Chapter 14
Augmented Reality in K–12 Education

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ABSTRACT

Today the world revolves around technology in daily tasks. Society uses technology to communicate, trade, for business, politics, and to education. Through education, Augmented Reality (AR) takes on a new purpose. AR enables students to reach a higher level of education, and teachers to efficiently engage students to see real-world situations. The use of technology in classrooms is currently on the rise; but how are teachers using AR within their classrooms to engage and education children? This chapter discusses literature and research supporting the AR affordances in K-12 Education.

INTRODUCTION

In a society where our daily lives revolve around an ever-changing digital world, new methods of learning have been created using technology. We use technology daily to communicate, collaborate, entertain, invent, design, and teach (Kidd & Crompton, 2015). Over the last few years, the educational system has integrated various digital tools and technologies into classrooms for students and teachers in the United States at an accelerating rate (Bower, Howe, McCredie, Robinson, & Grover, 2013). Teachers are able to utilize different digital tools to help students not only think critically in the classroom, but also take information and apply it outside of the classroom (Baharti, 2014). Augmented Reality (AR) is one of the digital tools being integrated into classrooms. AR is defined as a technology applied to digital devices to link together the reality and virtual worlds by adding a virtual overlay to real world scenarios (Bower et al.,). These digital tools allow teachers and students to formulate, explain, learn, and let their creativity take their education to new levels. Through traditional teaching, this opportunity would not be possible for students. The use of AR in a classroom enables students to reach higher levels of thinking by connecting to real-world experiences (Bower et al., 2013). Although AR is available to many educators,

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there are problems in using and applying it in the classroom (Demski, 2013). Teachers are still mainly relying on older methods of teaching to instruct students, as they lack training in how to use and integrate these digital tools into teaching and learning (Antonioli, Blake, & Sparks, 2014). Technology is often the tool selected to support didactic teaching in the use of slide presentations (Demski, 2013). Teachers also face obstacles, such as a lack of support from administration, a lack of personal experience with the technologies, and a fear of digital malfunctions (Spencer, 2012). There are a great many affordances in using AR in K-12 learning and with support these tools can be best used to support teaching and learning.

The purpose of this chapter is to articulate the affordances of using AR in K-12 classrooms. This is thematic review of the literature to understand what themes have developed from the published literature. This chapter begins with a definition of AR. This is followed by the unpacking of four trends in how AR can support teaching and learning. These affordances are that AR supports; authentic learning, contextualized learning, student-centered learning and enables students to better visualize subject content. Finally, the projected future path of AR is revealed to show where AR may benefit future students.

What is Augmented Reality?

Augmented Reality (AR) blends physical and digital worlds together in real time by using 3D technologies (Kidd & Crompton, 2015). Ionitescu and Radu (2015) articulated this further as they defined AR as "adding computer-generated content upon the real, physical objects in the world around us, by displaying overlays of information and digital content connected to physical objects and locations" (p. 105). This means that images on a piece of paper or our view of the environment can be enhanced with the addition of digital images, video, sound. This relatively new and still emerging technology can be applied to web-enabled devices such as tablets and iPads, smartphones, television, movies, desktop computers, and laptops. One common example of AR on television in the U.S. is when viewers watch sports, such as American football, and colored lines appear to explain what is happening in the game. Viewers see a blue line to symbolize the line of scrimmage, and a yellow line symbolizing the line for a first down. If you are present at the football game, there are no colored lines indicating the placements (Joan, 2015). These lines represent a basic AR technology by using an overlaid image on top of a preexisting real world object.

Two methods are used in AR, which are: Marker-based, which uses symbols or codes to create a digital image, and location-based, which uses GPS to pinpoint the user's location globally (Bharti, 2014). Virtual objects present in AR can include an assortment of texts, videos, audios, 3D models, animations, and images that are superimposed in the viewer's environment (Bower et al., 2013). Bower et al. listed basic hardware requirements for creating and viewing AR. These are a camera for video and image taking, computer storage space, a powerful computer processor, and a computer program to allow interaction between real and virtual objects. AR has progressively developed as a popular tool for use in real world applications.

AR Technologies and K-12 Education

AR is viewed via mobile devices such as tablets and mobile phones. There are various AR headsets available, such as the Oculus Rift, HTC Vive, VR One, Poppy3D, and Google Cardboard. Two of the most recent AR headsets that have advanced AR capabilities are the HoloLens and Meta 2.