Chapter 8
Augmenting Education:
Using Augmented Reality Technologies to Enhance Teaching and Learning

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ABSTRACT

This chapter covers research surrounding augmented and virtual realities as types of mobile technologies for teaching and learning. The efficacy of these technologies as mobile learning tools will be presented and how these technologies might be used to enhance or even create contemporary classrooms such as virtual operating theatres and virtual tours while on-the-go. The chapter will also present some conclusions that can be drawn from various augmented and virtual realities research using Google Glass and Google Cardboard as well as challenges and concerns in terms of privacy and detachment from physical reality. Finally, this chapter presents examples of how Google Glass Explorers use AR devices to deconstruct traditional segmented classrooms and reconstruct modern-day learning communities where teaching, learning, collaborating, and sharing become integrated.

INTRODUCTION

In April of 2012, Google announced *Project Glass*—a project that set out to re-design the way people interact with and utilize mobile technology (Google Glass Social Media Posting). *Project Glass* was a unique computing device, with a cutting-edge design, that users wore on their heads to retrieve information from the web and interact with the world around them. The device looked like a futuristic lens-less pair of glasses with a thumbnail-sized translucent square screen suspended by the frame over the person's right eye. That June, Google demonstrated *Project Glass* at its annual I/O conference, a conference geared towards developers during which they showcase their latest products, and introduced the *Glass Explorer* program that would allow two thousand people to help Google determine the future of this next-generation technology. The program required participants to pay $1500 in exchange for an early beta (moderately tested) version of the device. The accepted candidates who signed up for this program received their device around April 16th 2013. Although Google initially allowed only two thousand North

American residents into the program, over subsequent months, new applicants were accepted allowing an increasingly growing group of *Explorers* (and Google) to generate and collect more data related to this new piece of hardware.

During the months prior to and following the *Explorer* device release, several videos demonstrating the video-recording and video-conferencing capabilities of *Glass* started to appear on a variety of social networks. These videos covered a wide range of applications from skydiving, skiing, receiving real-time turn-by-turn directions, riding on a horse, riding in a hot air balloon, and flying an airplane (Google, 2013). While innovative and interesting, these applications weren't necessarily focused on education. While it could be argued some of these videos had an educational component to them, through simulating experiences for viewers, it is this author's contention that education was not the primary focus behind the creation of these initial videos. That said, educators were thinking about creative ways to utilize this device inside (and outside) the classroom at least as far back as August 2013 (Pinantoan, 2013). According to Pinantoan's infographic, some examples of educational applications consist of: creating video guides for students, remote teaching, real-time translation of languages and texts, recording classes, creating documentaries, and a myriad other possible uses covered later in this chapter.

The benefits of this device, however, were balanced out by its issues and, as will be covered later in this chapter, included: poor battery life, assault on wearers, theft of devices due to value and demand, poor audio recording, social stigma, and extreme heat associated with prolonged usage.

While this chapter focuses on Augmented Reality (AR) as a whole, it will explore AR through the lens of Google Glass. The chapter begins with a definition of and introduction to the field of Augmented Reality (AR) and will provide a brief background summary of both AR and VR and the mobile movement or advances in this regard. This background will also present how the technology has been used for education across the United States. The chapter then moves on to introducing Google Glass and presents research related to using an AR device for teaching and learning along with research being done on the efficacy of this technology as a mobile learning tool. Next, the chapter presents an array of issues associated with using this type of technology such as privacy concerns, stigma associated with wearing the device, and public perception of (and in some cases aggression toward) users. Finally, it concludes with the future of augmented reality learning, examining Microsoft's new *Project HoloLens* and the evolution of augmented reality into Articulated Naturality Web, both of which are introduced and defined.

BACKGROUND

Augmented reality (AR) was born from virtual reality (VR), a technology that completely immersed participants into a synthetic computer-generated reality via a head-mounted television display (HMD). This VR HMD was essentially a television screen (or two) placed inside of a box that a viewer would look through. For VR, the HMD box was designed to intentionally obstruct the participant's view of the real world (RL) in favor of focusing their full attention on the virtual world (VR) to enhance their synthesized experience. In addition to the television screen(s), the HMD also used a head-tracking system to simulate a feeling of being in the actual computer-generated reality. Thus, when a participant wearing the HMD looked left, the simulated reality within the HMD also moved left and the landscape unfolded as if the user was really standing in the simulated environment surveying it. The Philco Corporation, the first developer of HMDs, envisioned this technology could be used for remote mobile viewing of dangerous environments. Bell Labs also used a similar device that allowed helicopter pilots to control

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