

A New Approach to Virtual Reality in History Education: The *Digital Oral Histories for Reconciliation* Project (DOHR)



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Abstract In this chapter we propose a new approach for designing virtual environments (VEs) that has the potential to make important contributions to teaching and learning history. We briefly outline the history of VR and define key terms and concepts. We describe three types of history-focused VEs, digital historical games, 3D historical reconstructions, and interactive storytelling, and discuss the opportunities and challenges they offer for history teaching and learning in terms of learning, accessibility, historical thinking, and historical empathy. In the final section, we describe the *Digital Oral History for Reconciliation* (DOHR) curriculum and virtual learning environment (VLE) that was created to promote relationality and historical empathy. We describe a new approach to designing curriculum-specific VLEs that offers several potential benefits for teaching and learning history and the design of interactive storytelling VLEs.

Keywords History education · Virtual reality · Teaching and learning · Reconciliation · Relationality · Historical thinking · Historical empathy · Oral history · Digital history · Virtual reality design · Difficult history

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More than a decade ago, both Staley (2003) and Allison (2008) argued that virtual reality (VR) technology had already shown its potential to improve how history is taught and learned in classrooms. More recently, Checa and Bustillo (2020) contend that history is one of the most promising knowledge areas for VR. Despite the potential of VR to improve history teaching and learning, Wright-Maley et al. (2018) reminds us that, “as is often the case with prophecies, there have been disappointments and surprises” (p. 603). Over the past two decades history educators have experienced unprecedented access to digital technologies that have fundamentally changed how history is researched, taught, and communicated (Staley, 2014). At the same time, many history educators have been reluctant to adopt digital technologies, perhaps because they have witnessed cycles of techno-romance that accompany the emergence of digital technologies that promise to transform teaching and learning, but often fail to deliver (Hicks et al., 2014).

In this chapter we propose a new approach to the design of virtual environments (VEs) that has the potential to make important contributions to teaching and learning history. We begin by providing a brief outline of the history of VR and defining key terms and concepts. We then describe three types of history-focused VEs, and discuss the opportunities and challenges they offer for history teaching and learning. We conclude by describing the potential benefits of the virtual learning environment (VLE) created for the Digital Oral History for Reconciliation (DOHR) project curriculum.

Virtual Reality and Virtual Learning Environments: Some Key Terms

Attempts to create the illusion of being immersed in a virtual world are not new. Computer scientists first began designing “virtual experiences” in the 1950s (Korbey, 2017). When Jaron Lanier first coined the term “virtual reality” in 1987, VR technology was already being used for educational purposes by the military, aviation, and medical industries to simulate activities that were considered too dangerous or risky to perform with real people or expensive technology (Staley, 2014). By the 2000s VR was considered a “mature technology” and scholars and practitioners in a variety of fields had been touting its benefits for more than twenty years (Spiegel, 2018). Most VEs were displayed on a computer screen, user interaction was controlled by a mouse or joystick, and immersion levels were low (Checa & Bustillo, 2020).

By 2020, the development of new VR head-mounted devices (HMDs), 360-degree video, tactile gloves, motion sensors, increased processing power, and widespread availability of high-speed internet vastly improved the quality of VR experiences (Hasson et al., 2019). Although VR experiences are increasingly realistic, immersive, and interactive, Staley (2014) states that “virtual reality is as much virtual as it is reality” in that no VR systems have been able to make VR indistinguishable from actual experience (p. 98). VR still requires expensive and unwieldy hardware

including processors, projectors, sensors, gloves, and headsets to create “sensory immersion” experiences in virtual environments (Staley, 2014; Watters, 2016).

The term “virtual” has been indiscriminately used to describe a wide range of technology and digital media, which has led to widespread confusion about what VR is (Laurel, 2016; Watters, 2016). VR is generally understood to be an immersive and interactive computer-generated three-dimensional (3D) digital environment designed to create presence in a virtual place or space (Allison, 2008; Staley, 2014). A virtual environment (VE) is a virtual place or space generated using VR. Immersion in a VE is created using sensory stimuli such as images, sounds, haptics (touch), and smells to make the user feel physically present in a non-physical world (Carrozzino & Bergamasco, 2010). “Interactivity” describes the degree to which the virtual environment responds realistically to the actions of a user (Papanastasiou et al., 2019). Immersion and interaction are understood to interact in VEs to generate presence and flow. Presence is the sense of “being there” in a virtual place or space (Heeter, 1992; Lee, 2004; Slater & Usoh, 1993), and flow is the state where users become so immersed in a VE that they are disinterested in other activities (Csikszentmihalyi, 1990; Scoresby & Shelton, 2011).

VR and augmented reality (AR) are often confused, and while they share several similarities, they are different. In VR the user’s perception of reality is based entirely on computer-generated environments, whereas in AR the user is provided with computer-generated information to enhance their perception of reality (Challenor & Ma, 2019; Yildirim et al., 2018). VR is also different from 360-degree video, which is a two-dimensional (2D) moving image that can be projected onto a 3D sphere in a 3D digital environment, but does not in itself constitute a VE. Google cardboard, which claims to offer “immersive experiences” (Cardboard, n.d.) in VR provides a 360-video experience that creates the illusion of three dimensionality, but features relatively low immersiveness and interactivity.

Virtual Environments in History

Most VEs used in K-12 history classrooms are designed for entertainment, and few are intentionally designed for pedagogical purposes as “virtual learning environments” (VLE) (Fowler, 2015). We use “VE” rather than “VLE” in this chapter to acknowledge that varying purposes VEs used in K-12 history education were originally created for.

Carrozzino and Bergamasco (2010) propose a two-axis model for classifying VEs. On the interaction x-axis VEs are classified by the “naturalness” of the interaction: non-interactive, mediated interaction, and natural interaction. Non-interactive devices that require high levels of mediation, like keyboards, joysticks, and mouses, are located at the left side of the interaction axis, while devices that feature more natural interactions such as speech recognition systems and motion sensors are located on the right side. The immersion y-axis features non-immersive environments (desktop computer and speakers) at the bottom, more immersive invasive

technologies like HMD, headphones, and wearable tactile gloves in the middle, and fully immersive non-invasive environments at the top. Thus, the top right quadrant is the ideal location for VEs because they are immersive, interactive, and more likely to generate presence and flow (Carrozzino & Bergamasco, 2010). Another design factor for improving presence and flow is “representational fidelity,” the degree to which a virtual illusion looks, sounds, or feels like physical reality (Bulu, 2012).

Desktop VEs that feature computer programmes that simulate real or imaginary worlds in 3D format on screens are the most cost-effective and accessible VEs, but are limited in terms of presence and flow (Carrozzino & Bergamasco, 2010). More immersive VEs provide users with the illusion that they are inhabiting different environments and bodies through the use of dynamic visual perspective, stereoscopic vision, binaural acoustic feedback, and realistic interaction with the environment using interfaces that manipulate, operate, and control haptic feedback (Spiegel, 2018).

There are three main types of history-focused VEs—digital historical games, 3D historical reconstructions, and interactive storytelling—and each type features a range of VR technology. The most commonly used type of VEs are commercially produced digital historical games designed for user entertainment and typically played with desktop VEs that have low levels of immersion, varying levels of interactivity, and high levels of representational fidelity. Whereas previous generations’ perceptions of the past were shaped by radio, film, novels, and television, digital historical games are among the most popular forms of media people use to engage with history in their daily lives, and digital historical games shape many people’s conceptions of the past (Chapman, 2016; Staley, 2014). Digital historical games focus on numerous historical themes, geographic locations, and time periods, and there are several gameplay options. There are first-person shooters; strategy games that re-enact historical events; simulator games where users operate different modes of transportation; first-person multiplayer melee combat games; real time strategy games that allow for counterfactual and alternate histories; open-world action-adventure games that explore historic sites; puzzle adventure games that explore different perspectives; and, other genres, themes, and hybrid types (Chapman, 2016). In the last decade, a multidisciplinary group of scholars drawn from diverse fields have created a new field of research focused on “historical game studies” (e.g. Kapell & Elliott, 2013; Kee, 2014b).

The second type of history-focused VEs is 3D reconstructed historical places that feature representations of cities, buildings, and simulations of ancient structures (Schreibman & Papadopoulos, 2019). For Staley (2014), experiencing significant historical sites that are still intact or places that have disappeared are among the most important possibilities afforded by VR technologies. In these types of VEs there is no single goal in mind and participants are invited to move around and interact with the 3D historical place to better understand it (Staley, 2014). 3D reconstructed historical places are usually designed for desktops, immersion is typically low, representational fidelity varies widely, and interactivity is usually limited to exploring the VE. For example, in the *Soweto ’76* 3D Interface users move through a 3D reconstructed street in the township of Soweto as it existed prior to the June 16, 1976 student uprisings

against Apartheid (*Soweto*'76, n.d.). VEs that reconstruct historical environments and artifacts that have been destroyed or damaged also play an important role in preserving them for posterity, as a restoration tool, or to perform virtual restorations without negatively affecting the originals (Slater et al., 2018). For example, the *Digital Hadrian's Villa Project* created a 3D digital model of Hadrian's Villa, a World Heritage site in Tivoli, Italy. Some reconstructive VEs also include enactments of historical events that took place in the environments they reconstruct. One of the most sophisticated examples, the *Virtual Paul's Cross Project*, uses surround sound in a physical installation to project a digitally generated impression of the auditory conditions in which John Donne preached in the seventeenth-century yard of St. Paul's Cathedral in London (Wall, n.d.).

In the third type of history-focused VE, interactive storytelling, users enter a VE and revisit important events in a person's life to better understand the person and the time period they lived in (Shin, 2018). They usually feature photo-realistic images of storytellers, immersive displays to create the illusion that the viewer is in the same space as the storyteller, and some degree of interactivity where the storyteller or the virtual space responds to the actions of the user (Kwon, 2019). Over the last decade interactive storytelling has been increasingly used to preserve the voices of marginalized people for educational purposes. These VEs are sites of environmental storytelling where users are immersed in an environment that communicates content, invites users to explore and interact with people and objects in the VE, and stimulates emotions to influence future actions (Kee & Darbyson, 2011; Shin, 2018). Early applications used 360-degree video in what has become known as "immersive journalism" (Baía Reis & Coelho, 2018; de la Peña et al., 2010), but interactivity was limited to witnessing stories. More recent versions have used artificial intelligence (AI) algorithms to add some degree of interactivity to video projections of Holocaust survivors' testimonies in museums. This type of history-focused VE has also attracted more ethical critique than other types (DeJong, 2020; Nash, 2018).

Virtual Environments in History Education

There is a dearth of research focused on the use of VR-based VEs in history education, which makes it difficult to make claims about almost every aspect of VEs in history education, including how often teachers use VEs to teach history, how different types of VEs are being used, and the benefits and challenges of using VEs to teach history. The lack of research is understandable given that newness of VR technology and the time lag between the introduction of new technology, its implementation in classrooms, and researchers' ability to conduct research studies and publish peer-reviewed articles (Bolick, 2017). Most VE research in history education focuses on historical digital games that utilize technologies that are not "virtual" because they feature low levels of immersion and natural interaction and are unlikely to generate presence and flow. All VR technologies, including desktop VR, AR HMDs, or VR HMDs, have inherent affordances and limitations in what they can and cannot do,

but their effectiveness depends on how they are used; or as Constance Steinkuheler puts it: “games, like any other media [...] are only as smart as the practices that surround them” (2016, p. 357). Despite these caveats, in the next section we discuss the potential benefits and challenges of using VEs for history teaching and learning as discussed in the scholarly literature.

Potential Benefits and Challenges of VEs for History Education

Learning. VEs are understood to have potential to enrich, enliven, and recreate the past in ways that secondary sources such as textbooks, role-plays, lectures, and videos cannot (McCall, 2012). Scholars commonly agree that VEs contribute to increased motivation, interest, attitudes to learning, and participation in learning activities (Challenor & Ma, 2019; Checa & Bustillo, 2020). Students who are disinterested in history, deterred by lengthy or difficult texts, or struggle academically have displayed increased motivation and positive attitudes towards learning during activities that utilize VEs (Kee & Darbyson, 2011; Shin, 2017). Because immersive VEs generate presence and flow, several studies have found that VEs can increase student learning rates and memory recall, particularly young students (Csikszentmihalyi, 1990; Scoresby & Shelton, 2011; Yildirim et al., 2018). Another commonly cited benefit of VEs, particularly games and simulations, is that they help students develop the knowledge, abilities, values, and dispositions needed for improved problem solving, creativity, and collaboration (Kee & Darbyson, 2011; Papanastasiou et al., 2019).

Although engaging learners is important, Wright-Maley et al. (2018) contend that engagement is an insufficient rationale for incorporating digital technologies to teach history. Most history VEs are commercially produced digital games designed for “nostalgic entertainment” not education, and may have limited benefits for students’ learning (Staley, 2014). If VEs are going to serve a meaningful educational purpose, they must be shown to improve the learning of important historical content and disciplinary processes. Research about the effectiveness of VEs for improving learning is mixed and several studies have reported that learning did not increase (Checa & Bustillo, 2020; Kee & Darbyson, 2011). Furthermore, several studies that reported increased learning took place over a short time period, involved small sample sizes, and featured research design flaws (Papanastasiou et al., 2019). Other studies experienced what Carrozzino and Bergamasco (2010) describe as the “Guggenheim effect,” where the appeal of the VE technology distracts from the intended learning goals. For example, Squire’s (2004) research found that although students enjoyed playing *Civilizations III*, they made limited progress in historical thinking, and the advances occurred as a result of classroom discussions, not playing the game.

Accessibility. VEs are thought to provide opportunities for students, particularly those with physical or cognitive challenges, to experience historical places in the past

and present that would not typically be available because of issues of time, distance, scale, cost, and safety (Kee & Darbyson, 2011; Yildirim et al., 2018). This includes historical evidence that would otherwise be inaccessible to students including architectural plans, models, photographs, film, maps, paintings, artifacts, and buildings (Bonnett, 2001). VEs are also believed to have considerable potential for preserving and providing access to oral histories of people who experienced significant historical events and time periods (Challenor & Ma, 2019). Although audio, film, and video recordings have been used to preserve oral histories for decades, Shin (2018) argues that VEs have unique potential to engage users with complex historical narratives.

Despite having the potential to make history more accessible for students, VR technology is largely inaccessible for most history teachers and students. Although the cost of VR technology has decreased, widespread usage is still unlikely to occur because the cost of purchasing and maintaining VEs is prohibitive for most schools (Carrozzino & Bergamasco, 2010). Only well-funded schools and cultural institutions have the financial resources and space needed to purchase, maintain, and house VEs (Papanastasiou et al., 2019). VEs also require large amounts of bandwidth to function as immersive environments, and many schools' networks lack the capacity to support multiple VEs at the same time. Also, most VEs are single-user experiences, which limits the possibilities for student collaboration and the number of students who can use them at the same time (Carrozzino & Bergamasco, 2010). Not all students are comfortable wearing HMDs, goggles, sensory gloves, or other technologies and numerous studies have reported that some users experience "cybersickness," including dizziness, motion sickness, headache, sweating, disorientation, vertigo, and nausea when wearing HMDs (Papanastasiou et al., 2019). Spiegel (2018) also raises concerns about the potential risks to users' bodies when using VEs, potential mental health risks including depersonalization disorder, and other moral and social risks. Many history teachers are also reluctant to use VEs because they do not know how to use VR technology, troubleshoot technological problems, maintain equipment, design meaningful learning opportunities, and assess students' learning (Wright-Maley et al., 2018).

Historical Thinking. Historical thinking is the process of analyzing and interpreting historical evidence with the aim of constructing, deconstructing, and reconstructing historical narratives (Stipp et al., 2017). At its core, historical thinking eschews the teaching of fixed grand narratives and focuses instead on teaching students to assess, critique, and construct historical accounts and interpretations with increasing sophistication (Kee, 2014a; Seixas & Morton, 2013).

Several scholars have illustrated how VEs can be a powerful tool for teaching epistemological understandings that are foundational for historical thinking (Allison, 2008; Kee, 2014b; Staley, 2014). The past is everything that ever happened and existed anywhere, it no longer exists, and cannot be recreated. History consists of narratives constructed from the analysis of historical evidence that impose coherence on the messiness of the past and make it into history (Bruner, 2005). Like written narratives VEs are abstractions of the past, except they use images, sounds, and interactive affordances in addition to words. Despite the best attempts of VE designers, VEs are imperfect recreations of past events that cannot replicate reality nor make the

past come to life (Slater et al., 2018; Sullivan et al., 2017). McCall (2011) discusses the importance of students recognizing that VEs are constructed interpretations of past events and places that need to be analyzed and critiqued like other secondary sources. According to Allison (2008), inviting students to critique the authenticity, accuracy, and realism of VEs, or experience a historical event from different perspectives, has the potential to deepen students' understanding of the past, history, and reality.

A significant body of history education research has conceptualized the structure and form of historical thinking in terms "second-order" historical concepts, which are defined by Lee and Ashby (2000) as ideas that shape our understanding of the discipline as a form of knowledge. In a historical thinking approach, second-order concepts such as historical significance, cause and consequence, evidence, progress and decline, and historical empathy are taught with first-order concepts, facts, and generalizations to deepen students' knowledge of substantive content and how historical knowledge is constructed. Kee and Darbyson (2011) and Wright-Maley et al. (2018) illustrate how digital historical games have been used to support the teaching and learning of second-order historical thinking concepts included in Seixas' (2006) framework. Both authors describe how learning activities that approach VEs as constructed narratives have been used to teach about five historical thinking concepts included in Seixas' framework: historical significance, evidence, continuity and change, cause and consequence, and historical perspectives, but they do not discuss the ethical dimension.

Historical Empathy. VR technology has been referred to as an "empathy machine," and one of the most frequently cited benefits of using VEs in education is that they can stimulate empathy (Alsever, 2015). Empathy is the ability to cognitively understand and affectively respond to what another person is feeling or experiencing by imagining what it would be like to be in that person's situation. Through the process described as "embodiment" VE designers attempt to provide users with the sensation of having the experience and seeing themselves as part of the VE (Shin, 2018; Slater et al., 2018). Hasson et al. (2019) argue that different methods of embodiment, including inviting users to experience a VE from another person's perspective, provide VEs with "almost limitless potential to simulate reality from different perspectives" in ways that cannot be done in the real world (p. 2). Some studies have shown that immersing users in another person or group's experience, including refugees or those with physical or cognitive challenges, can reduce negative attitudes, increase empathy, and promote cooperative behaviour (Hasson et al., 2019; Shin, 2018).

History education scholars have defined and conceptualized historical empathy, analyzed student examples of it, and identified effective pedagogical methods and strategies for promoting it (Ashby & Lee, 1987; Endacott, 2010; Foster & Yeager, 1998). Historical empathy is a second-order historical thinking concept defined as, "the process of students' cognitive and affective engagement with historical figures to better understand and contextualize their lived experiences, decisions, or actions"

(Endacott & Brooks, 2013, p. 41). Endacott and Brooks (2013) theorize historical empathy as including three interdependent aspects: historical contextualization, perspective taking, and affective connection. None of these aspects encourage learners to imagine themselves to be “in” the past, nor to experience events or emotions exactly as they were felt by historical actors. Instead, the goal is to understand and contextualize the lived experiences, decisions, and actions of people that lived in a time that was often much different than the present.

History-focused VEs provide generative opportunities for developing students’ historical empathy because they invite students to enter and inhabit a historical VE, interact with different historical actors, explore different interpretations of historical events, and understand different perspectives (Schultzke, 2013; Staley, 2014). Challenor and Ma (2019) suggest that VEs can enhance learning of emotionally complex topics such as the Holocaust because they require students to consider multiple perspectives to understand what happened, how it happened, and what the consequences of events were for people who experienced them. Teachers and students often forget that people in the past lived and operated in different physical, spatial, and intellectual contexts, and VEs can generate understanding of these contexts in ways that other types of secondary sources cannot (McCall, 2011). Experiencing historical places through different cultural and ethnic perspectives can also help students understand why certain groups have different historical memories and affiliations with particular places. Chang et al. (2015) refer to this as a “sense of place,” which they define as “the combination of feelings of attachment, dependence, concern, identity, and belonging that people develop regarding a place” (p. 166).

Given the historical realism of some VEs, there is also the potential that users will uncritically accept them as reality, rather than as constructed narratives (Gratch, 2018; Sullivan et al., 2017; Wall, 2014). All sensory experiences, including sound, touch, taste, and sight are historically and culturally generated ways of knowing (Smith, 2007). Even if VE designers could replicate sensory experiences from the past, it would be impossible to determine what those sensory experiences meant to the people who experienced them. Due to technological limitations and gaps in the evidentiary record, even the most realistic VEs cannot replicate sensory experiences, and haptic interfaces that simulate touch are still in early stages of development (MacLean et al., 2017). No matter how realistic VEs appear to be, users need to be reminded that the past cannot be brought to life and VEs are reproductions of the past. We agree with Staley who suggests the following sign be attached to all VEs: “This is not the past. It is a useful device for thinking about the past” (p. 127).

As Allison (2008) points out, advanced technologies like VR do not solve all the problems history educators face, and often raise new issues that are difficult to overcome. VEs offer unique and potent opportunities for teaching and learning history, but they also raise significant challenges including lack of accessibility for teachers and students and how to design and use VEs to support the development of historical thinking. In the final section, we describe the *Digital Oral History for Reconciliation* (DOHR) curriculum and VE, and describe a new approach for designing curriculum-specific VLEs.

The Digital Oral Histories for Reconciliation (DOHR) Project

The Nova Scotia Home for Colored Children (NSHCC) was a segregated care institution for African Nova Scotian children in Dartmouth, Nova Scotia from 1921 until the early 2000s. Generations of residents experienced neglect and abuse throughout the nearly eight decades it was in operation (Province of Nova Scotia, 2019). Following a seventeen-year struggle for justice by former NSHCC residents, the Government of Nova Scotia established a four-year Restorative Inquiry (RI) into the history and legacy of the NSHCC. The Government of Nova Scotia “recognized that the history, experience, and legacy of the Home reflects the systemic and institutionalized racism that has shaped Nova Scotia’s history and continues to impact the lives and experiences of African Nova Scotians to this day” (Province of Nova Scotia, 2019, p. 3). The RI was “future focused, yet concerned with getting a comprehensive understanding of the past in order to know how to move forward toward a just future” (Province of Nova Scotia, 2019, p. 26).

DOHR is a community-driven research project that brought former NSHCC residents, representatives from the Nova Scotia education system, and members of the RI together with artists and researchers from seven Canadian universities to develop a two-week grade 11 Canadian History curriculum unit that supports the RI’s educational mandate. In October 2019 the two-week curriculum was piloted in two Grade 11 Canadian history classes in Nova Scotia high schools.

The curriculum focuses on deepening students’ understanding of the history of the NSHCC within the larger context of African Nova Scotian history. The first-voice experiences of three former NSHCC residents, Gerry Morrison, Tony Smith, and Tracy Dorrington-Skinner, are centred in the curriculum, and students are invited to join the former residents in a “Journey to Light” that sheds light on what happened in the past in order to find a way to a better future (Province of Nova Scotia, 2019, p. 5). The overall purpose of the curriculum is to promote relationality—to equip students with tools to understand their relationship to difficult historical knowledge, to the lived experiences of historical actors, and to the future of their communities (J. J. Llewellyn, 2012). The DOHR team integrated theories drawn from various fields including restorative approaches to learning, historical thinking, oral history, difficult history, Africentric principles, and culturally relevant pedagogy when designing the curriculum (Epstein & Peck, 2018; Ladson-Billings, 2009; Llewellyn & Llewellyn, 2015; Llewellyn & Ng-A-Fook, 2020; Seixas, 2017).

The five-lesson curriculum was designed to be completed in ten 80-minute classes. Lesson 1 invites students to join former NSHCC residents in their journey to light, and introduces the goals of the curriculum and key curriculum concepts. In Lesson 2 students are introduced to significant events in African Nova Scotian history and use two historical thinking concepts, historical significance and continuity and change, to contextualize the history of the NSHCC. Lesson 3 focuses on analyzing different types of historical evidence, including VR oral histories in the DOHR VLE, to make plausible inferences about residents’ quality of life at the NSHCC. In Lesson 4

students examine and assess the interrelated factors that caused the NSHCC to become a place of harm. In Lesson 5 students share their learning and develop a “restorative plan” that builds just relations in their communities.

The DOHR Virtual Learning Environment¹

DOHR used a VLE to render oral histories of former NSHCC residents to make their stories accessible to students, and to relieve the former residents of repeated in-person storytelling (Roberts-Smith et al., Forthcoming). The DOHR VLE is a 13–15-minute individual and small group learning activity embedded in Lesson 3. A trained facilitator introduces groups of four students to the DOHR VLE, and helps students put on a VR HMD at one of the four individual VLE stations. The experience begins with a short, documentary-like 360-degree video segment that introduces the three storytellers, Smith, Morrison, and Dorrington-Skinner. Students then choose one oral history from each storyteller (three stories total) out of twelve possible stories. The twelve oral histories are rendered in a multi-modal blend of 3D graphics, 360 and 2D video, 2D images, environmental and spatially located sound, voice-over narrative, and text. Students then experience the same short sequence in which the three storytellers reflect together about their memories of one common room in the NSHCC. Lastly, students witness another 360-degree, documentary-like video in which the storytellers, without the use of voice-over, describe how they came to be activists. After students remove their HMDs, the facilitator leads a short restorative “sharing circle” where students debrief their experience and share their learning.

Given the unique pedagogical aims of the DOHR curriculum, including promoting relationality and historical thinking, we utilized a distinctive approach to designing the VLE. While our VLE falls into the category of interactive storytelling, we have taken a different approach to the definitional VR concepts of immersion, interactivity, and representational fidelity in our rendering of a three-dimensional (3D) digital environment. Like most VR-based VEs, we aimed to create a sense of presence; however, rather than give participants the illusion that they are “actually there,” we want them to be aware that they are witnessing a story being told by another person that they might not have access to otherwise. We use the term *relational presence* to describe this form of presence (Roberts-Smith et al., Forthcoming).

The goal of creating relational presence has had several consequences for the DOHR VLE design. Although we want students to understand what it was like to live in the NSHCC, we did not attempt to create representational fidelity in our renderings. Instead, we portray the NHSCC using a multi-modal, impressionist aesthetic that

¹ The DOHR VR experience was designed using the principles of “co-design” articulated in the work of Steen (2013), whereby stakeholders are actively involved throughout the design process and afterwards. The full citation for the DOHR VR experience can be found in the reference list under Roberts-Smith et al. (2019).

reinforces the former residents' oral histories. We want to make it clear that the world the students are encountering represents what the place means for storytellers and learners rather than an exact simulation of how it looked (Roberts-Smith et al., Forthcoming). Although our renderings might be considered high-fidelity from an aesthetic perspective, they do not aim for the kind of realism expected in a traditional understanding of representational fidelity (see Fig. 1).

Because the project emphasized the importance of students witnessing former NSHCC residents' oral histories, we limited interactivity in the VLE to providing students with the option to choose which stories from the three former residents they want to experience. This is not to suggest that listening to the oral histories is inactive or passive; rather, like Low and Sonntag (2015), we conceptualize listening as a learning process that builds relations between storyteller and listener (Roberts-Smith et al., forthcoming 2020). Although the DOHR VLE is delivered using the Oculus Rift



Fig. 1 Screen captures showing three different approaches to multi-modal impressionist rendering in excerpts from Morrison's story, "Swamp Water" (top left); Dorrington-Skinner's story, "Mrs. Johnson's Helper" (top right); and Smith's story, "The Switch" (bottom). See Roberts-Smith et al. (2019)

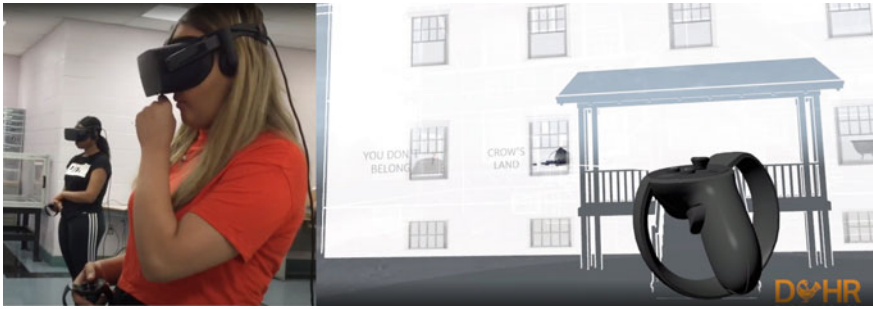


Fig. 2 The DOHR VLE is delivered using the Oculus Rift VR HMD (left). The in-world story selection mechanism uses an avatar of the actual hand-held controller to emphasize the constructedness of the experience

we deliberately preserved the low-level immersiveness of the Oculus hand-controller as a reminder to learners that the DOHR VR experience is constructed. There are no anthropomorphic avatars in our VLE, and no attempt is made to generate a sense of virtual “embodiment” by creating roles or characters for learners to assume. Instead of creating virtual representations of storyteller or student, we make space for each to occupy their own, actual-world perspectives. For storytellers, this means their oral histories are told using their voices, and for learners, it means witnessing the stories as students, not in roles (Roberts-Smith et al., Forthcoming; see Fig. 2).

Similarly, the DOHR curriculum’s pre- and post-experience learning activities challenge the traditional understanding of immersion by emphasizing that the VLE is not a complete experience in itself. Whereas traditional VLEs generate the kind of flow where students are fully engaged in their learning task and feel a sense of enjoyment while participating in the VLE, experiencing difficult knowledge in the former residents’ stories can lead to affective dissonance and discomfort. We hope that this productive discomfort will prompt questions to be further investigated in the curriculum. How could this have happened? Why didn’t I know about this before? What is my responsibility to respond now that I have heard these stories? (Roberts-Smith et al., Forthcoming).

Conclusion

We think the notion of relational presence as we applied it to the design of the DOHR VLE offers several potential benefits for teaching and learning history, and for the design of interactive storytelling VEs. While this approach to VLE design will not be relevant to all history-focused VEs, it offers a different way of thinking about VE design principles like immersion, interactivity, and representational fidelity, which might transfer to other contexts. The DOHR VLE represents a powerful means of preserving the oral histories of marginalized people and presenting them in a way

that builds relationality, a sense of place, and historical empathy. Since most students cannot interact with the former NSHCC residents or visit the NSHCC directly, the DOHR VLE exemplifies the kind of experiential learning that is likely to benefit from a VE (Dalgarno & Lee, 2010).

Additionally, scholars have demonstrated how witnessing oral histories builds relational connections that are intergenerational and support reconciliation (K. R. Llewellyn & Ng-A-Fook, 2017). In this way, the DOHR VLE is an instructional tool that can be used to propel learners towards deeper engagement with difficult history and the ethical dimension of historical thinking. Epstein and Peck (2018) define difficult history as “historical narratives and other forms (learning standards, curricular frameworks) that incorporate contested, painful and/or violent events into regional, national or global accounts of the past” (p. 1). For Seixas and Morton (2013) the ethical dimension imbues the study of history with meaning, expands students’ historical consciousness by helping them learn from ethical transgressions in the past, encourages them to judge the past more fairly, and supports them in better handling present and future ethical dilemmas.

The DOHR VLE has yet to be validated with empirical research, however, researchers have conducted a study of the curriculum, including the VLE experience, and are currently analyzing the data. Preliminary results suggest that students experienced a strong sense of flow, acquired new historical knowledge about the NSHCC and African Nova Scotians, and built a sense of relationality to former NSHCC residents. Further data analysis will focus on assessing the degree to which the VR experience and the curriculum met its objectives, including improving students’ ability to build more just relations.

Given the scarcity of research focused on VEs in history education, there are many fertile areas for future study. Research focused on how VEs are embedded in classroom-based curricula is most urgent. To date, most VE research has focused on digital historical games, but research is needed that investigates the opportunities and challenges that different VE types offer for teaching history. Designers have given the technical design of stand-alone VEs most of their attention, but the field has not yet applied pedagogical design practices to VEs (Fowler, 2015). One of the significant advantages of considering VEs in the context of a blended in-person and virtual curriculum design is that it avoids technological determinism, where virtual experiences are “considered both a product and an outcome of technology” rather than an outcome of the ways designers manipulated the technologies (Baía Reis & Coelho, 2018, p. 1093). Envisioning VE as one learning activity in the context of a larger curriculum makes the technology secondary, and emphasizes the agency of educators to design and use the VE in ways that best serve their students and their pedagogical purposes.

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