



PrismAR: A mobile Augmented Reality Mathematics Card Game for Learning Prism

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Abstract: Mathematics education has benefited from the increase in popularity of augmented reality (AR) technology. However, no game-based AR application has been developed specifically for prism topic. This paper aims to report PrismAR app that we have developed. It has interactive exercises and quiz and shows the prism's edges and vertices, in 2D and 3D views. This project aims to assist primary 3 students (9 years old) in developing their mathematical abilities and making prism mathematical concepts more interactive. An exploratory study design was used to evaluate the app with 20 students from a Malaysian school. We wanted to ascertain their degree of approval for the app's design, learning content, user interface, and interactivity with the augmented reality card game teachers. Overall, the assessment returned an average mean of 4.98, which was interpreted as 'highly acceptable.' The pre-test mean result is 12.6 (S.D. = 2.012), while the post-test mean result is 14.6 (S.D. = 1.789). The results indicate that using an augmented reality-based card game could be a successful method for increasing students' mathematics competence. This study serves as a call to action for potential developers and educators to improve AR integration in math education in the future.

Keywords: Math education, E-learning, Students, Serious games, Game-based learning

1. INTRODUCTION

As the age of digital learning has evolved, augmented reality (AR) has grown in popularity. Although AR incorporate virtual objects into the real world, virtual reality incorporates a physical object into the virtual world. By overlaying digital content on top of the real world, AR will create new experiences [1]. AR is a powerful instructional technique that combines multiple instructional strategies to bolster the learning process [2]. With the rise in popularity of smart devices, the development of AR technology in daily life has accelerated dramatically. Using digital information such as graphics and sounds, AR is common for improving user experience. The growing popularity of AR applications with location awareness is a result of recent advancements in mobile technology [3].

The advancement of AR is being used in a variety of areas, including marketing, education, and gaming. A popular example of the emerging use of AR is the popular smartphone game 'Pokemon Go,' which has been downloaded by millions of people worldwide. This

demonstrates that the application of AR can capture the interest of people worldwide. With the rise in popularity of mobile devices, the development of AR technology as instructional media in facilitating learning has also grown [4]. AR has the potential to transform the way we think, read, and interact. Numerous educational games are already being developed.

However, as far as we concern, no game-based AR application is being designed for the prism topic in the Mathematics syllabus for standard three students in Malaysia. The prism subject requires that the prism's form be presented in three dimensions (3D). However, it can only be viewed in two dimensions (2D) via a typical textbook. As with the previous subject, students must be familiar with the sums of the corners and surfaces of each prism. As a result, the textbook's 2D visualisation makes it impossible for students to visualise the prism.

This project aims to assist primary 3 students (9 years old) in developing their mathematical abilities and making prism mathematical concepts more interactive. It is constructed using Augmented Reality (AR) technology,