

Development of an AR App to Improve Healthcare Students' Classroom Experience

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Abstract: Augmented Reality (AR) is one of the most promising digital health innovations today. In the medical field, it is increasingly adopted as technological advancement in healthcare since it holds promise as a robust teaching initiative in the said field. However, most of the initiatives are conducted and analyzed in the developed countries. Its application and adoption seem to be challenging in developing countries like the Philippines, which may be attributed to the limited applied research or financial capability. Findings from this research also show only the knowledge acquisition from AR apps being developed rather than the effects of its inclusion on healthcare. Thus, this study was initiated to develop an AR app as a tool to improve the students' classroom experience. Specifically, this study is conducted to investigate AR app usability and its effects on healthcare students. Based on initial findings, AR integration in the classroom could have significant effects on healthcare students and clinical instructors. However, the psychologists observed that there remain several challenges and issues on its use that we need to consider in the development and use of this app. Thus, when the entire qualitative methodology is completed, it is expected that an AR app will be developed based on the initial findings. This study is also expected to produce an AR app that can be used as a mobile-based tool in medical education to contribute to the improvement of the healthcare students' classroom experience despite being in a developing country.

Keywords: Healthcare technology, augmented reality, AR, education technology

1. Introduction

Augmented Reality (AR) is one of the most promising digital health innovations today. It is a technology that combines digital information with the real environment by overlaying visual, auditory, or other sensory information onto the real physical world in real-time to enhance one's experience (Marr, 2018). In the medical field where, technological innovations play a critical role in achieving their strategic visions (Ebardo & Tuazon, 2019; Ebardo & Celis, 2019), it is increasingly adopted as a technological advancement since it holds promise as a robust teaching initiative in the said field (Adapa et al., 2020) aside from its use in the actual diagnosis and operations.

When the US National Center for Education Statistics (2017) concluded that almost half of the students who are pursuing a healthcare degree in college change their major, the primary reason is that the coursework in science fields are tough (Saidin, Halim, & Yahaya, 2015), too abstract, some concepts can be hard to visualize, among others, which resulted them to get lost and experience difficulty in catching up the lesson. Thus, these drive the instructors to continuously hunt for new ways to improve performance and keep students interested (Khan, Johnston, & Ophoff, 2019; Suarez-Rivas, 2020). AR is the latest multimedia education trend that have been found to improve the student learning since it offers the collaborative learning type (Eh Phon, Ali, & Halim, 2014) that engages students, helps with the development of spatial skills (Cerqueira & Kirner, 2012) needed by the students to understand three-dimensional objects, and enables the student to be in the driver's seat and build understanding and confidence to learn on their own (Suarez-Rivas, 2020). It is also believed that AR implementation would be an effective learning methodology among healthcare professionals, healthcare students, even the patients, thus, its current state in health literacy needs more attention (Adapa et al., 2020).

Based on the technology readiness level assessment, AR technology is already beyond the testing phase, and its practical applications are becoming more prevalent (Eckert et al., 2019). However, most of the initiatives and studies are conducted and analyzed in the developed countries, such as United States, Germany, Japan, and France, to name a few. Its application and adoption seem to be challenging in developing countries like the Philippines, which may be attributed to the limited applied research (Pugoy et al., 2016) or financial capability. Moreover, it was found that several studies only focused on knowledge acquisition from AR applications (apps) being developed rather than the effects of its inclusion on healthcare (Wüller et al., 2019). Thus, this study is conducted to develop an AR application (app) as a tool to improve students' classroom experience in developing countries and contribute to the knowledge of AR implementation as a robust learning and teaching initiative in the medical field. Specifically, this study is conducted to investigate the AR app usability and its effects on healthcare students with their classroom experience.

2. Related Studies

The growth of AR adoption, together with Virtual Reality (VR), is expected because of technological advancements and digitalization in healthcare, amicable government initiatives, expanding usage of surgical procedures, and extensive medical training (Wüller, 2019). Additionally, the global healthcare AR and VR market is predicted to increase. In the Asia-Pacific region, the healthcare AR and VR market is predicted to increase from 205.9 million in 2018 to 2,353.9 million in 2025 (Stewart, 2021). Traditionally, medical-related activities like teaching, learning, demonstration, and actual medical care are performed in a clinical setting. Today, these activities have influenced technological advances for the improvement of outcomes, especially for patients (Munzer et al., 2019). Some departments of the medical institutions have been the early adopters for technology-based educational tools, such as simulation tools (Jones et al., 2015; Munzer et al., 2019). They are initiating the implementation of AR into their curriculum to provide valuable hands-on learning experiences to students. Some of them have already partnered with Microsoft to develop AR-based tools like HoloAnatomy, a HoloLens app, for the students to be able to visualize the human body easily and impressively (The Medical Futurist, 2019). In the Philippines, the Department of Education (DepEd) is presently harnessing different technology-based projects, particularly in maximizing AR, as part of the academe's new normal (Hani, 2021)

3. Preliminary Data

The Augmented Reality in the study is conceptualized based on Anatomy 4D app by EducationalAppStore Ltd. which allows the users to take a journey inside the human body, heart, skeleton, muscles, and the entire body systems. Nevertheless, the AR to be developed in the study is through in-house development for it to be open for improvement by the aspiring app developers and to save cost. It could have a higher chance of usability and AR integration in the classroom could have significant effects on the healthcare students and clinical instructors. However, there are still concepts that need to be clarified and to be studied to make sure that the AR is safe and appropriate to be used because, based on the initial findings from the psychologists' perspectives while observing the students' experiences based on a previous study by the author (Trapero et al., 2020), there remains several challenges and issues on its use that we need to consider in the development and use of the AR app. It is found to boost the students' motivation in the learning process since it stimulates and enhances their learning interests and serves as a beneficial tool for teachers in improving their teaching effectiveness. However, risks are also apparent specifically in social, visual, and motor development.

4. Future Work

This study is aimed to complete its proposed research methodology after the gathering of the preliminary data. This includes the development of an AR app based on the initial assessment described

in the previous section. The AR app will then go through usability and effectiveness assessment by conducting series of interviews and focus group discussions with the clinical instructors, resident doctors, and healthcare students. Qualitative data analysis will then be performed to formulate the findings, conclusions, and recommendations for the improvement of the app.

5. Expected Output

This study is expected to produce an AR app that can be used as a mobile-based tool in medical education to contribute to the improvement of the healthcare students' classroom experience despite being in a developing country. Specifically, this AR app is expected to assist in delivering quality and comprehensive medical-related lessons to the students regardless of whether the clinical instructor is teaching in a classroom or an online setting.

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