

## Submissions Abstract Book - All Papers (Included Submissions)

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Assessing the Use of Immersive Virtual Reality in the Higher Education Classroom to Enhance Learner Engagement

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**Research Domain:** Digital University and new learning technologies (DU)

**Abstract:** Learner engagement is frequently cited as a challenge in Higher Education (HE) and virtual reality (VR) has been identified to hold a great deal of possibilities for pedagogical applications, particularly around learner engagement and motivation. In this study, we used immersive VR as a tool within real teaching environments to determine if the immersive experience enhanced student engagement and helped to achieve learning outcomes. To this end, Google Earth VR with high-end Oculus rift headset was used which allowed Geography and Digital Humanities students have an immersive VR experience related to their course after which they completed questionnaires which allowed them to reflect on their experience. The acquired quantitative and qualitative data showed that the immersive VR tool was sufficiently easy to use for student and their understanding and engagement was enhanced. We also considered the challenges for greater adoption of its use in teaching in HE.

**Paper:** Learner engagement is defined as ‘the extent to which students are engaging in activities’, and there is a reasonable evidence base that greater learner engagement will lead to stronger learning outcomes (Kuh, Kinzie, Buckley, Bridges and Hayek, 2007; Krause et al., 2008). However, learner engagement is frequently cited as an issue within higher education (HE) (Bryson, 2014; HEA, 2014). Virtual reality (VR) has been identified to hold a great deal of promise and possibilities for pedagogical applications, particularly around the challenges of learner engagement and motivation (Bodekaer, 2016; Hussein and Natterdal, 2015; Sinclair and Gunhouse, 2016). Consequently, HE institutions are now seriously considering investing significant financial resources in VR particularly immersive VR. By evaluating the use of immersive VR technology, which is completely different to non-immersive VR on a conventional screen which has been used in HE so far, we can determine if the immersive experience will enhance learning outcomes and potentially provide empirical evidence of its educational value. A fully immersive experience could give students a level of autonomy, ownership of learning activities and increase engagement. This is important because student often do not feel they have ownership of the learning process and this has been identified as one of the drawbacks of technology enhanced learning (Dommett, 2018). Engaging in a process where students have control of where they go within a 3D virtual environment and giving them a degree of autonomy and control could potentially increase engagement and help students have ownership of

learning activities. But this warrants appropriate trials to determine if the hypothesis around increased learner engagement is valid. In this study, we address the following research questions:

i) Is there an evidence base that the immersive VR tool would benefit a specific pedagogical goal - learner engagement?

ii) Would the immersive VR tool help achieve learning outcomes?

A high-end VR tool (Google Earth VR using a high-end Oculus rift headset) was used in teaching Geography and Digital Humanities undergraduate and postgraduate students (n=70) during a preparatory fieldtrip class, a computer practical class and a small group seminar. The high-end VR tool used moves the user's field of view inside of the virtual 360-degree environment using 6 degrees of freedom (3 of head movement, and 3 of movement in physical space) allowing for a high sense of immersion. This allowed students have an immersive VR experience related to their course and use the experience to reflect on the specific learning objectives. This approach ensured an appropriate pedagogical basis which fitted in with the existing curriculum. Students were asked to complete questionnaires with closed and open-ended questions which allowed them to reflect on their experience and the extent to which they found it beneficial. The acquired quantitative and qualitative data from three trials was analysed and showed that students found the immersive VR tool sufficiently easy to use as shown in Figure 1. We also found that student understanding and engagement was enhanced which was attributed to a strong perceived sense of presence associated with the high level of immersion provided by the VR tool (Figure 2 - 5). Presence refers to the psychological sense of "being there" in the environment generated by the system and it is a subjective psychological response (Lee, Wong, and Fung, 2010). The sense of presence in a 3D environment occurs because of the fidelity of representation and the high degree of interaction or user control, rather than just a unique attribute of the environment (Dalgarno, Hedberg, & Harper, 2002). Geography students showed greater engagement than the digital humanities students suggesting that the use of immersive VR technology may lead to stronger student engagement in certain disciplines compared to others (Figure 2). Also, we observed that proper preparation is essential for successful learning using immersive VR tool. For more widespread implementation of immersive VR technology in HE, there is a need for thoroughly planning, training and continued support of teaching staff in order to ensure efficient and safe use. Prior to careful consideration of the aims and learning outcomes of the courses and exercises is needed, with the tool introduced if there is a reasonable expectation it could help with students' engagement. In addition, it is necessary to have adequate interactive teaching spaces which allow for students to move around when considering using VR tools.

## References:

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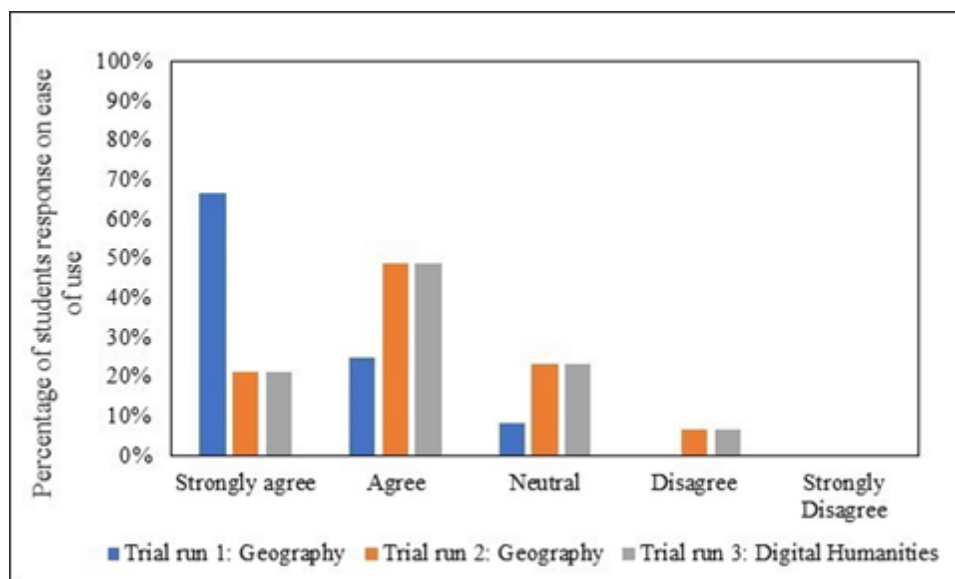
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## Figures



[Figure 1. Percentage of students' response to question on ease of use of the VR tool from all 3 trial runs \(sample size, n = 70\).](#)

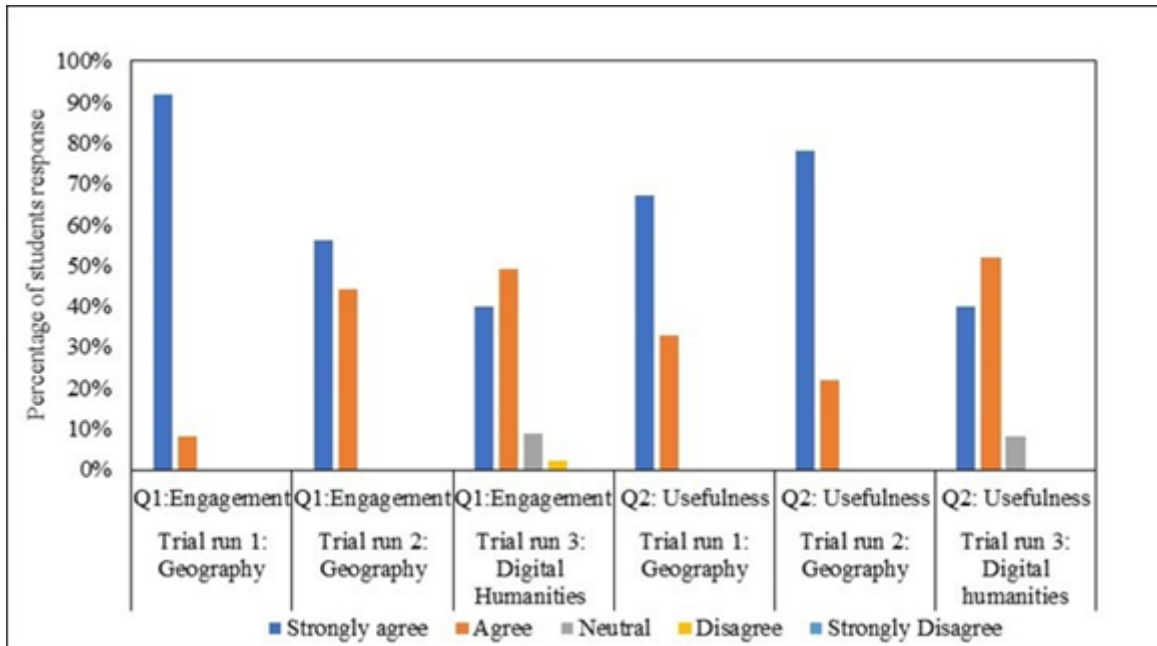


Figure 2. Percentage of students' response to questions on engagement and usefulness from all 3 trial runs (sample size, n = 70).

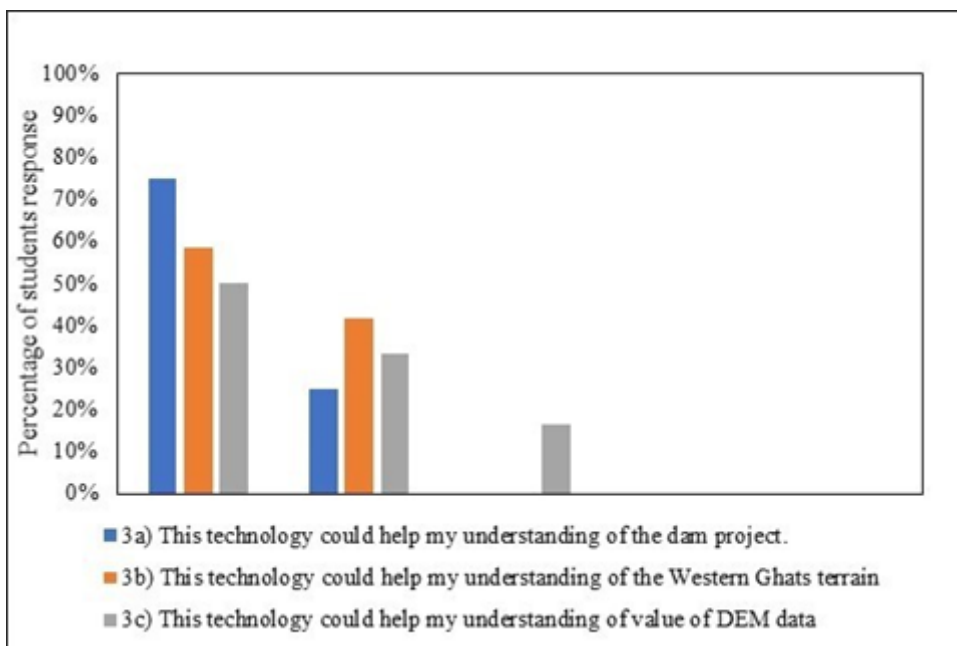


Figure 3: [Geography students' \(trial run 1\) perceptions on the tool's ability to assist with understanding \(sample size, n = 12\).](#)

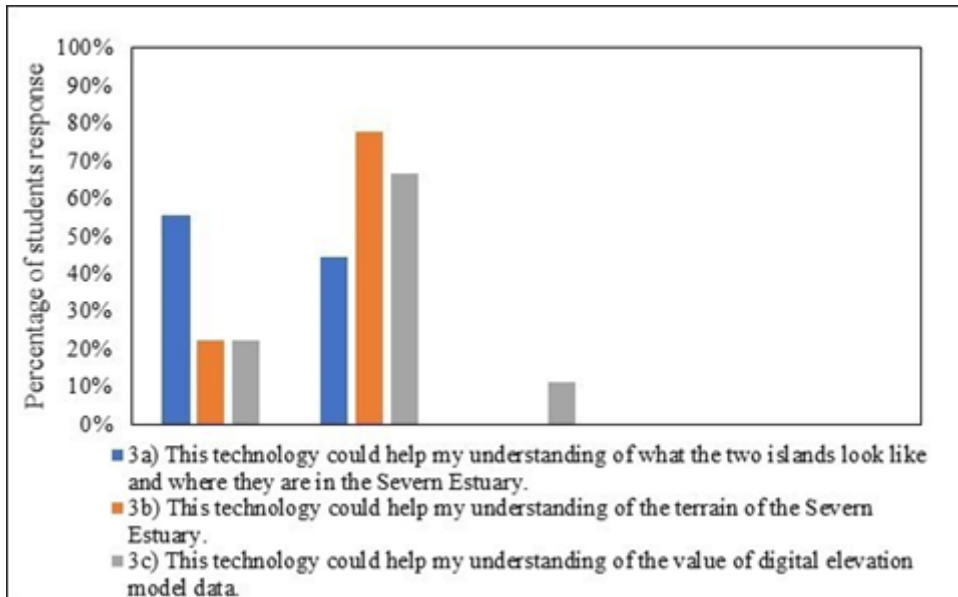


Figure 4: Geography students' (trial run 2) perceptions on the tool's ability to assist with understanding (sample size, n = 9).

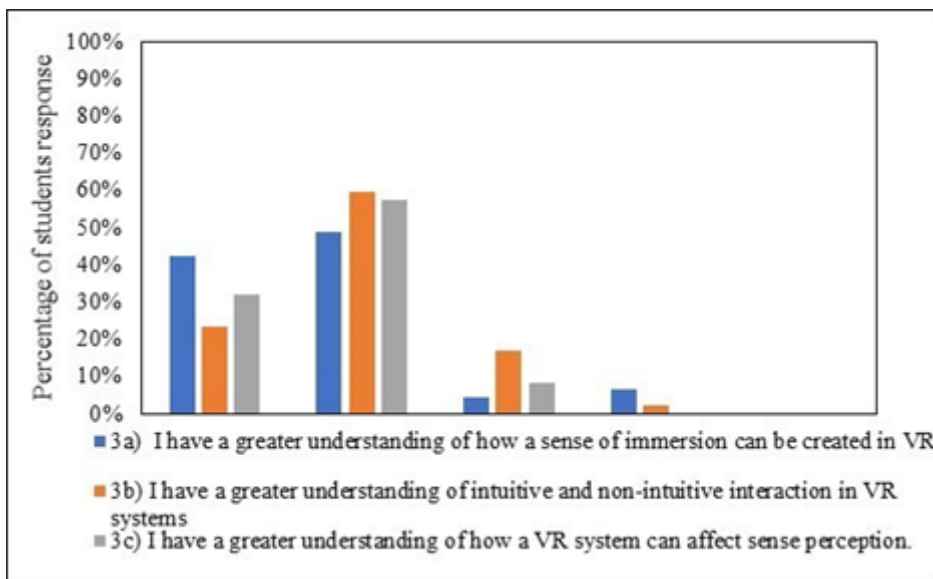


Figure 5: Digital humanities students' (trial run 3) perceptions on the tool's ability to assist with understanding (sample size, n = 49).