

DIGITAL TRANSFORMATION AND ARTIFICIAL INTELLIGENCE IN IMPROVING LEARNING EFFECTIVENESS

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Abstract

This research aims to analyze the role of digital transformation and artificial intelligence in enhancing learning effectiveness through a literature review. Research data were obtained from scientific articles, books, proceedings, and reports from official institutions relevant to *digital transformation*, *artificial intelligence in education*, *adaptive learning*, *student engagement*, and *learning effectiveness*. Literature was selected based on relevance, quality of sources, availability of complete texts, and publication priorities of the last five years. The analysis is carried out in the following stages: identification, screening, feasibility assessment, theme grouping, and narrative synthesis. The results of the study show that digital transformation and artificial intelligence can increase learning effectiveness through material personalization, intelligent tutoring systems, automated feedback, learning analytics, prediction of learning difficulties, and increased flexibility and student engagement. However, the effectiveness of its implementation is greatly influenced by teacher readiness, digital competence, pedagogical design quality, technological infrastructure, organizational culture, and institutional policy support. The study also found a number of challenges, including access gaps, algorithmic bias, personal data protection, academic integrity, technology dependence, and the potential for a decrease in critical thinking skills if AI is used unsupervised. Therefore, AI should be positioned as a supporting tool that strengthens the role of teachers, not as a substitute for educators' pedagogical, social, and emotional functions. This research confirms the importance of human-centered, inclusive, ethical, transparent, and sustainable AI integration models. The study's implications underscore the need to improve educators' digital competence, AI governance policies, equitable infrastructure distribution, and continuous evaluation so that digital transformation truly improves the quality and effectiveness of learning. In addition, further research needs to empirically test the longitudinal impact of AI across various levels of education, fields of study, learner characteristics, and social contexts.

Keywords: digital transformation; artificial intelligence; learning effectiveness; educational technology; adaptive learning.

Introduction

Digital transformation has become one of the most significant changes in the modern education system. The development of online learning platforms, mobile devices, cloud computing, learning analytics, and artificial intelligence (AI) has changed the way materials are delivered, learning interactions are carried out, and student achievements