e-ISBN : 978-967-25608-3-8
SIG : e-Learning@CS
https://appspenang.uitm.edu.my/sigcs/
Publication Date : 15 – Apr - 2022

GEOGRAM: DIGITAL GAME-BASED LEARNING TOOL FOR IMPROVING BASIC GEOMETRIC KNOWLEDGE

*Rafizah Kechil[1], Azlina Mohd Mydin[2] and Wan Anisha Wan Mohammad[3]
**rafizah025@uitm.edu.my[1], azlin143@uitm.edu.my[2], wanan122@uitm.edu.my[3]*

[1,2,3]Jabatan Sains Komputer & Matematik (JSKM),
Universiti Teknologi MARA Cawangan Pulau Pinang, Malaysia

ABSTRACT

Geometry refers to the mathematical study of shapes and space. Students should be able to memories the formulas for the basic shapes and spaces in order to solve geometry problems. Calculation problems will arise due to a lack of knowledge and skills in identifying basic geometry's formula. The goal of the development of GeoGram is to provide students with an edutainment experience in which they can review and improve their knowledge of basic geometry formulas. We designed a game to teach students simple and quick self-learning techniques that they can use at any time. As a game platform, we used a PowerPoint spinning-wheel created by tekhnologic and a tangram created by mathigon. We modify the spinning wheel by adding a task for the player to complete. After spinning the wheel, the player must complete the goal of creating a diagram using the tangram platform by using the provided formula. GeoGram, which includes an edutainment component, will assist students in improving their understanding of geometry formulas. Based on the results of a pre-test and a post-test, students are better able to solve basic geometry applications after being introduced to the GeoGram.

Keywords: geometry, game-based learning, spinning-wheel, tangram, self-learning

Introduction

Students have a number of misconceptions, a lack of prior knowledge and basic operation errors in the topic of geometry (Özerem, 2012). Geometry has become one of the most difficult subjects for students to learn because it requires students to have strong cognitive abilities as well as spatial skills (Buchori et al., 2017). They also lack understanding and application of geometric concepts (Carroll, 1998). As a result, we created a digital game-based learning tool called GeoGram to assist students in resolving this issue. The purpose of this GeoGram is to provide students with an edutainment experience in which they can refresh and improve their basic geometry formula knowledge. Geogram is a digital game that teaches students quick and simple self-learning strategies that they can use at any time.

GeoGram is created using the PowerPoint software. It combines the use of spinning-wheels in PowerPoint developed by tekhnologic's (2018) and tangram on mathigon's website (2022). A spinning wheel is commonly used as a teaching tool. Botelho et al. (2019) and Beck & Gong (2013) used the spinning wheel as a teaching aid in their research. Deddiliawan et al. (2019) discovered that the used of spinning wheel as an educational tool, was beneficial. They discovered that using spinning-wheel element could help students become more interested in the learning process, resulting in better conceptual understanding. Students' visualisation and analytical thinking skills may enhance.

Tangram was used in the development of GeoGram because it contains a STEM learning tool. The use of tangram helps preschool-aged children develop a variety of important STEM skills (Brewer, 2020). Tangram can also be used by teenagers. Tangram is a simple concept with profound brain-growth implications. Tangrams aid in the development of problem-solving abilities as well as geometrical concepts (Shofan, 2014).

Methodology

Development Process

A tangram created by mathigon and a PowerPoint's spinning wheel created by tekhnologic were used to create a game platform. We change the spinning-wheel by displaying the basic geometry formula on it. Figure 1 depicts the GeoGram development process. The basic geometry formula, the PowerPoint's spinning-wheel and the tangram are all combined.

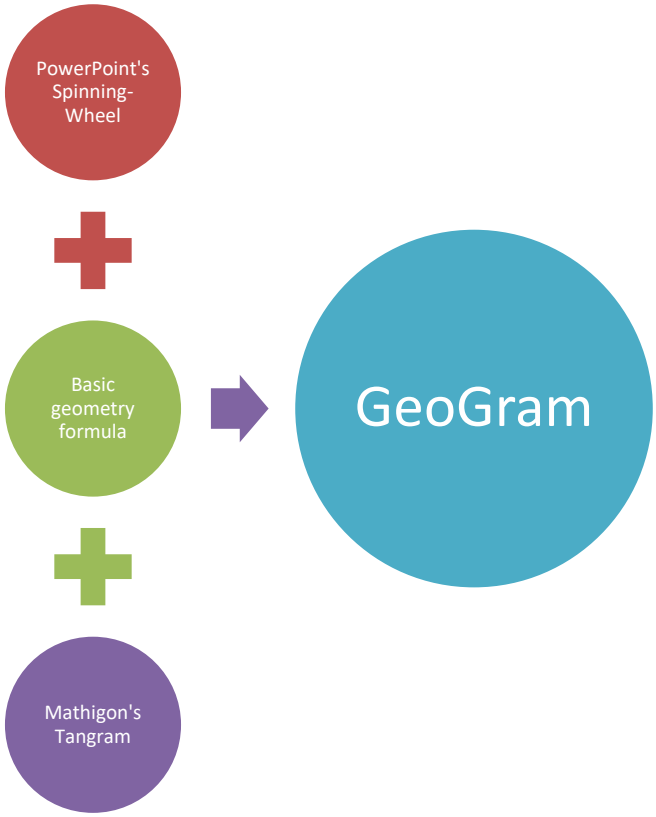

Figure 1: Development process of the GeoGram

GeoGram Elements

An instruction manual or user manual can be displayed on the first page of GeoGram. It will assist players in understanding the method to play quickly or when they become stuck. Figure 2 shows the user manual of the GeoGram.

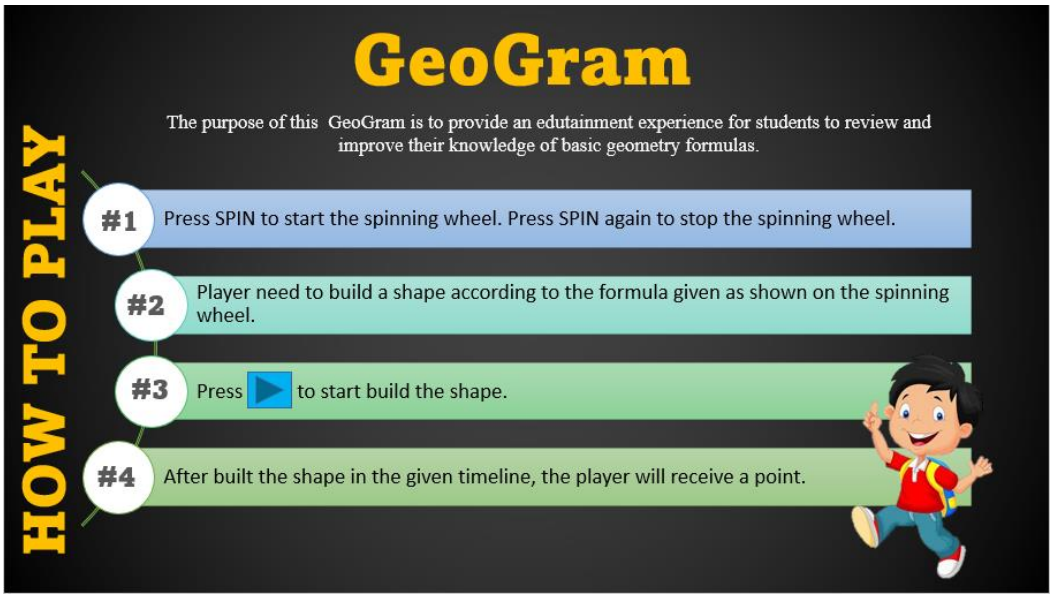

Figure 2: User manual of the GeoGram

The basic geometry formula can be seen near the spinning wheel, as shown in Figure 3. It will aid the player in recalling the basic geometry formula. The player must construct a shape after spinning the spinning-wheel using the number of shapes and formulas specified on the spinning-wheel. If players are unable to identify the formulas, they can refer the formulas in a list displayed on the same screen.

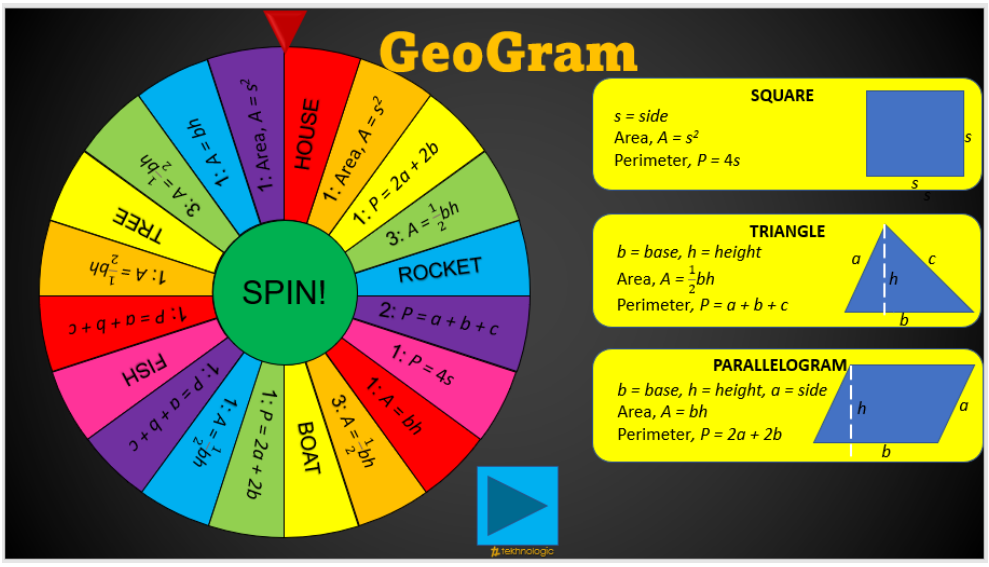

Figure 3: GeoGram interface

Players must press the play button to get to the tangram website. Figure 4 shows the Mathigon website, the platform to play the tangram in online mode.

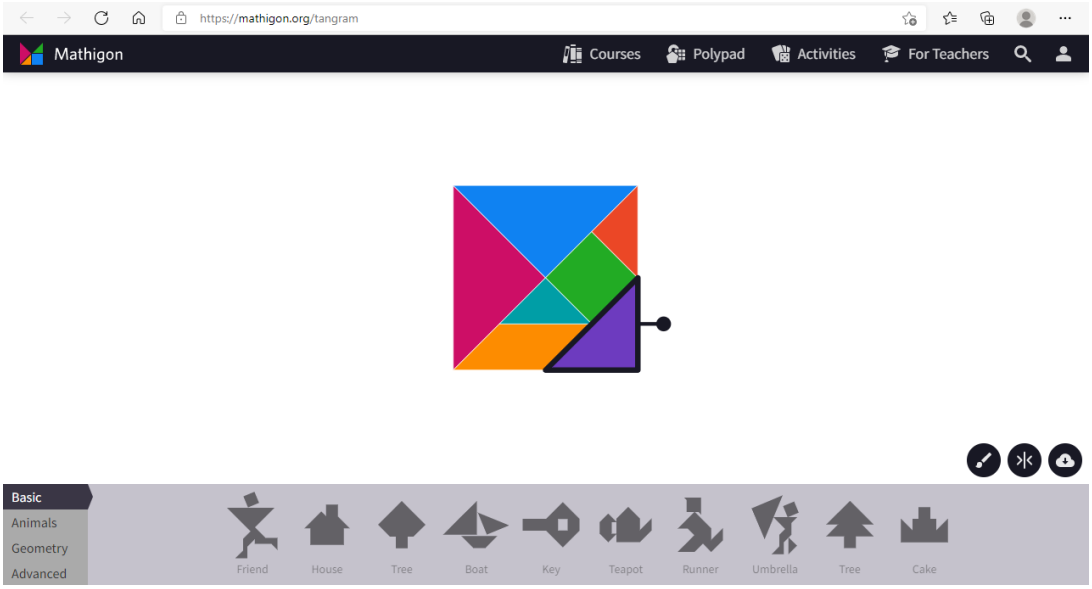

Figure 4: Mathigon website

Playing GeoGram

For example, if the spinning-wheel lands on a house plot, the player is suspected of building the house with one square, three triangular and one parallelogram, as shown in Figure 5.

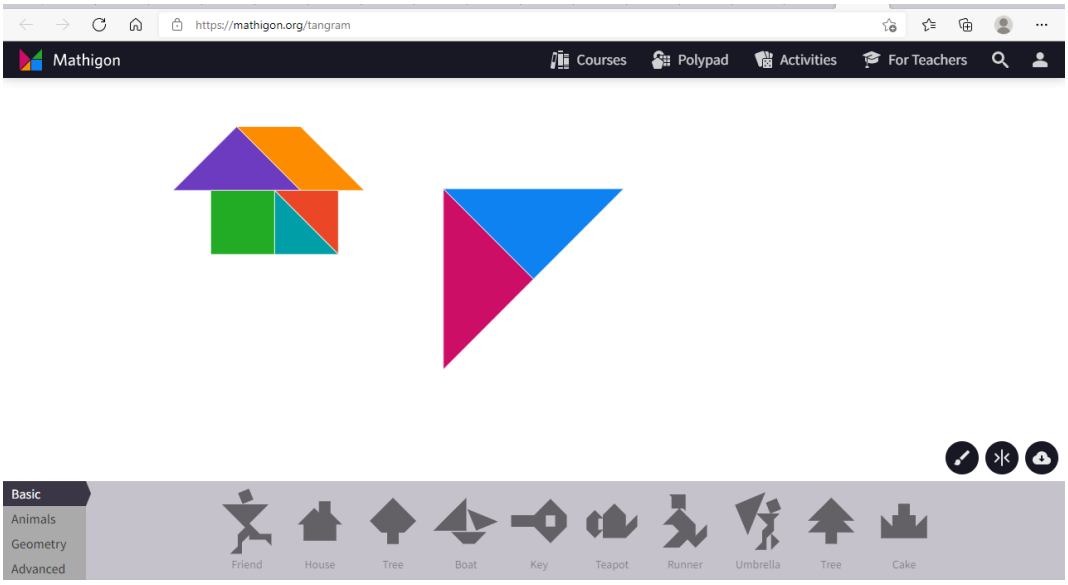

Figure 5: Sample of building a house

Result and Discussion

A total of 25 Pra Pendidikan Tinggi's students from UiTM Cawangan Pulau Pinang who is taking Intensive Mathematics 1 (MAT037) course for the semester, October 2021-February 2022 were participated in this study. Pre-test questions about basic geometry are assigned to students. The students are then instructed to play GeoGram. The deadline for them to play GeoGram is in two days. After two days of playing the GeoGram game, students are asked to complete a post-test. Figure 6 shows the pre-test and post-test questions that were distributed to students via Google Form.

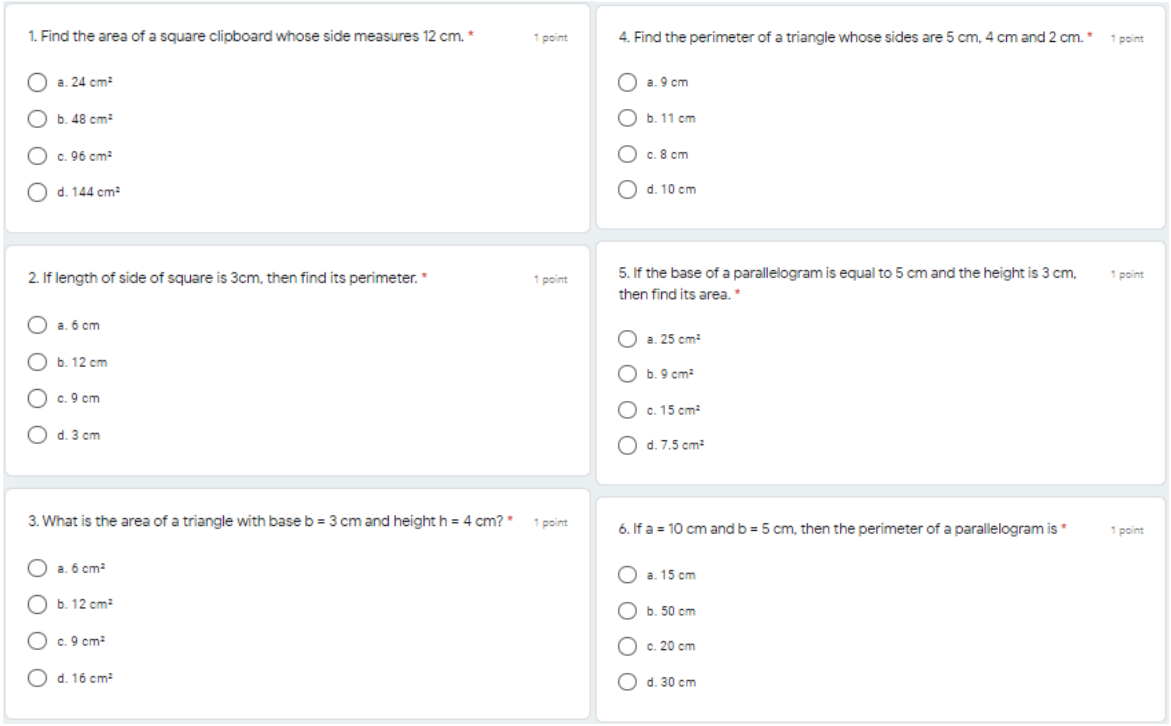

Figure 6: Pre-test and post-test's questions

According to the results of the pre-test and post-test as shown in Figure 7, students are better able to solve basic geometry applications after being introduced to the GeoGram.