AI in Education

Rany Sam
http://orcid.org/0000-0003-3266-5974
National University of Battambang, Cambodia

Sopharath Kheav
http://orcid.org/0009-0006-1283-6843
National University of Battambang, Cambodia

Sinoeurn Kheuy
http://orcid.org/0009-0000-2828-7435
National University of Battambang, Cambodia

Sereyrath Em
http://orcid.org/0000-0002-6803-195X
National University of Cheasim Kamchaymear, Cambodia

Hoeurng Heak
http://orcid.org/0009-0007-9745-2183
National University of Battambang, Cambodia

Sinath No
http://orcid.org/0009-0001-1644-8702
National University of Battambang, Cambodia

Sokha Hoeurn
http://orcid.org/0009-0003-2210-1566
National University of Battambang, Cambodia

Vireak Keo
http://orcid.org/0009-0001-1889-6939
National University of Battambang, Cambodia

Phearun Phorn
http://orcid.org/0009-0000-4283-1898
National University of Battambang, Cambodia

Bunrosy Lan
http://orcid.org/0009-0008-1862-7369
National University of Battambang, Cambodia

ABSTRACT

Artificial intelligence (AI) is reshaping modern education by offering innovative tools to enhance learning, support educators, and streamline administrative tasks. This article overviews AI's growing role, focusing on applications like personalized learning platforms, intelligent tutoring systems, and data-driven insights tailored to individual student needs. It also examines how AI can boost administrative efficiency, allowing teachers to focus on instruction by automating routine tasks. However, integrating AI presents challenges, including concerns about accessibility, algorithmic bias, data privacy, and the potential reduction of meaningful human interaction. Through case studies and research, the article highlights both the benefits and limitations of AI in education, offering insights for educators, policymakers, and technologists to use AI to promote student engagement, inclusivity, and improved learning outcomes. It also discusses the ethical and regulatory frameworks for responsible AI implementation in educational settings.

DOI: 10.4018/407418

1. INTRODUCTION

Accelerated progress in artificial intelligence has profoundly influenced numerous sectors, including education. Artificial intelligence technologies are revolutionizing the educational landscape by implementing novel pedagogical methods and altering student engagement (Hasse et al., 2019). The term "AI," introduced by John McCarthy in 1955, refers to a computer capable of performing diverse human cognitive functions, including communication, reasoning, learning, and problem-solving (Nilsson, 1998). Baker & Smith (2019) further explain that AI is a generic term describing a vast collection of different technologies and algorithms (e.g., machine learning, NLP, data mining, and neural networks). In the early stages of AI in education, commonly referred to as intelligent tutoring systems, the goal is to automatically solve problems, such as enhancing operator performance (e.g., Ross, 1987; Hwang, 2003). By incorporating AI-based solutions, sectors such as manufacturing and healthcare are undergoing a sea of change in their operational methodologies. Around the world, the education sector has a similar pattern. Given AI's advantageous digital changes to the system, it has undoubtedly challenged traditional educational methods. For the past 30 years, researchers have been studying the integration of artificial intelligence in education (AIEd). AIEd has achieved significant success in strengthening connections between teachers and students where the connections are lacking or need improvement. Using AI, effective teaching techniques, evaluation systems, and feedback mechanisms can also be introduced.

Additionally, weaknesses in existing systems can be identified, and a variety of student responses, such as boredom and concentration, can be captured to create an interactive environment (Ojha et al., 2023). Artificial intelligence has gradually entered the education sector, with early advancements in adaptive learning and intelligent tutoring systems. These systems use AI algorithms to deliver personalized learning experiences, adapt to individual students' requirements, and provide tailored feedback and support (Kamalov et al., 2023). Advances in natural language processing and other AI technologies have enhanced the functionality of educational tools, facilitating more complex interactions between students and digital learning environments. Guan et al. (2020). Furthermore, intelligent tutoring systems developed in the following decades utilized AI to deliver personalized guidance, feedback, and assessment (Ayala-Pazmiño, 2023).

2. HISTORY OF AI DEVELOPMENT

Since the idea of building intelligent machines first attracted the attention of scientists and philosophers in the middle of the 20th century, artificial intelligence (AI) has undergone an exciting evolution. The phrase "artificial intelligence" was first used in 1956 as part of the Dartmouth Summer Research Project on Artificial Intelligence (DSRPAI), according to Haenlein and Kaplan (2019). The field of artificial intelligence began with this crucial eight-week workshop, sponsored by the Rockefeller Foundation and led by John McCarthy and Marvin Minsky at Dartmouth College in New Hampshire. Early systems such as ELIZA and the Logic Theorist raised high expectations for the discipline, demonstrating capabilities in problem-solving and natural language processing. Progress was not linear either, as funding cuts and technical constraints during the "AI winters" caused periods of stasis. However, a revival in the late 20th and early 21st centuries was fuelled by developments in neural networks, machine learning, and computing power. Currently, artificial intelligence (AI) systems can perform specific tasks better than humans, such as driving autonomous cars and playing challenging games like Go. The history of AI highlights both technological ad-