GEOGRAM: LEARNING THROUGH PLAY

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ABSTRACT

The mathematical study of shapes and space is known as geometry. In order to solve problems involving geometry, students should be able to know the formulas for the basic shapes and spaces. Problems with calculations will arise due to a lack of knowledge and awareness of skills in calculating and identifying basic geometry's formula. The purpose of this GeoGram is to provide an edutainment experience for students to review and improve their knowledge of basic geometry formulas. We want to make a game that will teach students simple and rapid self-learning tactics that they may use at any time. We used a PowerPoint spinning-wheel created by tekhnologic and a tangram created by mathigon as a game platform. We modified the spinning wheel by including a task for the player to perform. The geometry's formula is also visible near the spinning wheel. After spinning the wheel, the player must accomplish the objective of creating a diagram using the tangram platform by applying the formula provided. The use of GeoGram, which has an edutainment component, will aid students in improving their familiarity of geometry's formulas. GeoGram can be utilised in STEM programmes involving secondary school and higher education students. This is because they can see how mathematics is used in their lives and surroundings, and students' knowledge and enthusiasm in mathematic subjects will grow. This is due to the GeoGram's development considering learning theories, as well as an awareness of students' requirements and interests.

Keywords: Geometry's formula, edutainment, learning through play, self-learning.

1. INTRODUCTION

Students have a variety of misconceptions, a lack of prior knowledge and basic operation errors in the topic of geometry [1]. Learning geometry has become one of the most difficult subjects for students because it requires students to have strong cognitive abilities as well as spatial skills [2]. They are also weak in their understanding and applications of geometric concepts [3]. Thus, we created a product called GeoGram to assist students resolve this issue. The goal of this GeoGram is to give students an edutainment experience in which they can refresh and improve their basic geometry formula knowledge. We want to provide a game that teaches students quick and simple self-learning strategies that they may utilize at any time.

GeoGram is developed using PowerPoint software. It combines the use of spinning-wheels in PowerPoint created by technology [4] and tangram on mathigon's website [5]. The use of spinning wheels as a teaching aid is common. For example, [6] and [7] in their studies also used the spinning wheel as a teaching aid tool. [8] found that the spinning wheel that had been used as a tool was effective. They found that using Van Hiele learning theory and spinning wheel media could attract students' interest in the learning process, resulting in better conceptual understanding. The spinning wheel media could improve from the level of visualisation thinking to the level of analytical thinking in students.
The selection of a tangram in the development of GeoGram is because it is a STEM learning tool that helps children as young as pre-school, develop a variety of important STEM skills [9]. They can also

be used by teens. Tangram provides a simple concept with powerful brain growth benefits. Tangram assists students in developing problem-solving skills as well as geometrical concepts [10].

2. PRODUCT DEVELOPMENT

A PowerPoint spinning wheel produced by tekhnologic and a tangram created by mathigon were utilised to create a game platform. We modified the spinning-wheel by displaying the basic geometry formula on the spinning-wheel. Figure 1 shows the process of development of the GeoGram. We blended the basic geometry formula, the PowerPoint spinning-wheel and the tangram together.

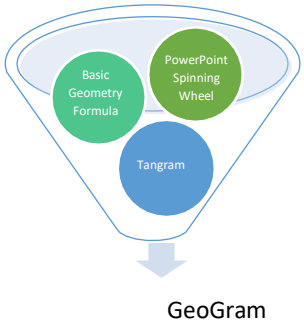

Figure 1: The Process of development of the GeoGram

3. PRODUCT DESCRIPTION

The formulas for geometry are shown near the spinning wheel. After spinning the wheel, players must use the formula provided to complete the goal of building a shape utilising the tangram platform. Figure 2 shows the user manual of the GoeGram. Players can refer to the steps that mentioned in this user manual before they proceed with the game.

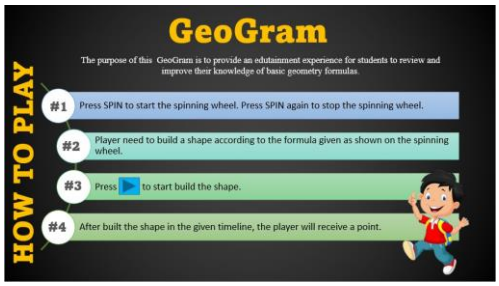

Figure 2: User Manual of the GeoGram

As shown in Figure 3, the basic geometry formula can also be seen near the spinning wheel. It will help players to remember the basic geometry formula. After spinning the spinning-wheel, players must construct a shape using the number of shapes and formulas specified on the spinning-wheel. If players are unable to identify the formulas, they can refer to a list of formulas displayed on the same screen.

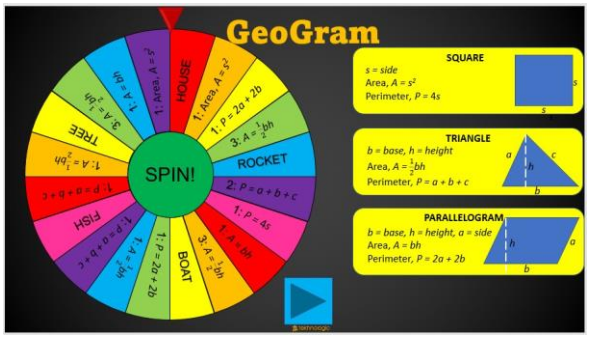

Figure 3: Spinning-Wheel of the GeoGram

To reach the tangram website, players must press the play button. Figure 4 shows the Mathigon Website, the platform to play the tangram in online mode.

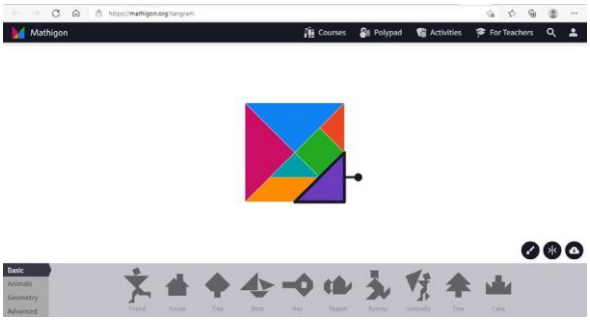

Figure 4: Mathigon Website

For example, if the spinning-wheel lands on a house plot, players are suspected of constructing the house's shape using one square, three triangular and one parallelogram, as shown in Figure 5.

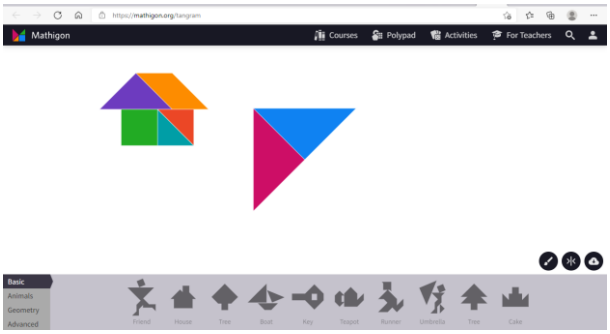

Figure 5: The Development a House using One Square, Three Triangular and One Parallelogram

4. NOVELTY AND UNIQUENESS

GeoGram includes an edutainment element, which is learning through play. Students' knowledge of basic geometry formulas and creativity in building a two-dimensional shape are blended in GeoGram. The combination of games encourages students to complete the overcoming challenge to improve their performance in the activities, making learning more enjoyable. Students appreciate completing the game since it allows them to work out their creativity.

5. PRODUCT SATISFACTION

A total of 25 people were chosen and participated in this study. According to the results of the pre-test and post-test as shown in Figure 6, students are better able to solve basic geometry applications after being introduced to the GeoGram.

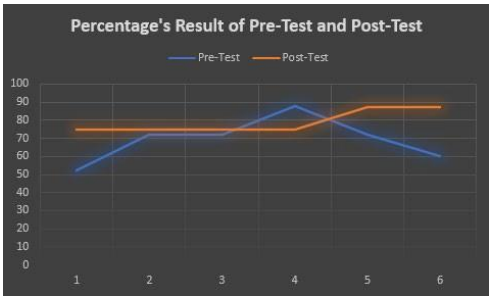

Figure 6: Percentage's Result of Pre-Test and Post-Test

6. BENEFIT TO MANKIND

Students will benefit from using GeoGram, which has an edutainment component. GeoGram helps to improve their understanding and ability to remember basic geometry formulas. Students' understanding and interest in mathematical subjects will grow as they see how mathematics is employed in their daily lives and surroundings.

7. POTENTIAL COMMERCIALIZATION

GeoGram can be used in STEM programmes involving students in secondary and higher education. STEM is important because it instills a love of innovation and teaches critical thinking skills. STEM education teaches students how to solve problems through critical thinking. Students learn how to examine problems and then devise solutions by participating in STEM learning experiences [11].

8. CONCLUSION

Learning through play helps students to improve their performances and this will make the learning more fun. They also enjoy completing the task because they can polish their creativity. GeoGram will sharpen students' skill in memorizing the basic geometry formula. This result aligns with the research done by [12]. They found that the students in the experimental group had developed a better attitude toward geometry.

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