Chapter 5
Educational Virtual Reality (VR): Revolutionizing Future Academic Practices

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ABSTRACT

Virtual reality (VR) is an immersive technology that simulates three-dimensional environments, allowing users to interact with virtual worlds through specialized hardware and software. This chapter explores the evolution of VR, its applications in education, and the integration of artificial intelligence (AI) to enhance user experience. VR's immersive capabilities foster active learning by enabling students to engage with content in ways that traditional methods cannot replicate. Theoretical foundations such as constructivism and experiential learning support the use of VR in educational settings, while practical applications include virtual field trips, simulations, and language learning environments. However, challenges such as high costs and potential accessibility issues must be addressed. This chapter concludes by emphasizing the need for ongoing research and collaboration to fully harness VR's potential in future education and other sectors.

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1. INTRODUCTION

Virtual reality (VR) is a simulated three-dimensional environment that allows users to interact with and explore a virtual world. This immersive experience is achieved through specialized hardware and software, often requiring the user to wear head-mounted displays (HMDs), motion controllers, and data gloves. VR seeks to immerse users in an authentic computer-generated environment, enhancing the sense of presence and realism (Bailenson, 2018). This immersion is achieved through realistic visuals, spatial audio, and multi-sensory haptic feedback. Users can manipulate and control objects, navigate through virtual space, and engage in activities within the virtual world. The environment can be fully immersive, providing a complete 360-degree spherical field of view, or semi-immersive, blending the real and virtual worlds.

The immersive nature of VR is enhanced by realistic visuals, which include high-resolution monitors and sophisticated graphics rendering techniques to produce vivid, lifelike images. Spatial audio technology provides realistic sound effects positioned physically within the virtual environment, enhancing the user's sensation of presence and immersion. Multi-sensory haptic feedback can provide tactile sensations, such as force feedback, vibrations, or full-body haptic suits, further enhancing the immersive experience (Burdea & Coiffet, 2017). VR enables individuals or groups to work together and communicate in a typical virtual environment, regardless of physical location. This collaborative feature is handy in education, business, and entertainment. Most VR systems offer a whole 360-degree spherical field of view, allowing users to look in any direction and explore the virtual space from different perspectives.

VR is used in various fields, including gaming, education, business, and entertainment. VR has been popular in gaming with titles like Beat Saber, Minecraft VR, and Skyrim VR. VR is used for training, education, and collaboration in education, such as in medical, safety, or military training. In business, VR is used for virtual meetings, product demonstrations, and training simulations. In entertainment, VR is used in social networking, fitness, and leisure activities. The concept of VR dates back to the 1960s, with significant advancements in technology and software. The term “virtual reality” was first used in the 1980s, and widespread adoption began in the 1990s with the development of more sophisticated HMDs and motion-tracking systems. VR continues to evolve, with new applications and technologies emerging, such as mixed reality (MR) and augmented reality (AR), which combine elements of the real and virtual worlds.

The integration of artificial intelligence (AI) and VR has recently led to significant advancements in immersive technologies (Dede et al., 2017). This integration has created more realistic, interactive, and personalized VR experiences. One of