

# Chapter 2

## The Evolution of AI in Education: A Historical and Technological Overview

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### **ABSTRACT**

*This chapter traces the evolution of artificial intelligence in education, mapping its trajectory from early computer-assisted instruction to the sophisticated AI systems reshaping today's learning environments. By contextualizing technological progress within historical shifts in pedagogy, it explores how each phase of innovation responded to specific educational needs and social pressures. The discussion critically examines the milestones that led to current AI applications, such as personalized learning platforms, predictive analytics, and virtual teaching assistants. More than a timeline, the chapter reflects on the changing role of educators and the persistent ethical and equity challenges AI introduces. Ultimately, it offers insights into how a historically grounded understanding of AI's development can inform future-proof curriculum strategies that balance innovation with humanistic values.*

### **INTRODUCTION**

Education, as both a human endeavor and a social institution, has always evolved in response to the changing needs of societies and the tools available to meet them. From oral traditions and handwritten manuscripts to printed textbooks and digital platforms, each era has introduced new technologies that have gradually reshaped the

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way knowledge is delivered, acquired, and assessed. Yet, no transformation has been as rapid, far-reaching, or controversial as the integration of artificial intelligence (AI) into educational systems (Williamson & Eynon, 2020). While the idea of intelligent machines has existed for centuries in philosophical musings and speculative fiction, its real-world application to education only began to materialize in the latter half of the 20th century—and has since accelerated with astonishing speed.

This chapter embarks on a journey through the layered history of educational technologies, focusing specifically on the rise of AI and its shifting role in learning ecosystems. To understand where we are today—and where we might be headed—it is essential to explore how AI has moved from the periphery of experimental edtech initiatives to the very center of curriculum reform and policy discourse. The term “AI in education” today encompasses a wide array of applications: intelligent tutoring systems, adaptive learning platforms, automated assessment tools, learning analytics dashboards, natural language processing chatbots, and even emotionally responsive virtual mentors. But these innovations did not appear overnight. They emerged from decades of research, trial and error, cross-disciplinary collaboration, and, importantly, reflection on what it means to teach and to learn.

In the 1960s and 70s, early computer-assisted instruction (CAI) programs like PLATO and LOGO hinted at the potential of machines to support learning, but they were limited by the hardware and programming constraints of the time (Kelkar, 2022). The AI revolution in education has been more evolutionary than revolutionary—a process of cumulative breakthroughs in fields such as machine learning, data science, neuroscience, and education theory. As algorithms became more sophisticated, and as data collection became more pervasive and granular, AI systems began to demonstrate capabilities that were once thought to be uniquely human: recognizing patterns, making predictions, offering personalized feedback, and even simulating human conversation. However, the narrative of progress is incomplete without acknowledging the tensions and contradictions that accompany it. AI has introduced both promise and peril. It offers unprecedented opportunities for scalability, personalization, and inclusivity, but also raises concerns about bias, surveillance, and the dehumanization of education (Costa, 2023). These dualities have fueled debates across academic, policy, and practitioner communities. Is AI a tool for liberation or for control? Does it support the democratization of education or reinforce existing inequities under a more technical guise?

This chapter does not seek to answer these questions definitively, but rather to provide a grounded historical and technological context in which such questions can be meaningfully explored. By tracing the evolution of AI in education—from its conceptual foundations to its current implementations—we hope to equip educators, curriculum designers, researchers, and policymakers with the perspective needed to make informed, ethical, and strategic decisions about the future (Ejjami, 2024). In

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