Chapter 67

Integrating Technological Innovations to Enhance the Teaching–Learning Process

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ABSTRACT

Virtual reality is one of the latest technologies to be integrated into the teaching-learning process and it holds significant potential to enhance instructional processes and impact student learning. Historically, technology integration for instruction has been initiated primarily within institutions of higher education, while K-12 integration has been gradual to become part of mainstream education. Likewise, as teachers play a pivotal role in the process of technology integration, it is imperative to train teachers not only in computer literacy, but also in the requisite technological knowledge and skills needed to use technology in instruction. Furthermore, such training should be accompanied by support for teachers in developing a pedagogy and self-efficacy for technology integration. Self-efficacy can also serve as a foundation of motivation for teachers to keep abreast of new technologies and to determine how and when to use such emergent tools to enhance instruction.

AN INTRODUCTION TO VIRTUAL REALITY

Virtual Reality (VR) is a computer-generated environment designed to simulate three-dimensional (3D) physical environments that provide user interaction. Three-dimensional immersive virtual worlds are one of the most exciting technologies being used today and have been successfully implemented to promote learning in K-12 and higher education (Dickey, 2005a). Immersive VR, such as Oculus Rift and Magic

Lead, have transformed education due to the ability to transport conventional learning environment to any virtual learning environment imaginable (Afshar, 2014). While these emergent technologies offer a unique venue to enact learning and practice skills, they also require teacher training, support, and opportunities for experimentation. Therefore, it is important to understand the broad scope through defining VR, identifying characteristics of VR, and describing VR in practice.

Defining Virtual Reality

While there are countless uses for VR in education and industry, there are equally as many definitions; definitions of VR have shifted as the related hardware and software applications have evolved, moving from a single user interface to massively multiplayer online worlds (MMOW). For example, in 1996 Schroeder first posited that computer-generated display allows or compels users to have a sense of being present in an environment, other than the one they are actually in, and to interact with that environment (Schroeder, 2008). By 2003, Sherman and Craig expanded the definition of VR when they defined it as "a medium composed of interactive computer simulation that senses the participant's position and actions and replaces or augments the feedback to one or more senses, giving the feeling of being mentally immersed or present in the simulation (a virtual world)" (p. 13). More recently, Kapp and O'Driscoll (2010) defined a virtual world as an "immersed 3D virtual environment in which a learner acts through an avatar to engage with the other avatars for the explicit purpose of learning" (p. 55). Hence, as the capabilities and applications of the VR functions have expanded, definitions and instructional uses for VR have changed. Often, visual, auditory, and other perceptual stimuli are incorporated within software and hardware applications of technology in a sequence of programmed events to which a person is expected to react.

The environment created through virtual reality is referred to as a virtual world (VW), virtual world environment (VWE), and/or a virtual world learning environment (VWLE). Simply, a VWE is an artificial physical environment created using digital technology viewed two-dimensionally (2D); a complex 3D environment contains digital objects and human avatars in real-time. VWLE's can accommodate a wider range of learning styles and goals, encourage collaborative and resource-based learning and allow greater sharing and re-use of resources (Britain, 1999). These VR environments are used to support multiple learning styles and encourage such collaborative exchange through social learning as well. This focus evolved when innovators of VR noticed that users were responsive to the collaborative community and in 2003, the immersive virtual world of Second Life was launched (Linden Lab, 2013), allowing users opportunities for interaction, exploration, and collaboration. In Second Life, the user typically has some digital representation of self, known as an avatar. Users create their own identity and embody themselves through their avatars and by representing self as avatars, users report feeling socially and psychologically connected (Biocca, Harms, & Burgoon, 2003). Additionally, users can interact and communicate with each other in real time by using voice and text chat and/or gestures. It is notable that Tokel and Karrats (2014) found Second Life was the most commonly used platform given that it was used in 85% of virtual world studies. As VWE's have evolved so have the characteristics of VR.

Characteristics of Virtual Reality

Designs of virtual worlds are quite diverse, ranging from the replication of real classrooms to imaginary worlds (Prasolova-Førland, 2008). Dickey (2005a) posited that 3-D virtual worlds typically share

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