
SCALABLE AND EFFECTIVE USE OF VIRTUAL REALITY FOR PHYSICS EDUCATION

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At ACSME2019, we presented early work on Virtual Reality (VR) software for correcting student misconceptions related to Newton's laws. This software now runs on the next generation headsets, which has enabled us to scale the experience to entire classes. Since 2019, we have collected data from 109 students who have used VR as part of their physics coursework at ANU.

Inspired by questions from Force Concept Inventory (FCI; Hestenes, Wells, & Swackhamer, 1992), our VR experience asks students to play with a basketball and decide which forces act on the ball. They are presented with the world that represents their choices, and therefore manifests their misconceptions. A narrator guides them with feedback to reconsider and reflect on their choices until they choose the correct answer.

When compared with 350 students who did not use VR but have undertaken the same course at ANU over several years, there is a statistically significant improvement in FCI metrics. Both overall score and questions relating to relevant misconceptions show improvements. The non-VR and VR groups both have equivalent baselines in their pre-course FCI test.

We also present recent work on a multiplayer, electromagnetism sandbox to allow for VR-based tutorials targeting EM visualisation and concepts.

REFERENCE

Hestenes, D., Wells, M., & Swackhamer, G., (1992) Force Concept Inventory, *The Physics Teacher*, 30, 141-151.

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