Chapter 16
Augmented Reality: A Brief Introduction, Its Potentials, and Implications in Language Education

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ABSTRACT
Rapid advancement in technology has altered the way language education is conceptualized and practiced. Technological tools, when effectively integrated with appropriate pedagogical foundations, can enhance the quality of teaching and learning experiences. Augmented reality (AR) has emerged as one of the latest technologies offering a new way to bridge virtual and reality worlds. Due to the widespread proliferation of digital technology, the implementation of AR on mobile devices such as smartphones and tablets has become a growing trend in educational settings. Regardless of the advantages that AR technology brings to language classrooms, there have been very few studies exploring the design, evaluation, and applications of AR for educational purposes. Therefore, this chapter aims to (a) introduce AR technology in learning environments, (b) embrace its potentials and foreseeable hindrances to language education, (c) discuss practical and applicable ways to use this merging technology effectively in the classroom, and (d) propose some issues for future research.

INTRODUCTION
Let us imagine two scenarios. In the first one, the young English language learners (ELLs) listen to the story, “The Enormous Turnip,” told by their teacher and acted out with the puppets and props that the teacher had spent a great amount of time preparing. In the second scenario, the learners use their mobile devices to read the same story with pop-up virtual characters and theme music out of their textbook. After that, they go out to the playground to search for those characters’ representations to learn more how to spell the words, pronounce them, and other information like their habitats and/or characteristics. They
also need to grow the turnip from the seed on their mobile device. When the turnip reaches its maximum size, the students then work in pairs dragging all the characters they have found together until the gigantic turnip is pulled out by the power of teamwork. Isn’t it fascinating to have these ELLs interact with both real and synthetic environments as in the second scenario? Then, welcome to the world of Augmented Reality (AR) in language education!

AR is defined as a technology where virtual images are blended with real the world and real-time interaction is ensured (Azuma, 1997). The applications created by AR enable the usage of three-dimensional models (i.e., 3D objects, images, videos, and animations) both separately and simultaneously (Wang, Kim, Love, & Kang, 2013). Mobile AR technology has gained increased research attention since it has multiple benefits in language education. Not only does it allow real-time interaction, but it also provides learning through experience, which can boost users’ attention and motivation (Barreira, Bessa, Pereira, Adao, Peres, & Magalhaes, 2012; Singhal, Bagga, Goyal, Saxena, 2012). Furthermore, several studies have investigated the effectiveness of AR as multimedia in optimizing students’ performance (Cadavieco, Goulão & Costales, 2012; Liu & Tsai, 2013; Santos, Lübke, Taketomi, Yamamoto, Rodrigo, Sandor, & Kato, 2016). AR technology can also be combined with global positioning system (GPS)-enabled smart devices or quick response (QR) codes to create a unique, compelling and meaningful learning experience (Lara-Prieto, Bravo-Quirino, Rivera-Campa, & Gutiérrez-Arredondo, 2015). Students can get access to their smart phones, scan the codes, and reach the 3D demonstrations in front of their eyes.

Regardless of the advantages that AR technology can bring to language classrooms, there have been few research studies conducted exploring the design, evaluation, and applications of AR for educational purposes. Therefore, this chapter gives a brief introduction about AR technology, provides literature review of AR in pedagogy, discusses some challenges that AR technology is facing in educational contexts, and proposes practical applications for EFL/EFL teachers. The authors of this chapter hope to inspire educators to bring this emerging tool into their classroom in an intriguing and creative way.

BACKGROUND

What Is Augmented Reality (AR)?

Augmented Reality (AR) is commonly mistaken for Virtual Reality (VR). AR and VR are related, yet different in that VR brings the users to an immersive artificial world by putting on a VR headset or creating an avatar in the VR environment (Solak & Erdem, 2015), whereas AR allows the users to see the real world enhanced or augmented by the virtual objects (Azuma, 1997). For instance, the user puts on the VR goggles and is completely immersed into the synthetic world of the dinosaurs without sensing any presence of the real world (Figure 1).

On the contrary, Figure 2 shows that the AR app on the iPad still gives the user the sense of co-presenting in both synthetic and real environments.

There are currently two developed forms of AR: (a) location-aware AR and (b) vision-based AR (Dunleavy & Dede, 2014; Pence, 2011). Location-aware AR allows users to track the distance from their current place to different ones by using a mobile device enabled with a Global Positioning System (GPS) feature. This form of AR is presented by multimedia (i.e., the combination of text, audio, image, animation, and/or 3D objects) to modify the navigation to the specific location. In Figure 3, for example,
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