THE REALITIES OF VIRTUAL REALITY FOR LEARNING SCIENCE

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Immersive Virtual Reality (VR) is emerging as an exciting possibility for new ways of learning science. It is particularly appropriate for providing otherwise-impossible student experiences, related to abstract scientific concepts. How should we use immersive, interactive VR simulations to optimise learning? To explore this question, we have used physics VR scenarios (see Debs, 2022) as the basis for learning activities in multiple university courses. These range over a variety of situations where a science discipline is studied – a “service” course introducing a discipline, first- and second-year courses core to a science discipline, and an education course for future science teachers. These course cohorts differ in educational aspirations, as well as in distributions of student gender, age, background knowledge in physics and mathematics. We have introduced several different VR-based learning activities in workshop or practical classes. For comparison with VR, learning activities based on comparable flat-screen interactive simulations were offered. Evaluation of learning activities included observations of students using VR, pre- and post-activity concept tests, student-experience surveys, and reflections of staff.

Evaluations to date, on a total of several hundred students, have been positive. Students are generally excited and interested to use immersive VR. The vast majority across all cohorts have limited or no VR experience. Therefore, these activities add to the student experience. For VR-based activities, high levels of student engagement were observed (manifesting, for example, as time-on-task, “Eureka” moments, and discussions with peers and staff). Adverse events such as physical discomfort were rare. In feedback, more than 75% of students in all cohorts said that the VR format was pleasant to use. In every cohort, most students (approximately 60% or more) agreed that the VR activity was helpful to their learning; moreover, that it helped them understand the related physics concepts better than other approaches. Students’ feedback comments are assisting us to understand what is valuable about immersive VR for their learning. Investigation of learning gains is ongoing.

The practicalities of implementation of VR-based learning activities bring some unfamiliar considerations. Achievable learning aims must align with simulation design, particularly with regard to balance between emphasis on conceptual understanding and quantitative capability. Simulations are well-suited to discovery learning; with this comes decision-making about how much guidance to provide, within the simulation and/or via outside teaching prompts. Although VR is inherently an individual experience, we have found that when the current VR user and other classmates discuss learning tasks and share what they see in the simulation, valuable interchanges have occurred, with students actively practising science communication. In some situations, the VR user and the simulation itself have a conversation! Analysis of our teaching experiences to date will help refine the design of learning activities, and could inform the design of future simulations.

REFERENCES

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