



REVIEW PAPER

The Unexplored Potential of Virtual Reality for Cultural Learning

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Abstract

Educational technology tools that improve learning and foster engagement are constantly sought by teachers and researchers. In the domain of Computer-Assisted Language Learning a variety of tools, for instance blogs and podcasts, have been used to promote language and cultural learning (Shih, 2015). More recently, virtual reality has been identified as a technology with great potential for the creation of meaningful and contextualized learning experiences. Despite the learning affordances of virtual reality, in language education most of the literature has focused on the low-immersive version, whereas research investigating highly immersive virtual environments has only emerged in recent years (e.g., Berti, 2019; Blyth, 2018). In other fields, the use of highly immersive virtual reality has been compared to traditional pedagogical resources and demonstrated that students' learning improved with the use of virtual environments as compared to two-dimensional video and textbook learning conditions (Allcoat & von Mühlelen, 2018). Considering the potential learning benefits of this technology, this paper argues that longitudinal empirical research in language education is strongly needed to investigate its potential unexplored impact on language and cultural learning.

Keywords

Virtual reality, cultural learning, language education, levels of immersion

1. Introduction

Recent advances in technology have made it possible for learners to experience environments that merge the real world with the digital world, enabling immersions in authentic and previously inaccessible spaces. Virtual reality (VR) is among those emerging technologies that offer authentic and situated learning experiences, placing students within the cultural context where the foreign language (FL) is spoken and producing a sense of being physically present in a non-physical setting (Blyth, 2018). Within the term VR, “virtual” refers to the digital representation of something, whereas “reality” indicates an environment that is close to the real world but essentially unreal since it is generated by computer technologies (Slater & Wilbur, 1996).

Finding a precise definition of VR is challenging considering that researchers and scholars have different interpretations of what this technology exactly represents. Freina and Ott (2015) define VR as a “computer-generated simulation of a three-dimensional (3D) image or environment that can be interacted within a seemingly real or physical way by a person using special electronic equipment” (p. 133). Others describe VR as a computer-based multimedia environment that enables participation and interaction in authentic virtual worlds (Chen, 2009; Schwienhorst, 2002a). Schwienhorst (2002a) proposed a distinction between low immersive VR, which presents the virtual environment on a computer monitor with a limited field of view, and highly immersive VR, which utilizes a head-mounted device, enabling a more immersive experience with a wider field of view. Despite differences in definitions of VR, it is generally agreed that this technology, whether low or highly immersive, promotes contextualized learning (Chen, 2009, Llyod, Rogerson, & Stead, 2017; Schott & Marshall, 2018), provides authentic experiences (Blyth, 2018; Jacobson, 2017), fosters engagement (Allcoat & von Mühlénen, 2018; Shih, 2018), and increases motivation (Huang, Rauch, & Liaw, 2010; Shih, 2015).

Most of the literature in language education has focused on low immersive VR since head-mounted displays (HMDs) became popular among the wider public only in 2016, when well-known companies made this technology accessible to the consumer market (Liu, Bhagat, Gao, Chang, & Huang, 2017). Current research focusing on VR and HMDs is mostly in science education (Freina & Ott, 2015), with only a handful of empirical studies (e.g., Llyod et al., 2017; Scrivner, Madewell, Buckley, & Perez, 2019) examining language learners’ perception of VR for educational purposes as well as the potential impact that highly immersive VR may have on language education. Furthermore, empirical studies in VR mostly focus on short applications without a long-term integration of such technology in the curriculum. Considering the gap in the literature of VR for language education, this paper discusses how VR may support language learners, especially from the perspective of cultural learning. The first section describes the use of virtual environments in the 2000s and reviews studies addressing low immersive VR for language education. Following, the two main affordances of virtual environments, that is immersion and presence, are identified. Next, research investigating highly immersive VR for education are discussed. Few studies have addressed the impact of highly immersive VR for cultural learning; thus, this paper concludes by suggesting potential advantages and limitations of VR for cultural learning in language education.

2. From low to highly immersive virtual reality

2.1. Low immersive environments

The last two decades have seen an important shift in language teaching, including the field of Computer-Assisted Language Learning (CALL). The change from teacher-centered to learner-centered pedagogy contributed to how technology first viewed as a tool, became the medium enabling learners to take an active role, collaborate, and interact with content (Schwienhorst, 2002b). New technological advances provide students with software and devices that allow for connections with speakers of other languages from across the world, as well as easy access to authentic digital resources from the target culture. VR technologies are not new; however, they are yet to become mainstream in education. The term VR was first used back in the 1960s with the Sensorama simulator,

a theatre cabinet that featured speakers, a stereoscopic 3D display, smell generators, fans and a vibrating chair. (Freina & Ott, 2015).

In the year 2000, before HMDs became accessible to the wider public, definitions of VR pointed to 3D environments that could be explored through digital avatars on computer monitors. An illustrative example launched in 2000 and still active today is Habbo, a 3D virtual world where multiple users simultaneously engage in text chat when situated in the same virtual room (Sadler, 2017). Launched in the same year, the VRoma Project is another example of an online virtual environment that aimed at teaching Latin and Greek using multimedia learning materials (Schwienhorst, 2002a). Other instances of low immersive VR are open social virtualities, including Second Life and OpenSimulator, which have shown to provide numerous opportunities for “immersion in linguistic, cultural and task-based settings” (Blyth, 2018, p. 227). In these cases, VR presented a low level of immersion since users experienced the virtual environments with a conventional computer monitor, a keyboard, a mouse, or a controller; however, today these virtual environments have become outdated (Lloyd et al., 2017).

Before 2010 highly immersive VR technologies were cumbersome and prohibitively expensive for wider distribution (Lloyd et al., 2017), for this reason most empirical research in language education focused on low immersive technologies such as those just described. Studies have shown that low immersive VR contributes to language learning due to its features that support awareness of self, collaboration with native speakers, as well as manipulation and experimentation in virtual environments (Schwienhorst, 2002b).

In a longitudinal case study Shih (2015) examined the effects of low immersive VR environments on cultural learning with four university-level English learners based in Taiwan. Utilizing Blue Mars Lite, a 3D virtual platform that integrates Google Street View, participants virtually explored British culture under the guidance of an English-speaking instructor as well as through guided podcasts. Data were collected using blog entries, interviews, and cultural knowledge tests. Findings suggest that the virtual platform contributed to the development of positive attitudes, enhanced learners’ interest in the target culture, and helped students gain knowledge about both visible aspects (e.g., food, geography, and historical artifacts) and invisible aspects (e.g., values, beliefs, and behaviors) of British culture. In later research, Shih (2018) utilized the Virtual English Classroom 3D to create immersive environments in which students completed meaningful goal-based language learning activities. For instance, participants described the environments in the target language (TL), located virtual buildings, and explored virtual sites in London and New York. After the initial challenge of becoming familiar with the novel interface, language learners reported that they enjoyed completing the tasks and felt stimulated to use the TL.

Other studies explored whether virtual environments contributed to lower students’ affective filter. Lin and Lan’s (2015) analysis of research studies published between 2004 and 2013 addressing VR for language learning, suggested that the use of virtual environments can effectively reduce learning barriers, such as anxiety and inhibition, and increase students’ engagement and motivation. In Grant, Huang, and Pasfield-Neofitou (as cited in Sadler, 2017), beginner Chinese learners in an Australian university engaged in a simulation of a Chinese town in Second Life. Results show that students who participated in the virtual world had a lower level of FL anxiety, and thus were more likely to use the TL, compared to those students learning in the traditional classroom setting.

These studies illustrate how low immersive VR benefited students from a FL acquisition as well as cultural learning perspective. However, considering the potential advantages of VR, it is surprising that only a few studies have focused on low immersive VR for cultural learning in the context of language education. This lack of empirical research may be due to the challenges that administrators, teachers, and students might have to face when implementing VR in educational contexts.

2.2. Presence and immersion

VR has evolved from low immersive environments, as those described above, to highly immersive environments. Aside from the advancement of technology (i.e., from computer monitor to HMD), immersion is a crucial distinguishing feature of highly immersive VR from low immersive VR. Immersion refers to the extent to which another reality claims the attention of the user and the level of immersion of a virtual experience is determined by the characteristics of the technology utilized. For instance, a computer monitor generates a low level of immersion since the field of view is limited and the presence of devices in the physical world is evident when looking away from the display. On the other hand, an HMD has the capability to completely immerse the user in 360 degrees. To generate a great sense of immersion the computer display, or HMD, should deliver an extensive, inclusive, surrounding, and vivid illusion of reality (Slater & Wilbur, 1996). These four aspects determine how immersive a VR technology can be and today most HMDs deliver virtual environments dealing with each one of these aspects with the potential for increasing students' engagement and motivation (Schott & Marshall, 2018).

Presence, defined as a psychological state of "being" in the virtual environment (Fowler, 2015), is another central aspect of VR. Presence is more subjective than immersion and it occurs when the environment is perceptually convincing; in other words, it looks authentic and real to the user (Freina & Ott, 2015). A high level of presence results in more engaging experiences. Scholars argue that when the virtual environment presents a storyline, different from events happening in the real world, a greater sense of displacement, or presence, may be generated (Slater & Wilbur, 1996). High levels of presence and high levels of immersion may lead to unprecedented learning experiences.

2.3. Highly immersive environments

VR has evolved to be a sophisticated technology that enables interaction and collaboration in highly immersive virtual spaces. In FL teaching and learning empirical research evaluating the effectiveness of highly immersive VR is scarce. Nonetheless, studies in other fields have explored its potential and how it compares to traditional pedagogical methods and resources. For instance, a study conducted by Allcoat and von Mühlengen (2018) compared highly immersive VR to other learning materials to foster knowledge about parts of a plant cell. Participants assigned to three diverse learning conditions, i.e., a traditional textbook, a two-dimensional (2D) video, and a highly immersive VR environment, had 7 minutes to learn as much as they could from the information presented in the three different formats. Data were collected through a biology knowledge questionnaire before and after the learning phase, along with a test investigating participants' emotions before and after the learning experience. Overall, participants in the VR condition showed better performance at remembering information compared to those in the other two conditions. Further breakdown of the data revealed that participants in both the VR and textbook-style conditions showed better learning and understanding than those in the 2D video condition. The authors claim that such results might be attributable to participants' unfamiliarity with the new equipment and their need to adapt to the VR headsets. Data also revealed that participants' positive emotions increased in the VR condition, while they decreased in the 2D video and textbook conditions. Similar to Allcoat and von Mühlengen's (2018) results, Billingham and Dunser (as cited in Scrivner et al., 2019) claim that highly immersive VR "can help students learn more effectively and increase their retention compared to traditional two-dimensional surfaces" (p. 4) since audio and visual aids, which are commonly used to reinforce language learning, are combined in highly immersive and engaging experiences. In another study, university stakeholders visited a virtual island in Fiji with an HMD and shared strengths and weaknesses of the experience in semistructured interviews. Data show that most participants reported a strong sense of immersion, with one of them stating: "it actually made me feel like, pretty much you were physically there" (Schott & Marshall, 2018, p. 848). The VR environment was restricted to single-user mode; however, participants took part in passive interactions with locals who were represented through embedded videos. Participant-to-participant interactions occurred outside of the virtual environment. The authors conclude that the ongoing development of VR will play a substantial role in the future of education and suggest that future research should

investigate whether VR activities aiming at developing students' intellectual abilities are pedagogically robust.

In the field of FL learning and teaching, one study investigated how Spanish language learners' perception of VR in the educational setting changed over one semester (Scrivner et al., 2019). Google Cardboard (an economical HMD) and the Google Street app were utilized to expose learners to authentic environments and surveys were used to gather feedback. Results indicate that VR increased students' interest in studying abroad and the realistic virtual experiences kept them engaged and helped them learn about some aspects of Hispanic culture. On the other hand, some participants reported experiencing dizziness and the authors attribute the discomfort to the low-cost cardboard viewer with limited settings to adjust distance and depth. Although Scrivner et al.'s (2019) study is promising and offers some insights into the use of highly immersive VR for cultural learning in the education setting, more research needs to focus on how VR can impact language learners' understanding of foreign cultures to then support the implementation of this technology in FL courses. The following section highlights the potential advantages as well as limitations of the use of highly immersive VR in the language classroom, especially for learning about foreign cultures.

3. Advantages and limitations of highly immersive VR for cultural learning

Teachers have argued that FL education often lacks a culturally rich learning environment, due to geographical reasons, which might lead to an incomplete understanding of the foreign culture. Total immersions in the target culture seem only possible for those who can study abroad, leaving other students external to a deeper understanding of cultural practices. Barab, Hay, and Duffy (1998) argue that content cannot be separated from context, and decontextualized learning will produce impoverished knowledge. Thus, decontextualized cultural information presented to students in FL courses might not be conducive to understanding the real world and preparing for authentic interactions. Shih (2018) explains that contextualized teaching helps relate content to real-world situations. Compared to traditional pedagogical materials, highly immersive VR has the advantage of immersing language learners in culturally authentic contexts that produce a sense of "being there." Dawley and Dede (2014) define this type of learning "situated" where students experience authentic environments, and the acquisition of knowledge becomes a situated process supported by technology. Other scholars call this "anchored instruction", where "the material to be learned is presented in the context of an authentic event that serves to anchor or situate the material and, further, allows it to be examined from multiple perspectives" (Barab et al., 1998, p. 5). Whether it is called contextualized, situated, or anchored learning, VR technologies enable cultural learning immersions where students enter an authentic community and experience in first person how other people live and interact. In these VR experiences, learner inquiry, active observation, and participation are facilitated and may lead to the construction of meaningful personalized understandings.

Authenticity and personalization are two other advantages of VR. In the language classroom authentic cultural learning is often supported by realia (e.g., music, magazines, video, etc.), however these resources are often used according to teachers' guidelines preventing students from customized learning. In VR, learners are no longer confined to specific information chosen by the teacher or to predefined content (Scrivner et al., 2019), since this technology enables the exploration of authentic digital spaces from multiple perspectives by moving the HMD and choosing where to direct their focus. Highly immersive VR environments transform learners from passive to active participants, compelled to explore the culturally authentic environment. Learner-centered and learner-controlled personalized learning may lead to higher cognitive engagement and increased motivation, as compared to traditional classroom learning (Allcoat & von Mühlenn, 2018; Schwienhorst, 2002b).

The use of VR in the educational setting also presents some challenges and some argue that virtual environments do not measure up to real-world experiences. While the difference between learning about culture in the foreign country and within the classroom cannot be ignored, VR provides language learners with cultural experiences that

approximate real-world ones and enables access to authentic and contextualized cultural content (Shih, 2015). Technical problems with equipment and Internet connectivity might prevent the implementation of VR in language courses. In this case, training is necessary such that instructors develop technical management skills to facilitate the use of VR (Dawley & Dede, 2014). As teachers choose to utilize virtual environments with their students, they should also consider how a specific VR experience meets the pedagogical needs of learners (Fowler, 2015) to avoid using a new technology just for the sake of it, without benefiting students.

Another limitation of VR is the risk of causing motion sickness to users, as shown by Scrivner et al. (2019), especially when economical headsets are used. A careful use of HMDs as well as technological advances will contribute to lessening users' discomfort in virtual worlds. Last, although VR technologies are becoming increasingly accessible, the hardware for fully immersive experiences is still likely too expensive for wider implementation in educational contexts (Lloyd et al., 2018). As this technology becomes mainstream, it will be easier to find and use VR learning activities for FL courses.

4. Conclusions

This paper discussed how VR has been used in education and its potential from a highly immersive perspective for language and cultural learning. In recent years, the concept of VR has shifted from low to high immersion, and while much research has been devoted to low immersive environments, the use of highly immersive VR in CALL is not well documented. Studies investigating low immersive VR have shown that it can enhance learners' attitudes and interest in the TL and culture, help students gain knowledge about visible and invisible cultural aspects, lower anxiety and inhibition, and increase engagement and motivation. In other fields, the use of highly immersive VR has been compared to traditional pedagogical resources and the results show that participants were better at remembering information when learning in a VR environment with an HMD, compared to 2D video and textbook learning conditions. VR offers great potential for FL acquisition and for learning about foreign cultures since in these fully immersive experiences students can navigate authentic and contextualized environments, focus on what captures their interest, and experience the authentic target culture from the classroom setting. An analysis of the literature revealed that little is known about highly immersive VR for cultural education and much needs to be done to support the integration of this technology in language learning. Future research should explore how VR might enhance students' learning by investigating their understanding of foreign cultures in virtual environments and by comparing learning in VR to traditional textbook-style learning. Longitudinal studies are needed to address how VR might lead to improvements over time, as users become more familiar with the technology and explore authentic cultural settings in unprecedented ways.

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