Chapter 2
Leveraging AI to Achieve Sustainability Goals in TVET: A Multifaceted Approach

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ABSTRACT

This study explored integrating AI-powered tools into TVET curricula and their potential to promote development goals. Incorporating AI can make education more effective and inclusive, address the growing demand for skilled professionals, and promote eco-friendly and socially responsible methods. AI tools can provide personalized educational experiences tailored to student's specific needs and learning preferences, potentially improving educational outcomes and preparing students for evolving workforce demands. This study investigated the current state of AI implementation in TVET, emphasizing its potential advantages, including customized educational experiences, engaging virtual simulations, and enhanced resource management. These technological advancements have the potential to promote more accessible and fair opportunities for high-quality education, foster the acquisition of practical skills with minimal environmental consequences, and decrease TVET institutions' carbon output.

INTRODUCTION

Overview of Artificial Intelligence (AI)

Artificial Intelligence (AI) encompasses creating computer-based systems that can execute tasks that typically require human cognitive abilities. These systems are engineered to replicate mental processes such as learning, reasoning, sensory interpretation, and judgment. The AI field incorporates several specialized areas, including machine learning, natural language processing, computer vision, and ro-

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botics. AI relies on algorithms and data. Machine learning is a crucial aspect of AI, allowing systems to enhance their task performance through experience. This is accomplished by training models using extensive datasets, enabling them to identify patterns, generate predictions, or make decisions based on previously unseen information.

Artificial intelligence (AI) has widespread applications in various industries, including healthcare, finance, education, transportation, and manufacturing. In the medical field, AI contributes to the identification of diseases, the development of new medications, and the creation of tailored treatment strategies. The financial sector employs AI to detect fraudulent activities, evaluate risk, and conduct automated trading. Educational institutions use AI-driven systems to offer customized learning experiences and streamline administrative processes. A subset of AI, Natural Language Processing (NLP), focuses on facilitating communication between computers and human languages. NLP enables machines to comprehend, analyze, and produce human speech and driving applications such as digital assistants, language conversion tools, and emotion analysis systems.

Computer vision, another crucial AI domain, focuses on enabling computers to extract high-level insights from digital visual data such as images and videos. The technology plays a vital role in face recognition systems, self-driving vehicles, and the analysis of medical imagery. The ongoing discourse surrounding AI's ethical ramifications of AI continues to evolve. Key issues under scrutiny include concerns about personal data protection, the potential for workforce disruption, prejudices embedded in algorithms, and long-range consequences of progressively autonomous systems. As AI technology has progressed, tackling these ethical dilemmas has become increasingly crucial.

AI's prospects of AI offer significant opportunities for revolutionizing various sectors and addressing complex worldwide issues. Cutting-edge research areas encompass quantum AI, which harnesses quantum computing to enhance processing capabilities, and neuromorphic computing, which strives to develop AI systems that replicate the neural architecture of the human brain more accurately. The rapid advancement of artificial intelligence is expected to accelerate its incorporation into diverse areas of our lives, potentially transforming. As AI continues to progress, it brings forth both promising possibilities and crucial issues that influence the trajectory of technological and societal development.

Conceptualizing AI and Sustainability within TVET

In Technical and Vocational Education and Training (TVET), Artificial Intelligence (AI) encompasses implementing sophisticated computer systems capable of executing tasks traditionally requiring human cognitive abilities. The AI-driven systems excel in data analysis, pattern identification, decision-making, and adaptation to new information, thereby improving the educational experience and operational effectiveness of TVET initiatives. Within TVET, AI applications range from individualized learning approaches and virtual training simulations to predictive analytics for student achievement and streamlined administrative processes.

TVET sustainability adopts a comprehensive educational approach that harmonizes the economic, social, and environmental aspects. The objective provide students with abilities and insights both industry-relevant and conducive to long-term societal welfare and environmental protection. Sustainable TVET curricula emphasize developing skills that promote efficient resource use, social accountability, and economic feasibility across various vocational sectors. Combining AI and sustainability in TVET creates a mutually beneficial educational approach. AI technologies can boost TVET program sustainability by enhancing resource utilization, minimizing the environmental impact through digital learning platforms,