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Strategic Integration of Artificial Intelligence in U.S. K–12 Education: A Comprehensive Review and Policy Roadmap

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ABSTRACT

This paper provides a comprehensive review of Artificial Intelligence (AI) integration in K-12 education, examining current implementations, policy frameworks, and emerging challenges. We analyze over 40 recent publications (2024-2025) from academic journals, government reports, and industry whitepapers to identify key trends in AI adoption across primary and secondary education systems. This paper presents a comprehensive review of Artificial Intelligence (AI) integration in K-12 education, examining its pedagogical, technical, and policy dimensions. Through an analysis of recent literature, we highlight Generative AI as the most widely adopted paradigm in educational settings, with Agentic AI emerging as a significant secondary focus. The review identifies key trends in architectural approaches while noting underrepresented technical frameworks.

Our review reveals three critical dimensions of AI in education: (1) pedagogical applications including personalized learning and administrative automation, (2) policy and ethical considerations at federal and state levels, and (3) infrastructure requirements for successful implementation. We highlight the rapid growth of Generative AI (GenAI) tools in classrooms alongside persistent concerns about equity, data privacy, and teacher preparedness. We summarize a conceptual framework for evaluating educational AI systems that balances pedagogical value with implementation considerations.

This systematic review examines Artificial Intelligence (AI) integration in K-12 education through pedagogical, technical, and policy lenses.

Qualitative Insights:

Generative AI emerges as the dominant paradigm, with Agentic AI gaining significant traction
Policy approaches vary widely across states, from comprehensive standards to targeted pilot programs
Persistent challenges exist in teacher preparedness and ethical implementation

Quantitative Findings:

GenAI tools achieve 60% school penetration by 2025
100% of reviewed literature discusses Generative AI applications
Only 29% of teachers report adequate AI training

The study reports from literature a readiness framework balancing pedagogical value against implementation complexity. Recommendations emphasize professional development, privacy-preserving architectures, and international governance standards to guide responsible adoption through 2030.

The paper concludes with strategic recommendations for stakeholders, emphasizing the need for teacher professional development, privacy-preserving technologies, and international collaboration to guide responsible adoption. This review synthesizes critical insights for navigating the evolving landscape of AI in education while maintaining human-centered priorities. The paper concludes with recommendations for policymakers, educators, and technology developers to ensure responsible AI integration that enhances rather than replaces human instruction. All proposals in this work are from cited reference, this is a pure review paper summarizing current proposals in the field.

General Terms

Artificial Intelligence, K12 Education, Policy Recommendation

Keywords

Artificial Intelligence, K-12 Education, Educational Technology, Generative AI, AI Policy, Digital Literacy

1. INTRODUCTION

The integration of Artificial Intelligence (AI) in K-12 education has accelerated dramatically since 2023, with generative AI tools like ChatGPT prompting both enthusiasm and concern among educators [1]. The White House's 2025 executive order on "Advancing Artificial Intelligence Education for American Youth" [2] marked a watershed moment in federal support for AI literacy, while state education boards have scrambled to develop implementation guidelines [3]. This paper synthesizes current research on AI in primary and secondary education, with particular attention to the period 2024-2025 when adoption reached critical mass.

Recent surveys indicate that 72% of U.S. school districts have experimented with some form of AI technology [4], ranging from adaptive learning platforms to administrative automation tools. However, as [5] note, the technology may be new but the challenges are familiar—equity gaps, teacher training, and curriculum integration remain persistent barriers. Our review builds on foundational work by [6] while incorporating the latest policy developments and classroom implementations.