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Trigo-Tricks (TT): Enhancing Mathematics Learning Via Online Games

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ABSTRACT

Gamification in mathematics is an interactive pedagogy that can be used to increase students' interests. In learning mathematical concepts like trigonometric topics, more interactive activities and engagement platforms are proposed to help the students' understanding. An online game called Trigo-Tricks (TT) was created so that students could play it and concurrently work through the games' questions. The aim of this study is to examine the students' interest in learning trigonometric topics which are found to be difficult for them to understand using Trigo-Tricks (TT). This Trigo-Tricks (TT) is designed using the Buildbox platform and it is integrated with trigonometric concepts. A sample of 45 sciences students in the Centre for Foundation Studies, International Islamic University Malaysia (CFS IIUM) will be selected for this study using purposive sampling technique. Overall, the findings support that gamification in mathematics gives a better learning environment and is suitable to be used as educational tools. Students are more likely to explore new learning methods for understanding subject matter compared to traditional methods. For commercialization, this game can be introduced and utilized by all institutions that offer pre-university programme. The game is practical, and it is easy to be accessed by students. As a conclusion, Trigo-Tricks (TT) provides an advantage for students such as increasing the students' interest and understanding in learning Mathematics.

Keywords: Gamification in mathematics; Students' interest; Pre-University programme; Interactive learning.

1. INTRODUCTION

The most popular method of teaching nowadays is game-based learning activities. Based on Trybus (2015), game-based learning is the process of incorporating specific game concepts into real-world situations. It's considered as one of the interactive methods that can enhance creativity in learning (M. Khatibi, 2021 & M. Kalinauskas, 2014). Besides, it is an instructional strategy that allows teachers to draw students' attention to various game elements so they can learn and apply particular abilities in real-world contexts (Fu et al., 2006; 2009). Why game-based learning? Because, based on Willis (1996), games will introduce the player to four main criteria during playing that are language used, motivation, exposure and teaching. It is not easy to design interesting game-based learning which suits the learning objectives. It was designed as such to make sure that through learning and playing, students can have a deeper understanding about the topic (Kirstavridou et al., 2020). Gamification is one of the game-based learning and it is a trend nowadays. It was accessible through smartphones, tablets, computers, laptops, televisions and others at anytime and anywhere. Numerous studies have been done to test the

effectiveness of gamification in education. Based on Buckley & Doyle (2014), it gives positive influence and motivation on student achievement. Moreover, Xu & Hamari (2022) proved that gamification can increase someone’s creativity. Referring to Kuo-Wei, L. (2023), their study of the implementation of gamification using six teaching methods shows that it enhanced students’ creativity, communication skills and collaboration. It also stimulates their motivation, attitudes and learning interests. Thus, Trigo-Tricks (TT) was created so that students could play it and concurrently work through the games’ questions. The main objective of this study is to determine the students’ interest in learning Trigonometric topics using Trigo-Tricks (TT).

2. METHODOLOGY

Trigo-Tricks game was developed using Buildbox software. Ideation was the first step in designing and developing the game. It involved the idea of how to ask the question while students are playing the game and integrating the gamification concept with learning the subject matter.

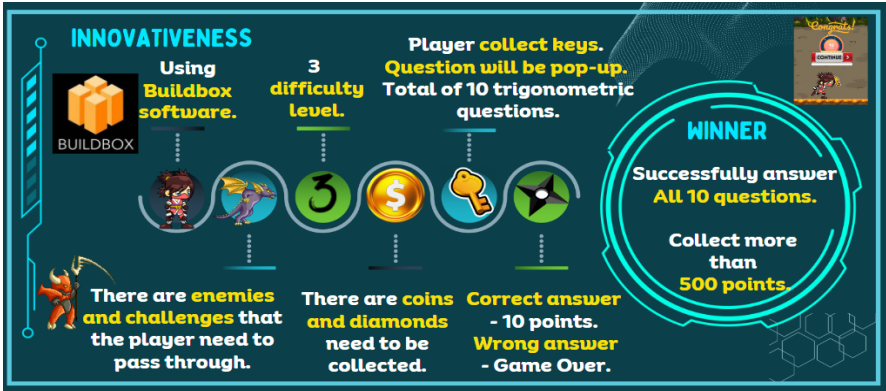


Figure 1. Trigo-Tricks Game illustration.

Based on Figure 1, the main character (Ninja Girl) will start to run and jump to collect the rewards in terms of coins and diamonds. The main character needs to face challenges such as enemies (dragon with fire and monster) and different geographical landmarks such as elevated blocks, rivers, holes, boxes, high cliffs and the most important landmark is the keys. Once the main character gets the key, the question will appear, and the players (students) will answer the pop-up question. If the player answers correctly, the player will resume playing the game or else, the game is over.

The next step was called plan engagement. The developers will choose where to find the characters, objects, enemies, challenges, rewards and sound effects. Platform chosen to design the game is Buildbox software. There is no prior coding or design skill required to design a game using Buildbox software. It uses only drag and drop creations or objects into the game world. The mid-map will link all of the actions that must appear in the game.

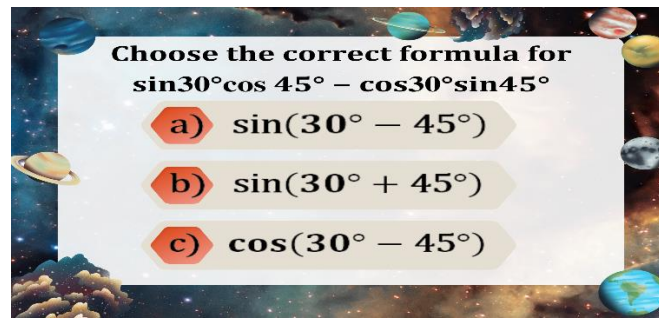


Figure 2. Trigonometric questions in the Trigo-Tricks game.

Figure 2 shows a question from the topic Analytic Trigonometric was included in the game for students to answer while playing the game.

3. RESULTS AND DISCUSSION

3.1 Descriptive Analysis

By using 17 items in the adapted survey form, descriptive analysis was done using SPSS to measure the mean score of the Motivation for Learning and Effectiveness constructs.

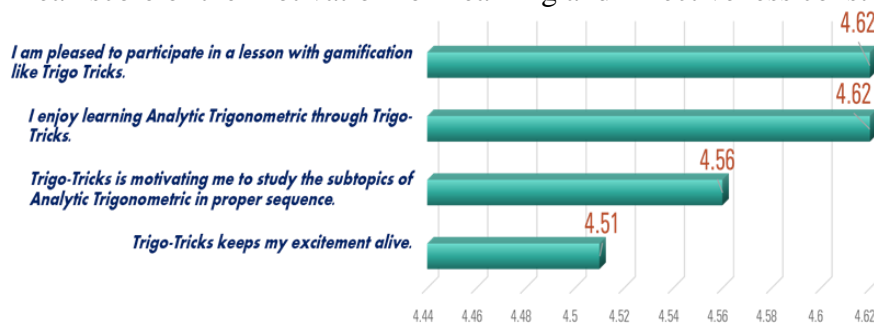


Figure 3. Mean Scores for Motivation for Learning.

Based on Figure 3, the item “I am pleased to participate in a lesson with gamification like Trigo-Tricks” has a mean score of 4.62 while the item “Trigo-Tricks keep my excitement alive” has a mean score of 4.51. In addition, the other mean scores for Motivation items were nearly 5 scores which indicates the students agreed with the Trigo-Tricks gamification may help to motivate themselves to learn trigonometric topics.

3.2 Inferential Analysis

The Mann-Whitney U Test was used to compare the distribution of the Motivation and Effectiveness construct between the gender.

Table 1. Mann-Whitney U Test results.

Constructs	N		Mean Rank		p-value
	Male	Female	Male	Female	
Motivation	26	19	19.38	27.95	0.030*
Effectiveness			18.90	28.61	0.013*

*Significant at 0.050 level.

Based on Table 1, it showed that at the 5% significance level, there is a significant difference between the distribution of construct Motivation between male and female. Similarly, under construct Effectiveness, the difference is significant between both genders. Hence, this gamification gave students' perceptions and experiences of differences between both genders.

4. CONCLUSION

As a conclusion, Trigo-Trick game offers a huge milestone in interactive and engaging learning experiences. This innovative platform incorporates technology to make trigonometry more accessible and additionally impacts the way students perceive and approach mathematical topics. The adaptability and user-friendly interface of Trigo-Tricks cater to diverse learning styles, ensuring that students of various abilities can benefit from this online game. Overall, the findings support the idea that gamification in mathematics will lead to a better learning environment and are suitable to be used as educational tools. Students are more likely to explore new learning methods for understanding subject matter compared to traditional methods. For commercialization, this game can be introduced and utilized by all lecturers from other institutions.

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