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AI-Driven Multimodal Learning in TV ET: A Systematic Review of Integrated Pedagogies for Hard and Soft Skill Enhancement

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ABSTRACT

The incorporation of Artificial Intelligence (AI) into Technical and Vocational Education and Training (TVET) is revolutionizing pedagogical techniques by facilitating multimodal learning experiences that strengthen both hard and soft skills. This systematic review investigates the role of AI-driven multimodal learning in TVET, harnessing its potential within integrated pedagogical approaches, including Project-Based Learning (PBL), Problem-Based Learning (PBL), Blended Learning (BL), and Phenomenon-Based Learning (PhBL). An extensive literature review from 2015 to 2025 was conducted across major academic databases (ERIC, Google Scholar, IEEE, Scopus, and Web of Science) following PRISMA guidelines. The review synthesizes findings from 15 selected studies, revealing that the integration of AI-driven multimodal learning into pedagogical approaches enhances hard skills in vocational fields while simultaneously promoting soft skills like problem-solving, critical thinking, communication, and collaboration. Moreover, this review also identifies key challenges, including disparity between AI and pedagogy design, over-reliance on AI, technological infrastructure limitations, insufficient training for both educators and students in AI literacy, and ethical considerations in AI adoption. This review adds to the growing body of knowledge on AI in TVET by offering evidence-based insights into the impact of AI-driven multimodal learning within the integrated pedagogy and suggesting directions for future research.

Keywords: AI literacy; Blended Learning; pedagogical approaches; Project-Based Learning; vocational education