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Exploring the Impact of Mobile Augmented Reality on COVID-19 Prevention Education in Primary Schools

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ABSTRACT

This study aimed to evaluate the effectiveness of an interactive mobile Augmented Reality (AR) game to increase the knowledge about COVID-19 prevention primary school students. We tested the application for usability and effectiveness through pre- and post-tests, questionnaires, and interviews. 12 participants from four states in Malaysia took part in the study. Their average age is 9.5 years old. Results indicated a significant improvement in student performance from the pre-test to the post-test, with a mean score has increased from 3.67 to 8.25. The average System Usability Scale (SUS) score was 75%. These findings show the effectiveness of our mobile AR application as a tool to increase the knowledge about COVID-19 prevention among primary school. The findings of this study contribute to the body of research on the use of AR in COVID-19 prevention education among primary school students. This study provides both theoretical and practical implications for educators, researcher and policymakers seeking to use mobile AR to support the prevention education of any future pandemic or infectious disease.

1. Introduction

COVID-19, also known as the coronavirus disease, is a viral illness caused by the SARS-CoV-2 virus that emerged in late 2019 and spread rapidly throughout the world. The COVID-19 pandemic has had a significant impact on all aspects of society [1], including education [2]. Meanwhile, mobile Augmented Reality (AR) is a type of mobile technology that allows users to view and interact with digital content in the real world. AR can create immersive and interactive learning experiences that enhance student engagement and learning outcomes.

Despite the increasing use of mobile AR, there is a lack of research on their effectiveness, particularly in COVID-19 prevention education [3]. To the best of our knowledge, this is the first study to examine the use of mobile AR technology for COVID-19 prevention education in primary schools in Malaysia. The findings of this study contribute to the limited body of research on the use of AR in primary school disease prevention education. The research question for this study is twofold:

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i. can an interactive mobile AR game be an effective method for educating primary school students about COVID-19 prevention?
ii. what is the effectiveness level of the developed interactive mobile AR game in delivering COVID-19 prevention educational content?

The aim of this study is:

i. to develop an interactive mobile AR game for teaching primary school students about COVID-19
ii. to assess its functionality and effectiveness in delivering COVID-19 prevention educational content.

We organised this paper as follows: Section 2 (Literature review) will provide an overview of existing research on the use of augmented reality in education, with a focus on its application in COVID-19 prevention education. Next, Section 3 (Design and development) will describe the design and development of our app. In the Methodology (Section 4), we will explain about the app evaluation and process. In the next section (Section 5), the results of the study will be discussed in relation to the effectiveness of the app. Finally, the Conclusion section (Section 6) will summarize the main findings and will suggest areas for future work.

2. Literature Review

The COVID-19 pandemic has highlighted the importance of innovative tools to support education. This includes mobile augmented reality (AR). AR has been used in various educational contexts to engage students and improve learning outcomes on various topics, such as mathematics [4], biology [5] and ICT [6]. One study evaluated the relationship between motivation and meaningful learning for students through mobile AR, as well as the effects and implications of its use in supporting teaching and learning. The results demonstrated a positive relation between mobile AR and the learning level achieved by students [7]. However, the effectiveness of AR in disease prevention has been the subject of debate, with mixed results reported in the literature. While some studies have found that AR can be an effective way to enhance student learning and engagement, others have found no significant differences in learning outcomes compared to traditional methods [8,9].

For COVID-19 prevention education, one study [3] developed a mobile application using AR to educate urban and rural communities on hand washing to prevent COVID-19 infection. The results indicated statistical significance for factors related to the hand washing technique. This suggests that mobile AR can be an effective tool for promoting proper handwashing techniques.

In addition, another study aimed to develop an AR learning model that could be accessed using smartphones to support online learning during the COVID-19 pandemic. The results showed that the AR learning model was useful for independent learning and motivated students to learn about COVID-19 [10]. Another study developed an AR game to teach primary school students about COVID-19 prevention [11]. The results indicated a significant improvement in student performance from pre- to post-test and a high usability score, indicating the effectiveness of the AR game in promoting COVID-19 prevention education. Meanwhile, *Escape COVID-19*. It is a serious game designed to promote safe behaviours among Health Care Workers (HCW) and hospital employees during COVID-19 pandemic [12]. Another mobile app is called “COVID-19–Did You Know?” It is a mobile serious game designed to bring scientific-based information on prevention and personal care about COVID-19 [13]. However, no AR is used in the development of the serious game.