Chapter 3
Bibliographical Analysis of Artificial Intelligence Learning in Higher Education:
Is the Role of the Human Educator and Educated a Thing of the Past?

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ABSTRACT

This chapter provides an overview of research on AI applications in higher education using a systematic review approach. There were 146 articles included for further analysis, based on explicit inclusion and exclusion criteria. The findings show that Computer Science and STEM make up the majority of disciplines involved in AI education literature and that quantitative methods were the most frequently used in empirical studies. Four areas of AI education applications in academic support services and institutional and administrative services were revealed, including profiling and prediction, assessment and evaluation, adaptive systems and personalisation, and intelligent tutoring systems. This chapter reflects on the challenges and risks of AI education, the lack of association between theoretical pedagogical perspectives, and the need for additional exploration of pedagogical, ethical, social, cultural, and economic dimensions of AI education.

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INTRODUCTION

Software applications in the field of Artificial Intelligence (AI) in higher education (HE) have been increasing over the last few years and are starting to gain a great deal of traction. AI in education has been the subject of research for some 30 years. AI and adaptive learning technologies have made some important developments in educational technology, with adoption times between 2-3 years (Becker et al., 2019; Johnson et al., 2016). Experts predict that AI in education is set to grow by 43% by 2022, although a 2019 report predicts that in HE, AI applications that aim to enhance the teaching and learning experience are expected to grow even more significantly (Becker et al., 2019). With significant investments by private organisations like Google, which obtained the European start up Deep Mind for $400m, as well as non-profit public-private partnerships like the German Research Center for Artificial Intelligence (DFKI), there is a huge possibility that the current wave of Internet will have a greater impact on HE institutions (HEIs) (Popenici & Kerr, 2017).

Using AI in education has been the subject of huge debates for the past 30 years (Cioffi et al., 2020; Jackman et al., 2010; Jiang et al., 2017; Liu et al., 2018; O'Donovan et al., 2019; Smart & Burrell, 2015). Broadly speaking, educators have only now began to explore the potential pedagogical opportunities that AI applications can provide for supporting learners throughout the student life cycle. Although there are significant opportunities that AI can provide for higher teaching and learning, new ethical implications and risks are attached to the development of AI applications in HE. For instance, budget cuts could tempt administrators to replace the human teachers with profitable automated AI solutions. This may instil fear into faculty members, teaching assistants, student counsellors, and administrative staff that AI solutions will take their jobs. In spite of the human implications of AI (Kearney et al., 2019), AI has the potential to advance the capabilities of learning analytics, though such systems require huge amounts of data, including confidential information about students and faculty, which raises serious issues of privacy and data protection. For that reason, it would be interesting to explore the fresh ethical implications and risks in the field of AI enhanced education. Russell and Norvig (2016) emphasise that AI researchers should consider the ethical implications of their work, and thus we are interested to explore the ethical implications and risks in AI enhanced education. The purpose of this chapter is to determine whether AI learning systems will impact the human educator and educated in HE in terms of replacing their teaching and learning skills with those of a machine or application in HE, as well as the ethical implications of such applications. Owing to the growing interest of educators in the AI field, this warrants the need to review the AI literature in HE. This paper specifically addresses the following research question by means of systematic literature review (Booth et al., 2016; Liberati et al., 2009; David Moher et al., 2009):

RQ1: *How is AI-enhanced education conceptualised and what are the ethical implications, challenges and risks in HE*?
RQ2: *How does AI enhance educational practices in HE*?

Although the AI field originates from engineering and computer science, it is greatly influenced by other disciplines ranging from philosophy and economics to cognitive and neurosciences. Owing to the interdisciplinary nature of this area of study, there is a lack of consensus among AI researchers on a common definition of AI (Tegmark, 2017). In terms of introducing AI-based tools and services in HE, several authors claim that AI has already been introduced to HE, though many teachers do not understand its scope and in particular, what it comprises. For our analysis of AI in HE, it is ideal to clarify