

# Chapter 3

## Augmented Reality in Research and Practice: A Content Analysis of Claims in Education

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### ABSTRACT

*The continued development of mobile technologies has provided individuals the opportunity to work, learn, and play across a variety of contexts. The growth of these mobile devices has afforded an equivalent rise in popularity in augmented reality (AR) technologies. Though it has seen widespread adoption across a number of industries, AR has yet to see consistent integration in the realm of education. Several individuals and organizations have cited AR as being poised for mainstream educational adoption despite continued setbacks. The purpose of this chapter is to examine the claims surrounding AR for teaching and learning to understand what is being done and what is possible with the technology right now. This chapter provides a review of a variety of academic and non-academic sources towards the construction of a framework for AR for teaching and learning. Recommendations for research and practice are discussed.*

### INTRODUCTION

The ongoing development of digital media technologies has spurred constant debate regarding the purpose and nature of technology integration in schools (Cuban, 1986). The rise of mobile devices, including smartphones and tablets, has provided individuals with opportunities across education, work, and personal contexts. Advances in hardware and software, coupled with decreases in overall product cost, have provided access to these devices at an unprecedented rate. The Common Sense Media census reported that 91% of 8- to 18-year-olds polled have access to a smartphone in their home (Rideout &

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Robb, 2019). Similarly, a Pew Research Center (Anderson, 2019) survey on mobile technology usage indicated that within the US 96% of respondents aged 18 or older owned their own mobile device. While mobile technologies continue their rise as an essential aspect of everyday life, individuals are granted greater access to the ability to work, learn, and play across a variety of contexts (Johnson et al., 2010). The growth of mobile devices has afforded an equivalent rise in popularity for several digital media technologies.

One such technology, augmented reality (AR), operates at the intersection of the virtual and the real. The proliferation of mobile technologies has led to widespread adoption of AR within a number of disciplines, including medicine (Eckert, Volmerg, & Friedrich, 2019), marketing and tourism (Dadwal & Hassan, 2016), and assembly training/maintenance (Webel, Bockholt, Engelke, Gavish, Olbrich, & Preusche, 2013). This technological-pedagogical revolution has been identified as being poised to profoundly transform education (Bower, Howe, McCredie, Robinson, & David, 2014). The 2010 Horizon Report (Johnson, Smith, Willis, Levine, & Haywood, 2010) suggested simple augmented reality as being two to three years from widespread adoption in the realm of education. This categorization included the adoption of well-established technologies that have become mainstream through the use of global cellular networks. In 2011, the Horizon Report reinforced its belief in augmented reality as it made its transition from a gimmick to a bonafide game-changer (Johnson, Smith, Willis, Levine, & Haywood, 2011). Despite increased interest, accessibility, and utility of AR experiences in education, the technology would disappear from the Horizon Report until 2016, when it was once again categorized as being two to three years from widespread adoption (Johnson, Becker, Cummins, Estrada, Freeman, & Hall, 2016). Without explanation, the 2018 Horizon Report cited AR as being four to five years from adoption. Though it was noted that the market for AR was growing exponentially and was expected to double within the next five years, the technology was somehow further from adoption than was predicted in previous years (Becker et al., 2018). Ultimately, the 2019 Horizon Report acknowledged the backwards progress of AR in terms of mainstream adoption (Alexander et al., 2019). Though the Horizon Report illustrates only one perspective on the current progress and future potentials of AR, it is far from the only source to claim the technology's readiness to adapt to the mainstream in education (Emiroğlu & Kurt, 2017; FitzGerald et al., 2013; Kroeker, 2010; Ong, 2010). Irrespective of the reasons for these setbacks, the experts in terms of AR are not confident the technology is prepared for mainstream adoption in education.

## **STATEMENT OF THE PROBLEM**

Research has suggested a wide variety of potential learning outcomes from AR integration in educational contexts (Akçayır & Akçayır, 2017; Dunleavy, Dede, & Mitchell, 2009; Wu, Lee, Chang, & Liang, 2013). Though AR technologies have retained their popularity in educational research, they are seemingly no closer to widespread adoption than they were almost a decade prior. The current trajectory of research into AR for teaching and learning has yet to encourage and prepare researchers, instructors, and students for widespread adoption of this technology into the classroom and beyond. Existing studies often target the research (empirical and theoretical) literature produced in a purely academic context. Subsequently, there is a gap in terms of identifying the claims and findings from education in practice and in non-academic contexts. In order to gauge the possibilities and learning outcomes of these AR implementations for educational contexts, an evaluation of the current claims, applications, and affordances of AR must be undertaken across a variety of settings. The purpose of this study is to present an overview of various

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