Chapter 5
Teaching and Learning With Artificial Intelligence

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ABSTRACT

Artificial intelligence (AI) is developing at a fast speed and has incessantly impacted the modern world for decades. AI technologies are beneficial for all kinds of industries, including businesses, economics, transportation, hospitals, schools, universities, and so forth. Many researchers have investigated the development of artificial intelligence in education (AIEd), specifically on how AI assists teaching, learning, assessment, references, and collaboration. Several questions arise. What impact do AI technologies have on education? How do AI technologies assist teaching (e.g., curriculum, assessment, student learning, and teaching practices)? How do teachers cope with AI Technologies in education? What are the ethical concerns of AI technologies? What are the barriers of AI-based learning in education? The purpose of this chapter is to explore the evolution and the challenges of AI technologies in education. Major research on AI from 1999 to 2019 will be reviewed. Problems with AI in education will be raised and solutions for solving the issues will be recommended.

INTRODUCTION

While teachers, psychologists, educational leaders, counselors, and parents are debating how much screen time is appropriate for children, the emerging technology named Artificial Intelligence (AI) has surfaced in the classrooms. Jill Watson, an AI-based teaching assistant, has answered students' questions online since 2015, while AI chatbot has assisted recruitment and retention in universities since 2016 (Raths, 2019). Educational robotics has been developed as a tool for students, and has been supporting learning in science, technology, mathematics, informatics, and other school subjects in recent years. Educational robotics has attracted teachers' interest and has been used as a valuable tool to develop social and cognitive skills for students from preschool to high school to support learning in mathematics, science, technology and other subjects at schools (Alimisis, 2013). AI has been applied in the domains of physics, writing, programming, reading, and the development of instructional systems as well.

Earlier, Drigas and Ioannidou (2012) delineated that the typical applications of AI in educational usually include intelligent tutoring, knowledge representation, autonomous agents, and natural language processing. In a decade review, Drigas and Ioannidou (2012) found that AI technology has developed application tools to carry on tasks and to help solve problems in special education, such as Attention Deficit Disorder, Attention Deficit Hyperactivity Disorder, Autistic Spectrum Disorders, dyslexia, physical and sensory impairments, reading/writing/ spelling difficulties, and difficulties in mathematics successfully. Later, Lu and Harris (2018) stated that applications of AI-based educational technology include tutoring (e.g., Intelligence Tutoring Systems), personalizing learning (e.g., adaptive tutors for pace, sequence and difficulty to tailor students' needs; support to special needs students), testing (computer adaptive assessments for different students' mastery levels based on students' answers), and automating tasks (e.g., taking attendance, grading assignments, and generating test questions).

Schroer (2019) reported that seven companies (i.e., Century Tech, Blippar, Knewton, Thinkster Math, Quizlet, Cognii, and Nuance) are using AI in education to enhance classrooms at schools. Learning Management Systems (e.g., Blackboard, Blackboard Ultra, Canvas, and Moodle) have been adopted in higher education to improve the digital learning environment and online classrooms at the universities in U.S. AI in education has been used to increase efficiency and optimize resources (e.g., iTalk2Learn, Third space learning, Duolingo Chatbot, Thinkster Math, and Ed Tech Foundry). The advance of AI technologies has reshaped instruction and learning approaches, since more online programs have been globally developed and implemented. AI in education improved students' learning environments and classroom interaction at universities. It appears that differentiated and individualized

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