Analysis of the Advantages and Disadvantages of Artificial Intelligence Technology in Promoting Student Professional Development

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Abstract: The extensive application of artificial intelligence (AI) technology is profoundly affecting the ecology of education. To analyze the advantages and disadvantages of AI for the professional growth of students, this study systematically analyzed the potential dual impacts of AI in higher education from two dimensions, namely academic ability and thinking patterns. Results indicated AI facilitated the development of students by improving learning efficiency and optimizing the integration of resources. However, it simultaneously aggravated the crisis of academic integrity and the inertia of thinking. In responding to these issues, this study proposed an integrated framework that included management, guidance, and standardization. This framework would facilitate the positive interaction between AI and education, contributing to the professional development of students.

Keywords: Artificial intelligence; Advantages and disadvantages; Professional development of students; Integrated frameworks

1. Introduction

Focusing on simulating human thought and behavior by computer, with the objective of exploring the laws of human activities [1], artificial intelligence (AI) technology is becoming increasingly ubiquitous. AI has been applied in the fields of education, medicine, industry, transportation, etc., and has brought substantial social and economic benefits [2-6]. However, the extensive application of AI also gives rise to controversies [7]. For example, students can use AI directly to complete their papers, which may result in their dependence on AI [8]. Therefore, AI exhibits dual aspects: it enhances academic efficiency while simultaneously posing a threat to academic ethics [9].

In order to leverage the positive effects of AI and alleviate its negative impacts, this paper conducted

a systematic analysis of the bidirectional influences of AI on the development of students and proposed a governance framework.

2. The positive effects of AI on student development

2.1. Improvement of learning efficiency

AI equips the capacity of enhancing learning efficiency, which can be fulfilled by improving the efficiency of document management, expediting the access to and integration of information, and providing a framework for research. Previous reports showed that, based on AI, students could enhance the efficiency of learning by 40% [10] and save 50% of the time consumed in information searching[11]. Facing the unstoppable trend of the application of educational AI in education all over the world [12,13], numerous universities have incorporated AI into their curricula. For example, Fudan University in China has established a comprehensive curriculum system for AI, which covers all students. This system promotes cross-disciplinary innovation and elevates learning efficiency by setting more than 45 "AI+" programs[14].

2.2. Intelligent assistance and resource integration

AI is restructuring the educational ecosystem, especially in the field of cross-disciplinary ability training and innovative practice [15]. With powerful data processing and pattern recognition capabilities, AI is capable of integrating resources across different areas to construct cross-disciplinary knowledge graphs. For instance, ChatGPT is capable of generating an article containing about 500 words within 120 seconds, accompanied by five references [16]. Besides, through integrating diverse knowledge, creating realistic scenarios, and providing intelligent tools such as AR and VR, AI facilitates students in breaking through disciplinary barriers and stimulating their innovation potential. For example, AI-based virtual simulation experiments could lower practice costs and experimental risks, which provided students the opportunity to explore high-risk research areas, such as the avoidance of radioactive sources and monitoring gas leaks [17,18]. Besides, AI has the potential to transcend geographical limitations, providing students in remote regions with international academic resources, which can bridge the educational gap [19,20].

2.3. Individualized education

Through specific approaches, such as personalized learning and real-time feedback [21], AI can transform the education model from standardization to precision. AI can construct dynamic knowledge graphs based on the students' knowledge proficiency, learning behaviors (e.g., the speed of question answering and types of errors), and interest preferences. Therefore, personalized learning can be achieved by modeling and adaptive learning. Real-time feedback is achieved by the reconstruction of students' learning models, which facilitates the transformation of education from unidirectional knowledge dissemination to dynamic and interactive learning. For example, compared to traditional education, individualized education improves students' academic performance by 30–50% [22].

3. The negative impacts of AI on student development

3.1. Crisis of academic integrity

AI is extensively employed in learning, including chart generation and writing assistance, which triggers crises regarding academic integrity [23]. Students may depend on AI to engage in improper behaviors when completing

assignments, writing essays, and taking exams. This may challenge the fairness of education and pose latent threats to the quality of academic research. In recent years, academic misconduct, such as AI-generated text and falsified data, has occurred frequently. For example, within 2 years, 402 students at Birmingham City University in the UK participated in cheating by using AI [24]. This trend may not be easy to avert in the short term, as it is difficult to identify AI-generated content accurately [25,26].

3.2. Absence of critical thinking

AI is powerful in information collection, integration, and analysis, which may result in the absence of critical thinking and, consequently, pose a potential threat to the cognitive development of students. AI has led students to get used to acquiring answers conveniently, rather than solving problems independently. This might result in a lack of critical thinking ability [27,28], the fragmentation of knowledge, and weakening logical reasoning and in-depth analytical capabilities [29].

In addition, due to the personalized learning and real-time feedback capabilities of AI, as described above, intelligent recommender systems tend to promote the content that is in line with students' pre-existing viewpoints. This may undermine the critical thinking abilities of students in depth [27,28].

4. Integrated frameworks

To minimize the negative impacts of AI on student development, this study proposed an integrated framework to facilitate the positive interaction between AI and education, contributing to the professional development of students. This integrated framework included three dimensions: management, guidance, and standardization.

4.1. Management: Policy and regulation

An increasing number of new AI tools have been emerging, and universities should pay attention to these tools and develop standardized management policies. These should include various aspects such as ethics and privacy. Universities ought to monitor the latest technological advancements by collaborating with AI companies and research organizations, ensuring that the AI tools they use are safe and meet their specific requirements. Besides, teachers and students should be encouraged to participate in the innovation of AI, which promotes the localization and personalization of the tools, thereby optimizing the quality of education.

A dynamic monitoring system is needed to ensure the AI tools are both highly efficient and practical, as well as safe and reliable. For these objectives, universities should establish a dynamic monitoring system that is not limited to real-time tracking at the technical level, but also focuses on the effectiveness of the application. This can be accomplished by data analytics (including the utilization of AI in learning and the assessment of its efficacy) as well as feedback to facilitate the continuous enhancement of the application strategy.

4.2. Guidance: Awareness of rationality and social responsibility

Developing a rational understanding of the utilization of AI: The widespread usage of AI represents a technological transformation, which elicits a profound shift in mindset and educational philosophy. In this process, universities should play the role of ideological guidance, assisting teachers and students in accurately comprehending the functions and limitations of AI. This will help prevent excessive dependence on AI. A variety of methods, such as lectures, seminars, and academic exchanges, can be employed to guide teachers and students to rationally regard the application of AI. This approach can cultivate their correct understanding of the usage of AI, highlighting that AI is an auxiliary tool, and the ultimate goal of education should be jointly

achieved by both teachers and students.

Developing the awareness of ethics and social responsibility of AI: The application of AI enhances the quality of education; simultaneously, it poses a threat to the ethics and responsibility of human society. Specialized courses and lectures should be applied to enhance students' awareness of ethics and social responsibility of AI. Through these activities, students can comprehend the potential and risks associated with AI, assisting them in preventing the indiscriminate use and excessive dependence on AI. Besides, discussion platforms can be provided for students to develop critical thinking, with the aim of developing a comprehensive and responsible perspective on the utilization of AI.

4.3. Standardized guidelines

A standardized system should be constructed for AI applications, and the applicable scenarios, usage processes, and evaluation criteria should be defined. The standardized system should cover multiple aspects of AI, including selection, application, and evaluation, so as to ensure that different disciplines can select the appropriate tools according to their needs.

Standardized guidelines for training in the selection and application of AI should be systematically established, which can facilitate the proficiency of teachers and students in the utilization of AI. This training program should cover fundamental technical operations, the functions and application scenarios of the tools, as well as the efficient utilization methodologies in teaching and research. In addition, certifications should be carried out periodically to assess the capacity of teachers and students in the application of AI, which helps to ensure the tools are utilized in an efficient and secure manner. Consequently, the training and certification system helps to improve the overall proficiency of AI applications and ensure the optimal efficacy of AI in practical applications.

In addition, the standardized system ought to include quality evaluation criteria. This criterion should be customized in accordance with diverse types of AI tools, including online learning platforms, intelligent tutoring systems, and research assistance tools. The aim of this criterion is to formulate specific quality evaluation indicators, so as to ensure the tools can meet the practical requirements of teaching and research. Besides, AI tools should be regularly reviewed and updated to make sure that they are efficiently applicable.

5. Conclusion

The influence of artificial intelligence on the development of students demonstrates a notable, significant dual impact. A dynamic equilibrium between empowerment and constraint is required. It is necessary to mitigate the risk of abuse via technological iteration and policy innovation, and to reshape the core competitiveness of students through the reform of educational evaluation and the cultivation of ethics. It is also recommended to conduct a more in-depth exploration of the teaching model of collaborative innovation between AI and human intelligence.

In addition, it is imperative to enhance the training of both teachers and students in the application of AI and foster an elevated awareness of ethical considerations and social responsibility. Besides, specific operational specifications, such as clarifying which areas can use AI tools, how to ensure their compliance, and how to evaluate the effectiveness of the tools, etc., should be formulated to provide legal safeguards and management bases for the utilization of AI at the institutional level. These systems can guarantee the legal and compliant application of AI and minimize its potential negative impacts.

Disclosure statement

The authors declare no conflict of interest.

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