

Embodiment & Social Interactions in a Class Virtual Reality Poster Session

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Background and Objectives

VR can provide students with immersive experiences that allow them to interact with content in meaningful contexts (Abadia et al., 2018), encourage active collaboration through shared experiences (Gao et al., 2019), and cultivate a sense of community (Liu et al., 2019; Holt et al. 2020). Some research has shown that VR changes physical interactions within the environment, impacting cognition (Bailey et al., 2016) and student learning (Abadia et al., 2018).

However, little research explores how incongruities between physical embodiment – the sensations that come with having and controlling a physical body – and virtual embodiment – the sensations that come with controlling a body in VR – can affect learning in formal higher education settings.

We investigated the following research questions: (RQ1) How do incongruities between physical and virtual embodiments impact social interactions in a classroom? (RQ2) How do these incongruities open opportunities that are otherwise missing from remote classroom environments?

Methods

We observed a 75-minute, immersive, VR poster session held in Mozilla Hubs as a part of the regular course syllabus for a 3D User Interfaces class taught by the second author in Fall 2020.

The lead researcher recorded observations of the 11 study participants (2 female graduate students, 4 male graduate students, and 5 male undergraduate students) and performed follow-up interviews with 8 of them. Field notes focused on interactions in which congruities and incongruities in embodiment were observed to impact students' social interactions. Interviews focused on in-person and remote classroom experiences and on their social interactions.

Episodes of collective social interaction were sorted into two emergent themes at the intersection of embodiment, collaborative problem solving, and social interactions.

Results

The first emergent theme was opportunities for collaborative learning in VR. A large part of students' shared experience was exploring their physical and virtual embodiment in the Hubs environment. This opened opportunities for playfulness, creativity, and genuine peer-to-peer interactions as students discovered novel aspects of the environment.

At other times, embodiment facilitated student communication and peer teaching episodes. For example, students used gestures to instruct others how to navigate the virtual space and control their avatars. These episodes were prevalent during class and were referenced as positive experiences by multiple students during the interviews. Such peer mediation mimics the social learning supports that happen naturally in face-to-face classrooms but are often missing in remote spaces.

While virtual embodiment through avatars provided positive collaborations when replacing some aspects of co-located interactions at typical poster sessions, we found it could also have unexpected effects. For example, because of different sound features in the space and students' unfamiliarity with them, they perceived the "normal" behavior of walking by a poster presentation as more disruptive in the virtual space and avoided doing so when someone was presenting.



Figure 1: Part of the immersive virtual space where the poster presentations happened.



Figure 2: Group of students gathered around a poster presentation, discussing the findings with the presenter.



Figure 3: Student improvises using marker feature of Hubs in response to unexpected audio challenge.

Discussion and Conclusion

Observed interactions highlight two key strengths of VR: (1) **it provides the opportunity for students to interact naturally within a shared space.** In the interviews, students reported that in classes held through video conferences they felt alone in what one student referred to as a "sea of information" with no unstructured interactions such as casual conversations. Students reported that VR allowed for interactions that decreased feelings of isolation. (2) **The VR environment helped students participate in peer-to-peer learning, which made class more engaging and comfortable.**

Incongruities in embodiment can create unusual or frustrating social situations. Although such incongruities may make VR seem undesirable, it was exactly these challenges that presented opportunities for students to engage in open discourse and collaborative exploration. This in turn engaged students throughout the session and created a sense of community. VR technology increasingly grows more advanced, and as interactional elements are improved, opportunities to learn and explore novel environments together will expand.

We remain optimistic that free, open-source technologies such as Hubs will continue improving accessibility to VR technology, paving the way to impactful remote student experiences.

References

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