

Evaluating the Effectiveness of a VR-Assisted Instructional Approach to Enhance Mechatronics Practicum Outcomes

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Abstract

With the increasing integration of artificial intelligence (AI) and virtual reality (VR) technologies into education, their application in technical and vocational training has gained substantial attention. These technologies have been shown to improve learning outcomes, foster communication, and enhance holistic thinking through interactive, real-time feedback. In response to these educational innovations, this study developed a Mechatronics Practicum course for third-year engineering students, utilizing a panoramic VR-based interactive teaching platform in combination with a peer-led self-directed learning model. The primary aim of this study was to evaluate whether the VR-assisted instructional approach could enhance students' professional knowledge, as well as their holistic thinking and problem-solving abilities—core competencies in vocational education. Furthermore, the study compared the new teaching model with traditional practicum instruction to explore the differences in learning outcomes and pedagogical impact. The findings offer insights into the potential benefits of incorporating emerging technologies into engineering education and contribute to the development of more effective instructional strategies for technical fields.

Keywords

Virtual reality (VR); Mechatronics practicum; Peer learning; Engineering education; Problem-solving; Holistic thinking; Technical and vocational education