


Chapter 6


AI–Driven Pedagogy and Assessment in TVET: Transforming Education Through AI – Enhancing Pedagogy and Assessment in TVET

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ABSTRACT

AI-driven pedagogy and assessment in Technical and Vocational Education and Training (TVET) are transforming traditional educational practices by introducing adaptive learning, immersive experiences, and intelligent tutoring systems. These technologies personalize learning paths, enhance student engagement, and provide real-time feedback, ensuring competency-based education. Immersive tools like VR and AR offer hands-on training, while digital credentialing validates skills transparently. Despite challenges like data privacy, algorithmic bias, and digital equity, ethical AI integration promises inclusive and effective education. By leveraging AI, TVET can enhance lifelong learning, global collaboration, and workforce readiness, aligning education with evolving industry needs.

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1. INTRODUCTION

In today's rapidly evolving global economy, Technical and Vocational Education and Training (TVET) plays a crucial role in preparing learners for the workforce by equipping them with practical, job-specific skills. Unlike traditional academic education, which focuses on theoretical knowledge, TVET is designed to provide hands-on training that aligns closely with industry requirements. This makes TVET particularly relevant in sectors such as manufacturing, healthcare, information technology, and other technical fields where practical skills are essential. As industries increasingly rely on advanced technologies such as automation, Artificial Intelligence (AI), and digital manufacturing, the demand for specialized vocational skills continues to grow. Consequently, TVET is positioned as a key mechanism for bridging the skills gap, enhancing employability, and contributing to economic growth by ensuring that the workforce is equipped with relevant, up-to-date competencies. However, despite its importance, TVET systems worldwide face several significant challenges that hinder their effectiveness and relevance. One of the primary challenges is the reliance on outdated teaching methodologies that are predominantly lecture-based and fail to engage students. These traditional methods do not cater to diverse learning styles or individual student needs, resulting in decreased motivation, low retention rates, and suboptimal learning outcomes. Additionally, TVET often struggles with assessment practices that are inconsistent, subjective, and prone to human bias. Conventional assessments rely heavily on paper-based exams and manual grading, which lack the objectivity and scalability needed in modern educational contexts (Maclean & Lai, 2011). This not only compromises the reliability and fairness of evaluations but also limits the ability to provide timely, actionable feedback to students. Furthermore, resource constraints pose a significant challenge, particularly in developing regions where TVET institutions often face inadequate infrastructure, outdated equipment, and a shortage of trained educators. These resource limitations hinder the delivery of high-quality vocational training, impacting student engagement and learning effectiveness. Another critical issue facing TVET is the disconnect between the skills taught in educational settings and the competencies required in the workforce. Rapid technological advancements are continuously reshaping industry needs, making it difficult for traditional curricula to keep pace with emerging trends. As a result, graduates often find themselves underprepared for the demands of modern workplaces, leading to a growing skills mismatch. This misalignment between education and industry expectations highlights the need for more dynamic and adaptable learning systems that can quickly respond to evolving job market requirements. These challenges underscore the urgent need for innovative approaches to modernize TVET and ensure its continued relevance in the digital age. The integration of advanced technologies, particularly AI, offers a promising solution to these persistent challenges by revolutionizing both pedagogy and assessment practices.

AI technologies have the potential to transform TVET by introducing innovative solutions that enhance educational quality, engagement, and accessibility. One of the most significant advantages of AI in education is its ability to analyze vast amounts of data, allowing for personalized learning experiences that cater to individual student needs. Adaptive learning platforms, powered by sophisticated algorithms, can dynamically adjust educational content, pacing, and difficulty levels based on each learner's progress, preferences, and areas of struggle. This level of personalization ensures that students receive tailored support, helping them overcome challenges without feeling overwhelmed or under-challenged. By providing customized learning paths, AI-driven platforms enhance student engagement and improve retention rates, ultimately leading to better educational outcomes. Intelligent Tutoring Systems (ITS) further enhance personalized learning by simulating the role of human tutors (Niño-Rojas et al., 2024). These

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