not answer any questions correctly. For the Post Examination, respondents were found to achieve better performance and showed significant improvement in the number of questions answered correctly. Based on Table 1, it was found that Respondent E was the most successful respondent, with 8 questions answered correctly. Respondent A and Respondent B showed the difference between the same Pre and Post-Examination of which 7 questions were answered correctly. Respondent D and Respondent C answered 6 questions and 5 answered correctly.

Analysis of Topical Exercises

During the intervention, the researcher also conducted a document analysis of the respondents' topical training with the aim of reviewing and examining the respondents' remedial measures after the intervention. The analysis of this document is intended to enable the researcher to identify the patterns of achievement of the respondents throughout the duration of the intervention and to assist the researcher to better understand the mastery of the respondents' skills. The results obtained are shown in Figure 1.



Based on Figure 1, it is found that Respondent A and Respondent B are showing best achievement by answering 9 topical training questions correctly and right. The other respondents also showed positive performance and gradual increase in scores. Improvement in Respondent E's achievement. Respondent C and Respondent D can be shown in Figure 1, which is eight (8) questions, seven (7) questions followed by six (6) questions (Topical Exercise 3). Overall, the improvement in the performance of all the respondents was positive and showed that they were further understanding of the probability concept with Minecraft.

V. DISCUSSION AND CONCLUSION

The implementation of systematic teaching and learning sessions will bring a positive effect on learning of probability concept. Minecraft is one of the most popular gamification games used to support the teaching and learning process (Makuch, 2014). Based on the findings of the study, it can be concluded that the use of the Minecraft gamification approach can assist low-achieving students in learning probability concept effectively. The findings of the study also support and achieve the objective of the study. Minecraft helps teacher to convey mathematical concepts easily and helps respondents learn (Braithwaite et al., 2017; Wu, 2011). Their researches have shown that gameplay such as Minecraft can positively impact students' abilities to master mathematical concepts and skills. The use of these gamification elements can help students cope with the difficulties they face as well as facilitate and speed up their task of solving. Minecraft can enhance students' confidence and curiosity as they work hard to complete the tasks provided in the Minecraft virtual world. In conclusion, the use of Minecraft Education Edition as a gamification approach can enhance Year Five students in learning mathematics.

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