Virtual Reality as a Tool for Promoting Diversity, Equity, and Inclusion Within the Higher Education Landscape

Jennifer Richter[1], Liesel Sharabi[2], Rachel Luchmun[3], Tray Geiger[3], Annie Hale[3]
and Alysha Ramirez Hall[3]

[1]*School for the Future of Innovation in Society, Arizona State University, Tempe, AZ, U.S.A.*
[2]*Hugh Downs School of Communication, Arizona State University, Tempe, AZ, U.S.A.*
[3]*Action Lab at EdPlus, Arizona State University, Tempe, AZ, U.S.A.*

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Abstract: While Virtual Reality (VR) Has the Potential To Be a Powerful Tool for Promoting Diversity, Equity, and Inclusion (DEI), It Is Crucial To Be Aware of the Biases that May Be Present and Work To Address Them Throughout the Design and Development Process. Inclusive VR Will Accommodate the Differing Requirements and Identities of Individual Students, Together With a Commitment To Remove the Barriers that Impede that Possibility. in Doing so, This Will also Introduce New Possibilities for Expanding DEI Initiatives Through Embodied and Immersive Experiences that Will Allow Students To See the World from Someone Else's Perspective. However, While the Promises of VR Are Plentiful, There Are also Emerging Issues that Will Hamper Access Unless They Are Proactively Addressed by both VR Designers and the Institutions Implementing VR Technologies into Curricula.

1 INTRODUCTION

Intentional efforts to increase the diversity, equity, and inclusion (DEI) of both participants and infrastructures in virtual reality (VR) settings for higher education are still in their infancy. Consequently, literature around this concept needs to expand from the speculative to the material, as more universities and colleges explore the use of VR in higher education settings. VR has incredible potential as a pedagogical tool to increase DEI in terms of access and use for new technological innovations, as well as being a site for promoting awareness and empathy for different social identities and positionalities. However, existing and emerging systemic and structural issues relating to bias may limit the potential for promoting DEI values, especially as this technology becomes more widespread in education settings. In order to promote DEI values in VR settings, it is critical to address DEI-related issues early, not only in the design of VR experiences, but also during its implementation and use (Blackwell et al., 2019).

The available literature surrounding the topic of DEI in VR makes a clear statement that "when existing inequalities are unacknowledged and unaddressed in the 'real' world, they tend to be replicated and augmented in virtual realities" (Franks, 2017, p. 503). In the following sections, we provide several areas where VR in educational settings can be better utilized to promote DEI values and principles, as well as issues that will need to be addressed to ensure students have equal access to these experiences. Specifically, we focus on how to design more inclusive experiences and how to encourage more equitable participation in VR settings, as well as how VR can be used as an effective pedagogical tool for all students.

2 POSSIBILITIES FOR DEI IN A VIRTUAL ENVIRONMENT

A VR environment, or what a user can see and/or interact with, is rife with possibility for increasing positive representation and visibility of people who have historically been rendered invisible or who are only made visible in highly stereotypical ways (see, for example, Dirks & Mueller, 2007). Current literature around VR points to several systemic and structural issues with VR, while also pointing to the advantages of engaging with VR technologies in

educational settings in relation to improved and measurable learning outcomes through a controlled and well-designed virtual setting that provides an experiential learning environment (Merchant et al, 2014; Di Natale et al, 2020; Marks & Thomas, 2022). For example, a virtual environment can depict and allow a user to experience various interactions with a character who does not conform to the ways that they are often portrayed in the media (Ramirez, 2020). Interacting with someone on an interpersonal level rather than having to rely on popular media portrayals can help increase awareness of harmful stereotypes and promote increased acceptance and understanding (Dirks & Mueller, 2007). A virtual environment can also allow for people to participate in experiences that might otherwise be inaccessible to them in-person, such as those with disabilities that affect physical travel to remote locations, or people visiting a virtual location that might otherwise be inaccessible to them because of cost or safety concerns, such expensive or physically dangerous sites. VR is particularly well suited for these experiences because well-designed VR settings create a sense of "presence," or the feeling that the VR world is real and that the user has been transported to another place (see, for example, Dede et al., 2017).

3 AVATARS AND EMBODIMENT

Embodiment refers to the sense of self-location, agency, and body ownership experienced in VR environments (Kilteni et al., 2012). Customizing the virtual body (i.e., an avatar) induces a meaningful relationship between a user and avatar from the start (McArthur & Jenson, 2014), bolstered by the fact that avatar creation interfaces are often capable of producing millions of unique permutations. Avatar diversity, including diversity of clothing and appearance (e.g., age, body size/shape, facial features), provides inclusive choice for embodiment within a VR environment, and can reflect the wide diversity of the human appearance (as well as non-human). This is especially important as it can allow users of historically underrepresented demographics (e.g., women, ethnoracial minorities, people of differing abilities) to see themselves and others in situations that are often rendered invisible to them, or where they are often rendered invisible.

Avatars can also increase a user's empathy for historically marginalized groups, as users can experience different treatment from their own positionality. For instance, a VR experience simulating racism experienced by a Black person in

the United States (U.S.) could lead to better understanding of prejudice and discrimination for a non-Black user. Conversely, those from historically under-represented and marginalized groups can get a better sense of how they might be treated differently if they come from a more entitled group (e.g., a cisgender woman can have a male-presenting avatar and can compare her treatment to that in the virtual world, creating a sense of what it may be like to embody another gender identity). Experiencing different reactions to different positionalities is one way that avatars can create a space for different human experiences and promote recognition and awareness of structural racism, sexism, and ableism, to name just a few DEI issues, that would be near impossible to experience in a non-VR setting (Roswell et al., 2020; Stanney et al., 2020). However, it is worth noting that a false sense of empathy can also be created, especially if the focus is on feeling the pain of marginalized groups rather than on structural inequalities (Nakamura, 2020).

4 PROMOTING DEI THROUGH VR-SITUATED SCENARIOS

To encourage empathy for understanding and addressing structural inequalities, VR can be used to simulate situations that people from marginalized groups face in the real world, such as discrimination or bias. Creating and cultivating empathy and shared experiences is one way to promote an inclusive mindset (Winters, 2020). VR can be used for exploration or training for individuals to recognize such problematic situations (Juvonen, 2019; see also Bailenson, 2018; Roswell et al., 2020). VR is often touted as the future of skills training given its advantage over face-to-face role playing, making it the ideal environment for simulating life-like scenarios (Mast et al., 2018).

Likewise, VR settings can provide a safe and controlled space for people to experience and understand the perspectives of others. These types of moments of empathy can be intense and temporarily transcend social norms that typically characterize relationships within structured institutionalized contexts. These obvious opportunities for intentional DEI efforts can result in profound impacts for VR users on future interactions with others both within and outside of VR. For example, a VR setting can include a plurality of gender identities, which provides a space for the intentional inclusion of a wide range of gender identification that might not be

often visible in everyday scenarios. The Proteus effect posits that the physical appearance of an individual's VR avatar may lead them to "conform to the behavior that they believe others would expect them to have" (Yee & Bailenson, 2007, p. 274), which suggests that the experience of embodying an avatar different from oneself in VR could affect not only a user's attitudes but also their behaviors towards historically underrepresented groups, both within and beyond VR.

5 ETHICAL AND PRACTICAL IMPLICATIONS OF VR AND DEI

There are a number of ethical and practical implications to consider with the use of VR technology. In this section, we discuss some of the more prevalent issues of VR relative to the affordances (e.g., anonymity, presence, accessibility) (Fox & McEwan, 2017) and infrastructure of traditional learning modalities. Some of these issues require further consideration and discussion, as well as, perhaps, coordination and sharing of best practices between and among higher education practitioners and those involved with designing and creating VR settings. Lastly, while the issues below are concerning, potential harm can be greatly reduced or eliminated with intentional design focused on addressing DEI concerns.

5.1 Safety and Privacy

VR technology often involves the collection and storage of personal data, which raises concerns about how this information is used and protected. The anonymity afforded by the virtual world may also lower people's inhibitions (Suler, 2004), leading them to behave in ways that could jeopardize the psychological well-being of themselves and others. While the anonymity of VR may offer a more open space for personal expression, it may also offer the illusion that people's actions are without consequences. For instance, sexual harassment has been reported on popular VR platforms like Meta's Horizon Worlds, making it important that people have access to safety features that give them control over their own personal space and allow them to set physical boundaries within the virtual world (Basu, 2021).

VR can be used to create highly realistic simulations, which raises concerns about the potential for deception and manipulation. In educational settings, it is critical that users understand who they are engaging with in any virtual setting (as opposed to choosing to engage with anonymous agents, or to remain anonymous in social spaces). For instance, users should be aware that avatars, by definition, are human-controlled, but there are also opportunities to engage with virtual agents that are controlled by artificial intelligence (Fox et al., 2009). To the user, avatars and virtual agents may seem indistinguishable from one another, which could allow personal data to be collected for purposes unknown or unsanctioned by the user. In educational settings, it is incumbent on the institution to protect students and not the responsibility of students to be concerned about the protection of their identity in educational VR settings.

Currently in educational VR settings, students are in spaces that are designed for limited peer interaction; often, students routinely interact with virtual agents. This is a major difference between social settings (e.g., gaming or VR worlds like Meta) and educational settings. Because students are generally interacting with the VR environment and not interacting with other students, the potential problems presented by anonymity are not necessarily a large issue at the present. But as the use of VR grows, and more social spaces are introduced for students to work in, anonymity may need to be limited under certain contexts. However, it is also important to recognize that anonymity can be beneficial for students who are less inclined to participate in classroom settings. The issue of anonymity needs special long-term attention and monitoring by designers as higher education VR spaces grow to create a space for free and open expression while also contributing to a safe and supportive learning environment.

5.2 Physical Ability and Health: Inclusion and Accessibility

User experience is a major concern that will shape the utility and accessibility of VR in educational settings. VR technology may not be accessible or inclusive to certain groups of people, such as those with disabilities (physical and cognitive). Use of VR headsets can lead to physical symptoms of illness. Physical issues, such as supporting a heavy headset for a set period of time (such as a class period), is one such issue. Headsets are often tested on adult male subjects, creating a physical norm against which other physicality may be limited. Women and smaller users (such as adolescents) have a different experience with headsets, especially over time (Munafo et al., 2017).

Those with physical disabilities, such as spinal injuries and paralysis, may also find the use of headsets unwieldy and uncomfortable, making it difficult to focus on and enjoy the VR experience. Users with existing medical conditions, such as epilepsy, may find it impossible to engage in VR settings, and those with mild physical issues, such as those who wear eyeglasses, sometimes find the VR experience difficult to engage in. How VR headsets can be redesigned to encompass the needs of all users is a pressing issue for educational settings.

Another pressing issue emerging with the increased use of VR is cybersickness, which involves symptoms such as eye strain, headaches, and nausea (Slater & Sanchez-Vives, 2016). There is evidence that women experience cybersickness at greater rates than men, thus making VR experiences potentially less inclusive for women (Munafo et al., 2017; Stanney et al., 2020). Female users are particularly at risk from cybersickness, as well as vertigo. As the use of VR technologies becomes more widespread, the diversity of the physical accommodations for users needs to grow. Finding new designs today will help make VR technologies more accessible, and more inclusive for users in the future.

5.3 Embedded Threats

Beyond physical limitations, there are also a host of ways that VR settings can create spaces that may reinforce negative stereotypes and abusive behavior, negating the aspects of VR that would promote DEI values. Historically, human biases are shaped by pervasive and often deeply embedded prejudices against certain groups, which can be reproduced and amplified in VR spaces and backend code (Lee et al., 2019). Bullying, harassment, and, specifically, sexual harassment in VR environments has been reported (Chang et al., 2019; Parshall, 2022). As VR technology can be used to simulate experiences and perspectives in realistic ways, it is critical to ensure that it is not used to perpetuate harmful stereotypes, discrimination, or patterns of abuse (Bale et al., 2022; Wu et al., 2021). When these issues happen in the material world, they are often traumatizing. In a VR setting, these negative interactions may be amplified relative to other distance learning modalities due to the embodied and immersive nature of a VR experience (Bailenson, 2018; Biocca et al., 1995). Purposeful control and regulation of VR spaces is critical, at both the design stage and the implementation stage. As educational VR settings grow, understanding how users may encounter and experience negative interactions must inform the

ways that these environments are regulated by institutions.

5.4 Infrastructural Limitations: Cost and Access

While educational institutions' use of VR was once limited by cost, the advances made in computing and data management has allowed for growing adoption of VR in educational spaces. However, while institutions are investing in VR technologies for educational purposes in institutional settings, VR technology is still considered cost-prohibitive for many individuals at higher education institutions, particularly those from lower socio-economic (SES) backgrounds. As VR becomes more pervasive, the cost will ultimately be reduced (XRGuru, 2022), but in educational settings, the associated cost and any course fees need to be considered alongside other learning costs, such as tuition and existing fees. A U.S. Department of Education (2016) report noted that two-thirds of Hispanic, Black, and Asian undergraduates had a gap between total financial resources (e.g., federal student loans) and the total cost of attendance. More than 80 percent of Hispanic, Black, and Asian undergraduate students had a gap between their financial need (cost minus expected family contribution [EFC]) and grants and scholarships, compared with 71 percent of white undergraduate students. Many of these students need to take out additional loans or work to finance their education, while some students may choose to not enroll at all if there is too large a gap between available money and the cost of attendance. Such financial concerns may be amplified if the costs of VR technologies are passed down to students. Clarity is needed on how and by whom costs for VR technologies will be paid, and how that may influence students' abilities or desires to enter higher education degree programs. If lower SES students are forgoing higher education opportunities because of growing costs, this creates a systemic inequity that privileges wealthier students while simultaneously discouraging those who need degrees for better employment opportunities.

Keeping the above-mentioned challenges in mind, VR can level the playing field for lower SES students by providing similar opportunities to learn and succeed as their more affluent peers. This can especially be the case with accessing remote and/or exotic locations and experiences through VR, such as famous museums or historical landmarks. Providing VR experiences to all students, and certainly those from marginalized backgrounds, will ideally enhance

future employment opportunities as VR-related jobs are created, as well as other opportunities for experiential learning that can contribute to personal and economic growth.

5.5 Access to Cutting Edge Technology

The local (i.e., non-remote) university setting is one place to address DEI concerns, and it is presently the most likely place for students to encounter VR use for educational purposes. VR is currently often used in a "lab" setting (Pan & Hamilton, 2018), which in the context of higher education involves students gathering in a university-created space on campus to utilize VR for learning content. This setting often includes VR operators (i.e., the people who provide VR-related set up and support), who can bolster an inclusive environment that can lead to an improved user experience. If non-campus students will use VR for remote learning, more attention to infrastructural limitations and technology support needs to be considered. Practical infrastructural barriers such as adequate bandwidth, internet speed, technology assistance, and accessible locations for VR need to be created or alleviated (Dick, 2021).

Both currently and in the future, remote VR access from disparate locations will require better access to a strong telecommunications infrastructure. This access will be costly and will create a disproportionate burden on students from lower SES backgrounds if this is not proactively accounted for. It is critical that VR not exacerbate the "digital divide" regarding access to internet and broadband technologies. For example, this is especially true for rural tribal nations in the U.S. (Bauer et al., 2022; Duarte, 2017). One such nation, the Navajo Nation, which is the largest and most populous tribal nation in the U.S., has experienced a systemic lack of investment and sovereignty over the development of information and information communication technologies (ICTs) on their reservation. Access to broadband ICTS, such as fiber optic cables or satellite links, have not reached much of the Navajo Nation, and what limited access exists is insufficient for VR (Park, 2020). Tribal lands reserved for Indigenous communities are a site where DEI is already a structural and systemic concern, reflecting societal values that historically have excluded these populations from technologies, or denied them control over those technologies.

The need to access VR remotely will exacerbate the issues, even as universities continue to pursue and create more accessible remote and online educational opportunities. If students in remote or rural areas cannot access a robust internet connection (due to cost or limited availability), the benefits of VR instruction will be of limited value and the students who could potentially benefit the most could ultimately be the ones who are further excluded.

6 CONCLUSIONS

Ultimately, VR spaces need to be carefully considered for their adherence to DEI principles. In designing these spaces, educators need to attend to the risks and benefits for students using these spaces for educational purposes. The responsibility for creating safe and supportive learning spaces lies with the institutions that choose to use VR technology, as well as all involved parties (e.g., developers, designers, administrators, faculty); this responsibility should not be left to fall on students. This paper contributes a summary of information that systems implementing VR strategies can look to in order to evaluate their work in the VR space with regards to DEI issues.

The promise of VR remains very hopeful, and it has a bright future for pedagogical applications. VR has great potential for creating more awareness of DEI issues and can even provide a platform for addressing those issues, but only if care and attention are paid to the issues raised by those using VR technologies. DEI concerns should be at the center of VR design, development, and implementation to ensure that VR becomes a useful pedagogical tool for all.

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