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Virtual Reality for Collaborative Learning in Teacher Education

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Abstract: This poster discusses the potential of virtual reality (VR) for collaborative learning. VR can provide engaging, social and creative digital environments for collaborative knowledge construction but its pedagogically meaningful uses and affordances are only just developing. We present the design of a case study where pre-service teachers become acquainted with the pedagogical potential of VR through collaborative exploration and subsequently collaboratively design and reflect on authentic school projects using VR.

Introduction and related work

Collaborative learning in blended and digital environments is a critical skill to be mastered by 21st-century learners (Häkkinen et al., 2017). It requires both the social and cognitive contributions of the participants (Hesse et al., 2015; Scoular & Care, 2020) but is also vitally connected to the socio-emotional processes during collaboration (Isohätälä et al., 2020; Näykki et al., 2021). The pandemic has further challenged us to consider how to bring social and collaborative knowledge construction and engagement to the forefront in online learning (e.g., Carrillo & Flores, 2020). Virtual reality (VR) is a promising technology in this respect due to its immersive and experiential capacity. So far, few studies on VR in education have addressed communication and collaboration in authentic contexts (Radianti et al., 2020; Southgate, 2020). We also need solutions enabling educators and students to take control of immersive environments regardless of technical skills (Gaspar et al., 2020). One approach is the use of pre-designed but open-ended tools that offer creative opportunities. In school education, pupils have constructed Minecraft environments and explored them with Vivecraft and VR headsets, supporting self-directed collaboration and active engagement (e.g., Näykki et al., in press). Another example is the use of social VR platforms such as AltspaceVR, where people engage as avatars in real-time conversation and shared activities in immersive virtual worlds (Dzardanova et al., 2018). Research related to VR as an environment for interpersonal interactions in learning is still scarce but there have been positive experiences especially related to the sense of community (Ripka et al., 2020), suggesting that VR can tap into the need for social presence (Oh et al., 2018).

We present the design of a case study where pre-service teachers (PSTs) explore, co-design and reflect on the pedagogical potential of VR tools. Learning by designing refers to a social process, aiming to engage students in building knowledge and performing inquiries (Kolodner, 2002; Roth, 2001). Design activities require students to describe, predict and explain certain phenomena, and subsequently help them acquire deeper understanding of complex problems and abstract principles (e.g., Hmelo et al., 2000). The teacher education context also presupposes familiarization with real-life, authentic school contexts.

Study design and implementation

The study consists of two cycles (2021–22 and 2022–23), each linked to two study modules: an interdisciplinary Environmental Storytelling course (ES) and an elective module related to learning technologies and pedagogy (LT). All PSTs gain experience of different VR environments through collaborative activities and reflection, and some of them continue to work on the theme by co-designing authentic VR-related school projects, including the implementation and evaluation of the projects with pupils. The research questions are: *How do PSTs reflect on their learning experience with VR (RQ1)? What are PSTs' perceptions about the pedagogical potential of VR (RQ2)? How does learning manifest during collaborative VR activities and the co-design of projects (RQ3)?* The following data are collected: (1) written reflections (learning diaries, portfolios, targeted questionnaires) related to the PSTs' perceptions and experiences; (2) screen capture videos documenting the collaboration and co-design and video annotation to identify meaningful learning moments; and (3) focus groups and workshops to gain a rich understanding of the experience and to examine the development and potential change in the PSTs' perceptions.

The first cycle, taking place this academic year, is considered a pilot: due to COVID-19, both study modules have been implemented as distance learning, and virtual environments have been explored in 2D mode on the PSTs' own computers instead of VR headsets. In LT, the PSTs (N=12) explored several worlds in AltspaceVR and reflected on their experiences in a portfolio. In ES, the PSTs (N=19) engaged in a collaborative, role-based activity where five teams representing different media (TikTok, blog/vlog, YouTube, magazine, radio) were tasked by the 'Ministry of Education' to create a strategy for promoting environmental awareness in their respective target audiences. Working as avatars in AltspaceVR, the PSTs discussed the task, collaboratively

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created visual notes, and presented their ideas to the Ministry and the other teams. Screen recordings were made of the activities, and the PSTs' reflections were collected with a questionnaire and learning diaries.

Initial findings and discussion

The PSTs reflected on different aspects of the activities: some affordances (such as the feeling of presence when giving a presentation in front of other avatars) supported the learning experience while others (e.g., lack of screen-sharing functionality within the virtual world) made their collaboration less effective (RQ1). The PSTs discussed the motivational potential of using virtual worlds with pupils, also pointing out the importance of careful planning when implementing such activities (RQ2). We have yet to conduct a detailed video analysis, but initial observations have revealed some interesting points. For example, in the ES course, some PSTs built avatars that closely resembled themselves while others created distinct characters with backstories. The latter approach seemed to support adopting different perspectives to the task within the team (RQ3). The findings suggest that virtual worlds can be used for collaborative learning in pedagogically meaningful ways, but careful attention must be paid to how the activities are framed and how the PSTs are prepared for them. In the second cycle, we will focus especially on immersion as we were not able to examine it in the distance learning setting.

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