Evaluating the Effectiveness of Virtual Reality in Secondary School Physics Outreach

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In the past decade, Virtual Reality (VR) Technology has grown in popularity across a range of commercial and private applications [1]. With the ability to produce striking and immersive visualisations, the use of this emerging technology should be investigated in the context of science outreach. This work aims to evaluate the overall impact of *Mission Gravity,* an existing VR Physics activity developed by ARC-funded Centre of Excellence OzGrav. *Mission Gravity* was assessed across a number of target objectives including student interest, engagement and attitudes towards science, level of immersion in the Virtual Reality environments presented, and overall response to the program. The program was delivered on-site at several South Australian private and Independent schools to students in Years 7-9, and teaches students about the basic principles of stellar evolution using an interactive VR interface.

Previous research has found that teaching Primary-aged students Geometry through interactive VR produces both better academic results and greater student engagement compared to traditional worksheet-based lessons [2]. In addition to a proven positive effect on students' learning, VR experiences have been shown to have the greatest impact when they are less than 2 hours in duration [3]. Brown et al. [4] found that high school students' interest in science improved across the board following only a single 90-minute VR science lesson. Delivering effective science outreach on a time restriction is a necessity, as access to lesson time during school hours is often limited; this makes VR a uniquely advantageous tool for delivering science outreach. By understanding and quantifying student response to *Mission Gravity,* we aim to inform the development of future programs and help maximise the impact of school-based science outreach.

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[2] E. Demitriadou, K.E. Stavroulia and A. Lanitis, *Comparative evaluation of virtual and augmented reality for teaching mathematics in primary education*. Education and Information Technologies **25:1**, 381–401 (2020)

[3] Villena-Taranilla, Rafael, et al. *Effects of Virtual Reality on Learning Outcomes in K-6 Education: A Meta-Analysis*. Educational Research Review **35**, 100434– (2022)

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