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Immersive Learning in Higher Education: the Role of Virtual Reality in Engineering Education

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Abstract

The integration of Virtual Reality (VR) into higher education offers new opportunities to enhance teaching practices. This study explores how immersive technologies can be leveraged to create engaging, inclusive, and collaborative learning environments while simultaneously supporting advanced visualization of concepts in energy and building technologies. Specifically, the study investigates the impact of VR-based instruction on students' understanding and retention of engineering concepts, as well as its influence on engagement, motivation, and collaborative learning. A dedicated VR laboratory was established, equipped with hardware and software tailored for teaching energy engineering concepts. Experiments were conducted with first- and second-year undergraduate students, incorporating VR into classroom activities. Findings from a survey of 56 - first-year and second-year energy engineering students indicate a strong positive response: most participants reported higher engagement, improved conceptual understanding, and increased motivation when using VR compared to traditional teaching methods. Students also expressed enthusiasm for the continued integration of VR in future courses. The study was also extended to teaching staff and researchers, whose experiences and feedback further reinforced the potential of VR as a powerful educational tool.

Overall, the findings suggest that VR not only enhances comprehension of complex engineering systems but also fosters enthusiasm and collaboration, highlighting its potential as a transformative tool in engineering education.

Keywords: Comprehension; Engineering Education; Experiment; Learning; Vr