ScholarOne - Integrating Artificial Intelligence and Computational Thinking in Educational Contexts: A Systematic Review of Instructional Design and Student Learning Outcomes

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March 22, 2024

Abstract
A growing body of research is focusing on integrating artificial intelligence (AI) and computational thinking (CT) to enhance student learning outcomes. Many researchers have designed instructional activities to achieve various learning goals within this field. Despite the prevalence of studies focusing on instructional design and student learning outcomes, how instructional efforts result in the integration of AI and CT in students’ learning processes remains unclear. To address this research gap, we conducted a systematic literature review of empirical studies that have integrated AI and CT for student development. We collected 18 papers from four prominent research databases in the fields of education and AI technology: Web of Science, Scopus, IEEE, and ACM. We coded the collected studies, highlighting the students’ learning processes in terms of research methodology and context, learning tools and instructional design, student learning outcomes, and the interaction between AI and CT. The integration of AI and CT occurs in two ways: the integration of disciplinary knowledge and leveraging AI tools to learn CT. Specifically, we discovered that AI- and CT-related tools, projects, and problems facilitated student-centered instructional designs, resulting in productive AI and CT learning outcomes.

Title of the manuscript:
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Declarations of interest: none

Funding source: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Brief description: A growing body of research is focusing on integrating artificial intelligence (AI) and computational thinking (CT) to enhance student learning outcomes. Many researchers have designed instructional activities to achieve various learning goals within this field. Despite the prevalence of studies focusing on instructional design and student learning outcomes, how instructional efforts result in the integration of AI and CT in students' learning processes remains unclear. To address this research gap, we conducted a systematic literature review of empirical studies that have integrated AI and CT for student development. We collected 18 papers from four prominent research databases in the fields of education and AI technology: Web of Science, Scopus, IEEE, and ACM. We coded the collected studies, highlighting the students' learning processes in terms of research methodology and context, learning tools and instructional design, student learning outcomes, and the interaction between AI and CT. The integration of AI and CT occurs in two ways: the integration of disciplinary knowledge and leveraging AI tools to learn CT. Specifically, we discovered that AI- and CT-related tools, projects, and problems facilitated student-centered instructional designs, resulting in productive AI and CT learning outcomes.

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