AI Literacy for K–12 Teachers

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ABSTRACT

The rapid technological transformation has propelled Artificial Intelligence (AI) to the forefront of educational innovation, necessitating a comprehensive understanding of AI Literacy for K-12 educators. This research critically examines emerging AI Literacy frameworks, revealing a multidimensional approach that extends beyond technical knowledge to encompass cognitive, metacognitive, ethical, and social dimensions. The study argues that AI literacy is an evolving competency requiring continuous adaptation. The research highlights the importance of progressive learning models that move from basic AI comprehension to critical evaluation and ethical application, emphasizing teachers' crucial role as mediators in students' AI learning experiences. This analysis offers valuable insights not only for K-12 teachers but also for curriculum developers, policymakers, and educational researchers seeking to develop comprehensive AI Literacy programs in an increasingly AI-driven educational landscape.

INTRODUCTION

As Artificial Intelligence (AI) continues to reshape various sectors, its integration into education is becoming increasingly important. AI technologies hold the potential to enhance learning experiences, personalize education, and automate administrative tasks. However, for AI to be effectively integrated into classrooms, teachers must be equipped with the knowledge and skills to understand, evaluate, and ethically apply AI tools in their teaching practices. This has led to the growing importance of AI literacy for educators, which encompasses not only technical knowledge of AI systems but also an understanding of their social, ethical, and pedagogical implications.

The research problem addressed in this paper is the lack of comprehensive frameworks for AI literacy tailored specifically to K-12 teachers. Despite the importance of AI in education, there is a gap in understanding how AI literacy frameworks can best support educators in developing the necessary competencies for responsible and effective AI integration. This paper seeks to explore existing AI literacy

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frameworks, examine their application to K-12 teacher professional development (TPD), and identify the key competencies needed for educators to navigate AI technologies thoughtfully and responsibly.

The significance of this research lies in its potential to inform teacher training programs and educational policies on AI literacy. By critically evaluating and synthesizing existing frameworks, this paper aims to provide practical insights into how K-12 teachers can be prepared for the digital future of education. Furthermore, the research contributes to the broader field of AI in education by highlighting the interdisciplinary nature of AI literacy, which includes technical, pedagogical, and ethical components. Ultimately, this work underscores the need for holistic AI literacy that supports not just the technical competence of teachers but also their ability to critically assess and apply AI tools in ways that benefit students and society.

THE CONCEPT OF LITERACY

According to the Cambridge Dictionary, "literacy" is defined as "the ability to read and write" (Literacy, 2024). Until 1820, only 10% of the world's population was literate. Today, the same percentage (Roser & Ortiz-Ospina, 2024) remains unable to decipher what's on the box of their favourite cereal.

The first traces of written language date back to between 3500 and 3000 BC. Nevertheless, the effort and resources required, combined with education limited to ecclesiastical schools, kept it on standby until the first universities emerged, along with the invention of paper, and the printing press, which drove costs down and accessibility up. The Age of Enlightenment, marked by a surge in intellectual and cultural advancements, was significantly influenced by the advent of the printing press, which facilitated the widespread distribution of literature, scientific works, and philosophical treatises. These were essential in challenging existing norms and promoting critical thinking (Eisenstein, 1980). The Industrial Revolution is deeply intertwined with the intellectual developments of the Age of Enlightenment. Joel Mokyr (2005) argues that the intellectual shifts of the Enlightenment were crucial for the Industrial Revolution, where a unique confluence of ideas, culture, institutions, and technology facilitated unprecedented economic growth. Thus, learning to read and write through education has always been, and continues to be, of significant social and economic importance.

Researchers, businessmen, and policymakers worldwide estimate that the following technological wave will have an exponential economic impact compared to past innovations, with AI being at the forefront (BIG IDEAS 2024, 2024). But fear of missing out on a maybe once-in-a-lifetime opportunity to surf this wave pushes governments into the spotlight, making it part of global agendas to get literate in this new high-tech codex.

The history of this new field of computer science brings us back to the publication of Alan Turing's "Computing Machinery and Intelligence" (1950) and a proposal for a study on AI submitted by McCarthy et al. (1955). However, this leap forward into enabling machines to simulate human intelligence that can learn, solve problems, be creative and autonomous (*What Is Artificial Intelligence (AI)?*, 2024; Zerilli et al., 2021) had to wait around 70 years more to arrive to its Gutenberg-moment with the release of OpenAI's GPT-3 in 2020 reaching 100 million users in two months giving to everybody the opportunity to harness the power of Large Language Models (LLMs) (BIG IDEAS 2024, 2024). Today's technological transformation brings such fast breakthroughs disrupting almost every industry that it is called "the Fourth Industrial Revolution" (*The Fourth Industrial Revolution*, 2016). Staying true to "All that glitters is not gold", ethics and legal risks often make headlines making it a priority for governments