Chapter 13
Higher Education Teaching and Learning With Augmented Reality

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ABSTRACT

This chapter is based on a review of the literature, initial lab examinations, and experiences teaching university undergraduate pre-service teachers and master degree students in Instructional Design and Technology. The authors analyzed the literature, benefits, drawbacks, experiences, and educational implications of integrating augmented reality in higher education to prepare students for eventual workplace success. Using augmented reality, three-dimensional interactive digital imaging provides an immersive, engaging learning environment to interact with content in new ways not previously possible. The 3D models can impart significant content information by viewing digital objects from any angle, sometimes peeling back the layers, all in real time. In addition, they consider the educational implications for integrating and evaluating augmented reality.

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INTRODUCTION

Augmented Reality (AR) provides the simultaneous interaction between the real authentic environment and a three-dimensional digital overlay of hologram objects in real time. The digital objects can be manipulated by expanding the size of the object, changing the position or location, and viewing it from any angle above, below, or 360 degrees around it.

A study by Yilmaz and Batdi (2016) found augmented reality can be used in a systematic way in order to create fruitful learning environments for increasing academic success. This can be applied to all educational levels. The researchers found augmented reality “has a positive effect on social, cognitive and emotional improvement and it makes the learning environment more realistic” (Yilmaz & Batdi, 2016, p. 273). Augmented reality provides a new type of learning environment. It is one where students with low success rates can learn more efficiently by increasing attention and gaining the ability to materialize abstract concepts for easier comprehension (Cai, Wang, & Chiang, 2014). Augmented reality can be used to create new original 3D digital hologram objects directed towards the desired subject of interest. After creation, the objects can be placed in a real authentic environment to interact with. It “allows us to perceive whole new parts of the world” (Liberati, p. 27, 2016).

The studies mentioned above are more true today as many small public and private universities are dealing with constantly eroding budgets, forcing faculty researchers to look for connections with industry for multiple reasons. One, faculty are more likely to be able to acquire grants both internally and externally if we can find a use for our research in a business or industry setting. Also, in the constant competition to attract the attention of new students to our programs there is a strong underlying demand for the education we provide to connect to the real world as we have to prove to students they can get jobs after obtaining their education from our institutions. Therefore, discussions of industrial connections are included, first:

Augmented reality has roots as far back as 1968 with Ivan Sutherland who developed the first head mounted display (Augment News, 2016). AR technology has continued to grow and evolve in stages ever since. Each new technology development has contributed to the current form we have today. We are really still in the infancy of AR start-ups with both successes and failures. To date, the high-end augmented reality used in universities tends to be Microsoft HoloLens®™.

Later on, Ronald Azuma is credited with defining augmented reality in 1997 as “AR allows the user to see the real world with virtual objects superimposed or composited with the real world. Therefore, AR supplements reality, rather than completely replacing it” (Azuma, 1997, p. 2). It combines the real world, with the virtual world, appearing as three dimensional objects in real time.

In AR, the 3D objects viewed can be defined and driven by the user. The personalized content selected for viewing can relate to the individuals’ area of interest. The objects can be retrieved and examined from pre-made three-dimensional models. Alternatively, objects can be modified from basic shapes provided in some programs, existing code can be modified, or original code can be written to create completely new original 3D objects with some 3D objects offered for free. Highly complex layered 3D objects can take a great deal of time to create, as a result are very expensive to buy. One example is in the medical field where highly granular quality detail is needed, the cost can be extremely high.

When wearing the AR head gear, it has a clear shield to be able to view in the actual environment. After opening the 3D object, it appears as being layered on top of the actual environment. The viewer can walk around the object to look under and over it, and sometimes even look inside of the object depending on how the object was built. The Meta headset has been designed with haptic hand gesture
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