Chapter 2
A Systematic Review of Serious Games for Health Education: Technology, Challenges, and Future Directions

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ABSTRACT

Serious games offer an innovative blend of entertainment and learning in medical education. This chapter examines the technological underpinnings, challenges, and potential future developments in this domain. Drawing from publications between 2018 and 2023, this systematic review highlights the role of technologies such as web and mobile applications, game engines, augmented reality, virtual reality, mixed reality, and artificial intelligence in personalizing and enhancing the learning experience. However, the use of serious games in medical education also faces several challenges, including the need for adequate technological infrastructure, complex effectiveness assessments, and integration into existing curricula. Moreover, this chapter outlines projections for further research. The authors reveal how serious games have the potential to transform medical education to be more engaging, interactive, and effective, and inspire future research in the development of innovative technologies and learning methods.

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INTRODUCTION

The role of serious games in the health sector has attracted much attention in research in recent years (Wattanasoontorn et al., 2013). In the last decade, technological developments have driven significant changes in medical education, especially in the application of serious games (Tori et al., 2022). A game genre that combines entertainment and educational elements can provide unique opportunities for a challenging and interactive learning process (Arif et al., 2021). Serious games are an innovative approach that combines elements of games with the goals of education, training, or behavior change (Avila-Pesantez et al., 2019; (Hamari et al., 2016). In contrast to traditional games, which focus on entertainment, serious games are designed to provide an interactive and exciting learning experience (Arif et al., 2020). This approach has the potential to improve understanding and knowledge retention in a fun and dynamic way. With the right design, serious games can adapt a variety of subject matter and present it in a context that is interesting to users. This condition makes serious games a very flexible tool in education and training. Its use has spread to various sectors, from schools to professional training (Nurhayati & Arif, 2023).

The benefits of serious games are very diverse and significant, including increased learning motivation, increased knowledge retention, and a more active and interactive learning experience. Its implementation can be found in various fields, such as education (Arif & Nurhayati, 2022), health (Damaševičius et al., 2023), military (Mun et al., 2017), tourism (Arif, Nurhayati, et al., 2023), and business (Beranič & Heričko, 2022). In the military, for example, serious games can simulate realistic combat situations for training. In business, serious games can help in training management and leadership skills. Meanwhile, these games can be used in the health sector for patient education or medical training. The technology used in serious games is diverse and continues to develop, ranging from personal computer platforms and game consoles to mobile technology (Devraj et al., 2021). Virtual and augmented reality technology is also starting to become commonplace in creating serious games, providing a more immersive learning experience (Lu et al., 2022; Strada et al., 2023). This ability allows players to truly experience and interact with the learning material in a way impossible with traditional methods. This technology also allows developers to create highly realistic and detailed scenarios. This condition can help depict complex or abstract concepts in a form that is easier to understand. Overall, the technology used in serious games provides excellent potential for innovation in how we teach and learn.

Artificial intelligence (AI) is essential in developing serious games (Eun et al., 2023). AI can be used to make in-game characters and scenarios more realistic and provide challenges that suit the user's abilities and needs (Arif, Nurhayati, et al., 2023). For example, AI can adjust a game's difficulty level based on a player's progress, providing just the proper challenge to ensure an optimal learning experience. AI also enables the development of dynamic and responsive content to player actions so that each gaming experience is unique and personal (Arif, Putra, et al., 2023). In an educational context, serious games offer an exciting alternative to traditional learning methods (Arias-Calderón et al., 2022). Students can not only gain new knowledge but can also interact directly with learning material. This ability can help them understand intricate and complex concepts better. In today's digital era, the younger generation is often more connected to technology and digital media. These conditions cause serious games in education to offer a more relevant and exciting approach (Arif, Novriantama, et al., 2023). Additionally, using games in teaching also helps reduce the stress and anxiety often associated with formal learning, making the learning process more enjoyable. Thus, serious games can be a very effective tool in increasing student engagement and learning outcomes.