Chapter 12
Challenges and Limitations of Implementing AI in Schools

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ABSTRACT

This chapter critically examines the systemic challenges and limitations of implementing artificial intelligence (AI)—particularly cognitive tutors and adaptive learning technologies—in primary and secondary education. While AI is often lauded for its potential to personalize instruction, improve learning outcomes, and bridge educational gaps, its real-world integration remains constrained by technological, pedagogical, ethical, and institutional barriers. Based on international case examples and cross-disciplinary research, the chapter addresses the phenomenon of infrastructural inequality, the prejudice of the algorithm, dislocation of educators, privacy, and policy stagnation. It contends that the transformative possibility of AI in education is only achievable with responsible, context-sensitive implementation approaches that leave equity, transparency and human centrality on a legacy of paradigm-shifting academic innovation.

INTRODUCTION

The integration of artificial intelligence into educational environments—especially in the form of cognitive tutors and adaptive learning systems—represents a sig-

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nificant technological and pedagogical shift. As AI-powered tools increasingly permeate primary and secondary classrooms worldwide, they bring with them both immense promise and profound challenges. The advocates envisage the possibilities of this Smart Intelligent system where; the systems are able to tailor instruction to the individual needs of the student in real-time, detect student learning problems before they translate into failures and also enable a teacher to apply interventions with previously unknown levels of precision. In theory such innovations may close educational achievement gaps, engage students more and increase inclusivity and equity of learning (Park & Kwon, 2024).

However, in reality, the practical application of AI technologies in schools has not resulted in such a promising picture as the discussed intentions proposed it. Whilst AI applications in education have developed at lightning pace - due to the advancements in machine learning, natural language processing and data analytics - school systems consistently face the problem of integrating them in an accessible, economically viable, and pedagogically valid manner. The classroom is not only a social and an institutional space but it has its constraints beyond technical feasibility. Practically, AI systems will have to exist and work within current infrastructures and curricula, and models of governance with most of them not suited to the dynamic intelligent automation. In addition, the technologies have to overcome historical issues with teacher preparation, diversity among students, and low socioeconomic status (Huang & Qiao, 2024).

The current chapter aims to critically discuss the various impediments that stall the meaningful adoption of AI in K-12 education. Its main point is that although AI technologies can change education technically, their efficacy in the real-life hinges on a complex of mutually interrelated issues such as technological, pedagogical, ethical, or institutional. The chapter will not discuss AI as a single phenomenon but as a continuum of tools and practices the effects of which are dependent on context. There will be special focus on cognitive tutors- AI systems that are developed in such a way as to resemble a human tutor by helping learners improve their understanding through feedback and by scaffolding. Although these systems have demonstrated potential in laboratory settings, their success in the real classroom is limited due to technological-related constraints like lack of proper infrastructure, existence of rigid curriculum, and insufficient teacher acceptance.

Importantly, this chapter does not simply list barriers; it tries to re-frame these barriers as possibilities to do more considerate and responsible design. Contrary to believing that implementation failures can be seen as purely technical deficiencies, the discussion will point out the socio-technical character of AI teaching/learning. In another example, an adaptive learning platform that does not work well in a small town with limited broadband connectivity also has to do with the overall misinvestment and policy disparities in education funding. Likewise, a thinking tutor which