Chapter 8
Impact of Generative AI and Digital Learning Tools on Student Engagement and Academic Achievement in Middle School Classrooms

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ABSTRACT

This study explores the impact of Generative AI and digital learning tools on student engagement and academic achievement in middle school classrooms. With the rapid integration of AI technologies like ChatGPT and educational tools such as learning management systems and gamified apps, the research aims to understand how these innovations affect student motivation, participation, and academic outcomes. A mixed methods approach was employed, involving surveys of 200 middle school

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students, academic performance records, and classroom observations. The results reveal strong positive correlations between the use of AI tools, student engagement, and academic performance. The study highlights how personalized, interactive learning experiences facilitated by AI enhance cognitive, emotional, and behavioural engagement, leading to improved academic outcomes. Findings emphasize the potential of digital tools to support differentiated instruction and foster student-centered learning, offering actionable insights for educators and policymakers in integrating technology to optimize educational practices in middle school settings.

INTRODUCTION

In recent years, the educational landscape has undergone a transformative shift due to the rapid integration of digital technologies, particularly Generative Artificial Intelligence (AI) (Zmir et al., 2021). As the fourth industrial revolution continues to unfold, educators and policymakers are increasingly interested in how digital innovations influence teaching practices, student learning behaviours, and academic outcomes (Maqbool et al., 2025). Generative AI encompassing tools like ChatGPT, DALL·E, and others represents a new frontier in digital learning, offering personalized content creation, real time feedback, and adaptive learning experiences tailored to individual student needs (Nedungadi et al., 2024; Zamir et al., 2021). These tools can foster increased engagement by transforming passive learners into active participants, thereby enhancing motivation, creativity, and critical thinking (Maqbool et al., 2020).

Digital learning tools, including learning management systems (LMS), educational apps, interactive simulations, and virtual reality environments, have already demonstrated positive effects on student learning across various educational settings (Koh & Kan, 2021). Middle school classrooms, in particular, represent a critical stage in students' academic journey, where cognitive development, learning habits, and motivation can be significantly influenced by educational interventions (Zafeer et al.). The integration of Generative AI into these classrooms has the potential to address diverse learner needs, support differentiated instruction, and bridge gaps in achievement that traditional teaching methods may overlook (Zafeer, Yanping, et al., 2022).

However, despite growing enthusiasm, concerns about the ethical use of AI, data privacy, over reliance on technology, and digital equity remain prevalent (Kumar et al., 2024). Additionally, empirical research that investigates the practical implications of these tools on tangible educational outcomes especially among middle school learners is still emerging (Zafeer et al., 2020). Most studies have either focused on