

Chapter 1

Introduction

Artificial intelligence (AI) is increasingly shaping educational environments and influencing how students access information, complete assignments, and engage with learning. AI-driven technologies such as generative AI tools and adaptive learning platforms are becoming more common in K–12 education, raising important questions regarding their impact on student engagement and critical thinking.

Middle school students are at a critical stage of cognitive and social development in which they strengthen reasoning and higher-order thinking skills. Research by Ng et al. (2025) has emphasized the growing importance of AI literacy and ethical AI instruction that helps students critically evaluate AI-generated content rather than passively consume information. However, AI literacy instruction remains limited in many middle school settings, particularly within urban school districts (Al-Abdullatif, 2025).

Although research on AI in education continues to expand, much of the literature has focused on higher education or teacher perspectives rather than middle school students' experiences and perceptions. Therefore, this study seeks to explore middle school students' engagement, critical thinking, and perceptions of AI tools in urban school districts through a convergent mixed methods approach.

Statement of the Problem

The increasing use of artificial intelligence (AI) tools in educational settings presents both opportunities and challenges for middle school students. Students frequently use AI-supported technologies for academic support and learning activities; however, many engage

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with these tools without structured guidance related to critical evaluation, ethical use, or responsible decision-making. As a result, concerns have emerged regarding how AI technologies may influence student engagement, independent thinking, and critical reasoning skills.

Recent studies suggest that students often struggle to critically assess AI-generated information and may rely on AI tools without fully evaluating issues such as accuracy, bias, credibility, and ethical implications (Ng et al., 2025). Researchers have also identified concerns regarding the potential impact of AI technologies on students' critical thinking and metacognitive engagement during learning tasks (Ma et al., 2025). Despite the growing importance of AI literacy in K–12 education, limited research has specifically examined middle school students' perceptions of AI-supported learning within urban educational settings.

Because quantitative research may identify measurable patterns of AI usage and student engagement while qualitative research may provide deeper insight into students' experiences and perceptions, a mixed methods approach is appropriate for this study. Therefore, a need exists to better understand middle school students' engagement, critical thinking, and perceptions of AI tools in urban school districts through the integration of quantitative and qualitative data.

Purpose of the Study

The purpose of this convergent mixed methods study is to explore middle school students' engagement, critical thinking, and perceptions of AI tools in urban school districts. The study will combine quantitative survey data and qualitative interview data to develop a more comprehensive understanding of how students experience and interpret AI-supported learning within educational environments.

Theoretical Framework

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This study is grounded in Piaget's theory of cognitive development, Vygotsky's sociocultural theory, and contemporary perspectives on AI literacy. These frameworks provide a foundation for understanding how middle school students engage with artificial intelligence (AI) technologies and how these tools may influence engagement and critical thinking.

Piaget's theory of cognitive development explains how adolescence strengthens abstract reasoning, evaluative thinking, and higher-order cognitive skills (Piaget, 1972). This framework is relevant because students using AI technologies must learn to critically evaluate AI-generated information rather than accept responses passively.

Vygotsky's sociocultural theory further supports this study by emphasizing that learning occurs through interaction, guidance, and engagement with tools within social environments (Vygotsky, 1978). AI technologies function as educational tools that may shape how students construct knowledge and engage with learning tasks.

Additionally, contemporary perspectives on AI literacy emphasize the importance of helping students critically and responsibly use AI technologies in educational settings (Ng et al., 2025). AI literacy includes ethical awareness, critical evaluation of AI-generated content, and responsible digital decision-making. Collectively, these frameworks support examining both measurable patterns of engagement and students' lived experiences with AI-supported learning through the integration of quantitative and qualitative data.

Research Questions

1. Quantitative Research Question: What relationship exists between AI tool usage and student engagement among middle school students in urban school districts?

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2. Qualitative Research Question: How do middle school students describe their experiences using AI tools for learning and critical thinking?
3. Mixed Methods Research Question: How do students' qualitative perceptions of AI-supported learning compare with quantitative measures of engagement and critical thinking?

Significance of the Study

This study is significant because it addresses growing concerns regarding how artificial intelligence (AI) influences middle school students' engagement, critical thinking, and learning experiences in urban educational settings. As AI technologies become increasingly integrated into K–12 education, researchers have emphasized the importance of AI literacy and ethical AI instruction that supports responsible technology use and evaluation of AI-generated information (Yang et al., 2025; Al-Abdullatif, 2025).

Recent studies suggest that students often struggle to critically assess AI-generated information without explicit instructional support in AI literacy and metacognitive thinking skills (Ng et al., 2025). Researchers have also identified gaps in AI literacy instruction for younger learners, particularly in middle school environments where students are still developing higher-order reasoning and evaluative thinking skills (Ma et al., 2025). Despite these concerns, existing research has focused primarily on higher education, technological implementation, or teacher perspectives rather than middle school students' experiences and perceptions.

This study contributes to the field by centering student voice and combining quantitative and qualitative data to provide a more comprehensive understanding of how students engage with and interpret AI tools in educational settings. The findings may inform curriculum

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development, instructional practices, and educational policy related to AI literacy and responsible AI integration in urban middle schools.

Research Design

This study will employ a convergent mixed methods design to examine middle school students' engagement, critical thinking, and perceptions of AI tools in urban school districts. Creswell (2022) explained that convergent mixed methods research involves collecting quantitative and qualitative data concurrently, analyzing the data separately, and then merging the findings to develop a more comprehensive understanding of a research problem.

Quantitative data will be collected through Likert-scale surveys measuring students' AI tool usage, engagement, and perceptions of critical thinking. Descriptive and inferential statistical analyses will be used to identify patterns and relationships among the variables. Qualitative data will be collected through semi-structured interviews with middle school students who have experience using AI tools in educational settings. Interview data will be analyzed using thematic analysis to identify recurring themes related to engagement, critical thinking, and student perceptions of AI-supported learning.

Integration will occur during the interpretation phase by comparing and merging quantitative and qualitative findings to examine areas of convergence and divergence between measurable engagement patterns and students' lived experiences with AI technologies. The integration of both datasets will provide a more comprehensive understanding of students' experiences with AI-supported learning than either method alone.

Definition of Terms

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Artificial Intelligence (AI): Technologies that simulate human intelligence processes, including learning, reasoning, problem-solving, and content generation through computer systems.

AI Literacy: The ability to understand, critically evaluate, and responsibly use artificial intelligence technologies within educational and social contexts (Ng et al., 2025).

Critical Thinking: The ability to analyze, evaluate, interpret, and make reasoned judgments about information and ideas.

Student Engagement: Students' cognitive, emotional, and behavioral involvement in learning activities and educational experiences.

Urban School Districts: Public school districts located within densely populated metropolitan areas that often serve culturally and socioeconomically diverse student populations.

Convergent Mixed Methods Design: A mixed methods research design in which quantitative and qualitative data are collected concurrently, analyzed separately, and merged during interpretation to develop a comprehensive understanding of a research problem (Creswell, 2022).

Limitations

This study relies on self-reported student data, which may be influenced by students' ability to accurately reflect on their experiences or provide socially desirable responses. Additionally, the study focuses on middle school students in urban school districts, which may limit the generalizability of the findings to other educational settings or grade levels.

Delimitations

This study is limited to middle school students in urban school districts who have experience using AI tools in educational settings. The study focuses specifically on student

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engagement, critical thinking, and perceptions of AI-supported learning rather than academic achievement or teacher instructional practices.

Assumptions

This study assumes that participating students have meaningful experience using AI tools in educational settings and will respond honestly during surveys and interviews. It is also assumed that students' perspectives provide valuable insight into how AI technologies influence engagement and critical thinking.

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