Chapter 11
The Landscape of Artificial Intelligence in Education:
A Bibliometric Analysis (1989–2025)

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ABSTRACT

This chapter presents a comprehensive bibliometric analysis of the evolution and trends of artificial intelligence (AI) in education (AIED) from 1989 to 2025. The present study focuses on peer-reviewed publications indexed in the Web of Science, exploring key contributors, institutions, countries, and emergent research themes across the field. Utilizing data extracted through a systematic search and analyzed with the Biblioshiny R language and VosViewer, this study identifies major clusters, collaboration patterns, and citation dynamics. The findings are interpreted within the framework of educational technology paradigms such as TPACK and the SAMR model. The chapter provides insights into the role of AI in shaping curriculum, pedagogy, assessment, and equity in education. By mapping the intellectual and conceptual structure of this growing field, the analysis reveals prevailing and emerging trends while offering guidance for future research and practice.

DOI: 10.4018/979-8-3373-2612-2.ch011

1. INTRODUCTION

The growing presence of artificial intelligence (AI) in education marks a pivotal transformation in how teaching and learning are approached in the 21st century. Although digital tools have influenced educational practices for decades, AI brings a new depth of complexity—offering possibilities once considered the realm of science fiction. Technologies such as intelligent tutoring systems, adaptive learning platforms, automated grading tools, and real-time learning analytics are no longer theoretical; they are actively reshaping classrooms, institutions, and educational policy. These tools not only enable more personalized and data-driven learning experiences but also raise critical questions about equity, ethics, and the evolving role of educators. The urgency of this transformation became particularly evident during the COVID-19 pandemic, which acted as a global catalyst for digital adoption and intensified the need to examine how AI is shaping educational research, design, and delivery (e.g., Holmes et al., 2021; Zawacki-Richter et al., 2019). As a result, scholarly interest in the direction, scope, and implications of AI in education has grown significantly, reflecting a collective attempt to understand and guide this complex technological shift.

The historical evolution of educational technology reveals a steady progression through multiple paradigms—beginning with the mechanical tools of the Industrial Age, such as blackboards and slide projectors, and advancing toward the dynamic digital platforms that define contemporary classrooms. However, the emergence of artificial intelligence (AI) in education represents more than a linear extension of these prior innovations. Rather, AI acts as a transformative force that challenges conventional notions of instruction, learning, and even human cognition itself. Unlike earlier educational technologies that functioned primarily as static delivery mechanisms, AI systems possess the capacity to interpret vast amounts of learner data, respond adaptively to individual behaviors, and even generate novel content. These capabilities raise important philosophical and pedagogical questions about agency, authorship, and the shifting boundaries between human and machine intelligence in the educational sphere (Luckin, 2017; Selwyn, 2019).

The roots of AI in education can be traced to the development of intelligent tutoring systems (ITS) during the 1970s and 1980s. Pioneering programs such as SCHOLAR and GUIDON sought to replicate the instructional strategies of human tutors by offering individualized feedback and problem-solving support. These early systems, though innovative, were hampered by limited computational resources, highly specific content domains, and rigid learning environments (Carbonell, 1970). As a result, their adoption remained relatively constrained. It was not until the early 2010s—with the advent of big data, increased computational power, cloud infrastructure, and advanced machine learning techniques—that AI in education began

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