

Chapter 3

Getting Started With Augmented Reality (AR) in Inclusive Online Teaching and Learning in Higher Education: An Extended Environmental Scan for Pedagogical Design Leads

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ABSTRACT

With the mass-scale adoption of augmented reality (AR) in the commercial space, and student interest in 3d- and 4d experiential learning, higher education is starting to look towards digital augmentations of real spaces for teaching and learning. University creative shops are exploring whether they can get into the game of producing AR-enhanced experiences: campus tours, interactive gaming, virtual laboratories, exploratory art spaces, simulations, design labs, online / offline / blended teaching and learning modules, and other AR applications. This work offers a basic environmental scan of the AR space for inclusive online teaching and learning, and it includes pedagogical design leads from the current research, technological knowhow, hands-on design / development / deployment of learning objects, and online teaching and learning methods. This work does not take a pedagogical theory approach although several theories are mentioned. Rather, the focus is on applied AR in teaching and learning.

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INTRODUCTION

Historically, “augmented reality” is said to have been first conceptualized and used by Thomas P. Caudell and David W. Mizell, both engineers and researchers of The Boeing Company (in 1990) (Interactive Design Foundation, 2020, “Augmented reality...” (Vertucci, D’Onofrio, Ricciardi, & De Nino, 2023, p. 41). Specifically, AR was harnessed to superimpose information “on the visual field to make it easier for workers to lay aircraft cables” (Caudell & Mizell, 1992, as cited in Doerner, Broll, Jung, Grimm, Göbel, & Kruse, 2022, p. 25). While AR has been studied since the early 1990s, the rise of smart phones in the 2010s raised interest several decades later. The first conceptualization of augmented reality was in the 1960s, with the first commercial AR tools emerging in the 1980s ((Vertucci, D’Onofrio, Ricciardi, & De Nino, 2023, p. 35). Augmented reality (AR) is famously defined by R.T. Azuma (1997) as a system that “combines real and virtual,” is “interactive in real time,” and is registered in three dimensions (p. 356), which looks more real-world. Interactivity is considered “the most important characteristic of 3D-LOs” (learning objects) in the VR/AR environment, so people may engage in “touching, moving, exploring, annotating and triggering behaviors” (Mangina, Oct. 2017, p. 5) of the digital objects.

Instead of only going with off-the-shelf products, services, and subscriptions, university creative shops are exploring whether they can get into the game of producing AR-enhanced experiences: campus tours, interactive gaming, virtual laboratories, exploratory art spaces, simulations, design labs, online / offline / blended teaching and learning modules, and other AR applications.

This work offers a basic environmental scan of the AR space for online teaching and learning. From this information and hands-on instructional design work, this chapter explores what a Midwestern university would need to stand-up an initial AR shop: talent for staffing, requisite equipment, requisite software, physical spaces (studios, offices, labs, and production spaces), and others. This is an early and exploratory work that explores the promises and challenges of AR in higher education.

There is an additional brief applied “use case” defined lightly for immigrant learners. Vibrant societies often have strong inflows and outflows of peoples because they engage the world. One byproduct of this involves immigration and emigration (optimally more of the first than the latter, more inflow than outflow). A subset of the immigrants includes immigrant learners, of all ages. In terms of AR spaces, immigrant learners can perhaps relate to the sudden shifts in reality, given the adjustments to different peoples, new locales, novel practices, new cultures, shifts in worldviews, and other practices. They may experience augmentary changes with ease and engagement. More on this use case follows later on.

REVIEW OF THE LITERATURE

Augmented reality is considered “a variation of *Virtual Environments (VE)*” (Azuma, 1997, p. 2) or virtual reality (VR). Both are synthetic environments although AR is considered more annotative, and VR may include a more complete synthetic world surround. Azuma writes:

VE technologies completely immerse a user inside a synthetic environment. While immersed, the user cannot see the real world around him. In contrast, AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world. Therefore, AR supplements reality, rather than completely replacing it. (Azuma, 1997, p. 2)

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