



How Would Artificial Intelligence Propel Higher Education in China?

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Abstract. This paper aims to explore the ethical concerns we have to take into consideration if AI-based education becomes a reality in tertiary education, the potential risks and difficulties entailed by widespread application of AI technologies in universities as well as colleges, and the strategies to be devised on the faculty's side so that we can harness the power of AI and in the meantime keep the "tiger" in the cage. The result shows that universities should develop policies and guidelines to ensure the responsible use of AI technologies and to protect the rights and interests of students and faculty alike. Meanwhile, AI literacy education needs to be strengthened on campus to promote the understanding and effective use of AI technologies. Besides, co-operation among educators, policymakers, and technology developers would ensure that the integration of AI technologies into educational practices would promote educational equity, encourage innovation, and cultivate high-end talents.

Keywords: artificial intelligence (AI), higher education, AI-based learning.

1 Introduction

Artificial Intelligence (AI), hailed as among the top three latest technologies in the 21 century with the other two as nano engineering and gene engineering, has been developing tremendously in the past three decades. In December 2017, AI was voted as one of the "top ten buzzwords" in Chinese media in 2017. In the same year, "A new generation of artificial intelligence development plan" was released by Chinese State Council, which mapped the overall planning of AI development until 2030 so as to expand digital industries and foster a digital economy [1]. As to education, the plan specified to construct a brand-new system which incorporated AI learning and interactive learning, e.g. big-data based online learning platforms. In 2018, Ministry of Education issued "Higher Education AI Innovation Action Plan", which promoted the use of AI in updating teaching environment, teaching procedure, university administration, and so on [2]. Spurred by these policies, an exponential growth was shown in making and spreading of MOOC courses, and the most renowned MOOC platforms were icourses and XuetangX. To "promote the digitalization of education" was proposed in the CPC's 20th congress report. Huai (2024) proclaimed that AI empowerment initiatives are to be

implemented to promote the deep integration of intelligent technology and education (AI for education), scientific research (AI for Science), and society (AI for Society) [3].

As AI-assisted education is an inevitable trend in the arena of higher education, it is necessary for us to discuss on what basis AI would affect the current education, the potential challenges AI would impose on teaching faculty as well as learners, and how we could effectively cope with the difficulties or problems that ensue.

2 Methodology

As the mainstream discussion and researches concerning AI-based education in China has been included in the CNKI database, we use keywords “artificial intelligence” or “AI” and “higher education” or “university education” to search for relevant journal articles. Among the retrieved articles 61 Chinese Social Science Citation Index (CSSCI) journal articles are chosen as the texts to be further examined. Such a sifting criterion is established because CSSCI has a stringent peer-reviewed system, and thus the indexed journal articles are of high quality and are more frequently cited by peer researchers. Six out of the 61 articles were excluded from the corpus as they are of issues irrelevant to the use of AI to facilitate talent training in higher education; they focus instead on other concerns such as the employment of university students in the job market.

2.1 A Steady Rise of the Journal Articles Published from 2017 to 2024

A brief statistics of the 55 journal articles on a yearly basis are shown in Figure 1.

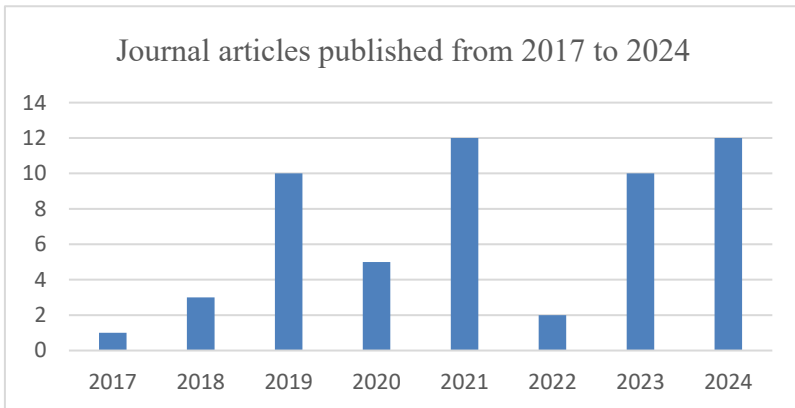


Fig. 1. Journal articles published from 2017 to 2024.

As is shown in Figure 1, since 2017, the discussion of AI technologies applied in higher education in China was initiated; though the amount of journal articles published each year after 2017 fluctuated somewhat, the major trend maintained a steady rise, which shows that it is necessary not only to discuss the significance of AI-based learning but also to map the landscape of how to integrate AI technologies strategically into

higher education. It should be noted that AI used in this article refers typically to the latest development in the technology which features machine learning, big data, generative AI, and so on.

2.2 The Distribution of the Categories of the Retrieved Journal Articles

The researcher read through the 55 articles carefully and sorted out categories of their perspectives and emphasis. Six articles discussed the introduction of AI technologies in tertiary education in other countries of the world, especially developed countries so as to elucidate the feasible ways which proved to be fruitful. A varied form of discussion on AI-mediated learning in higher education has also been recorded, e.g. interviews, forums and report analysis. Two articles probed into the ethical concerns amid the rapid promotion of AI technologies in universities as well as colleges. More than half of the articles dug into the multifold dimensions that should be harnessed against the context that AI had become an inevitable trend in our lives. The statistics are shown in Table 1 below.

Table 1. The distribution of the categories of the retrieved journal articles.

Categories of the retrieved journal articles	Number of articles published
introduction of the practice in other countries	6
a varied discussion: interviews, forums and report analysis	14
ethics	2
quantitative studies	3
qualitative analysis	31

3 AI as a subject and AI-assisted learning practice in international higher education

The practice of integrating AI technologies into higher education in other parts of the world have been noted and discussed.

Both Great Britain and Japan strive to cultivate high-end AI talents. Duan and Zhang (2019) noted that Great Britain aimed to promote interdisciplinary studies of AI, develop a modern apprenticeship-style AI master’s education, and in the meantime, increase the number of colleges and departments eligible to cultivate AI talents with doctoral degrees [4]. Wu and Zhang (2021) observed that Japan, transferring to an aging society, endeavored to improve the goal of multiple learning abilities, increase the cultivation of AI talents, and develop a diversified information technology-oriented university teachers’ training system [5].

Public funds are provided to promote AI technology development and talent training in developed countries. Ju and Ma (2019) revealed that the developed countries strived to deliver earmarked funds for AI talent training and scientific research, establish AI colleges, and highlight higher education’s role in AI construction clusters [6].

4 A heated discussion on AI's role in higher education: interviews, forums and report analysis

A lively talk and criticism to the latest reports on bringing AI technologies into universities is also enlightening.

Multi-disciplinary studies may become a norm, especially for researchers from the field of social science. Wang (2023) interviewed Professor Downey, a renowned professor in comparative media analysis and the president of the European Communication Research and Education Association, who stated that we should enhance our artificial intelligence literacy. Professor Downey proposed that we should think in a multi-disciplinary approach, and sociologists should co-operate with computational scientists to develop the brand-new courses which would facilitate student's adjusting to their future job scenarios [7].

There is a gap for high-end AI talents in the industry and universities should encourage innovation in curriculum design as well as the teaching process. Liu and Lü (2019) conducted in-depth interviews to researchers of academia and practitioners from the industry: the former included professors from "double tops" universities in Beijing and researchers from institutes of Chinese Academy of Sciences, the latter included administrative staff members and technical administrators from both long-established companies and startups from the industry. The interview revealed that there remained a gap for high-end talents, who had strong algorithm abilities and be keen to understand the situation so as to solve the problems efficiently. China's current AI talent reserve was more concentrated in the application end (back-end), while the fundamental research and development (front-end) still had a long way to go. Thus university education should be oriented to arouse students' awareness to innovate, equip them with innovative technologies, train their abilities to create so as to contribute to the industry in the future career [8].

Major concerns such as how to protect students' privacy should be addressed in time so that education in the AI era can be redefined. Nine academicians and presidents joined the China Engineering and Science Forum and offered insights on "AI enabling higher education", and a summary of their speeches was reported by Editorial Board of Journal of Xi'an Jiaotong University (Social Sciences) (2023). They discussed the trends and problems that arose in Virtue Reality (VR)+ learning; realizing the intelligent use, application, treatment and system of AI technology through the ethics of science and technology, intelligent algorithm and educational privacy protection; constructing an innovative system of digital technology to empower high-level personnel training, the proposal of the personalized learning guidance engine of knowledge forest; the need to redefine learning and education in the era of artificial intelligence [9]. Lan et al. (2020), Gao et al. (2021), Wang et al. (2022) and Peng et al. (2024) analyzed the influential Horizon Report released by EAU-CAUSE to focus on the key technologies and teaching practices of higher education development in the era of AI, covering four stages of exploration, development, integration and deepening of AI technology application in the education field [10] [11] [12] [13].

5 Ethical concerns of application of AI in higher education

Despite the overwhelming power of AI to reshape modern higher education and update the scope of knowledge, ethical issues such as academic misconduct, the absence of humanism and ill-balanced learning opportunities, have always drawn special attention in higher education.

Xu and Sun (2024) argued that students may use generative AI tools to write their papers and academic misconduct became more difficult to detect. In AI-based learning, humanistic factors such as freedom, democracy, rationality and fairness cannot be described or transformed by data, and technology-guided knowledge transformation and application lacked exploration of deep meaning such as value, culture and concept, resulting in the absence of humanism in the process of transformation and application of advanced knowledge [14].

Dong and Wei (2021) acknowledged that AI technology could break the barriers of time and space so that learning was always present and everywhere, however, people who lacked the technological skills would be barred from AI education because they had no access to the educational resources on the e-platforms and thus lost the channels to intelligent education. In these cases, the fairness of technology exacerbated the fairness of traditional educational opportunities to some extent. [15].

6 Analysis of the path to be undertaken for higher education in an AI era

6.1 Data-based Studies

In spite of the boosted learning outcomes and efficiency in higher education brought by AI technology, potential risks such as teacher-student relationship and educational equity are also entailed. Wei et al. (2024) conducted a big-data based survey of over 2,200 universities in the U.S. and found that ChatGPT can boost efficiency and quality of higher education, expand research theories and methods, improve administrative capacity, however, it also entailed potential risks, such as the trust between students and teachers may diminish, academic integrity would shrink, and so on [16]. Hao and Xiao (2021) reviewed journal literature from multiple databases to examine the application of AI in higher education from the perspective of learning outcomes and education equity. They concluded that AI technologies could boost the learning outcomes in higher education and enhance learning experience. However, discussion on AI's potential to expand educational opportunities and promote equity in education was inadequate yet. Whether special groups of learners, especially the less privileged learners, e.g. non-traditional learners and disabled learners, should be given more attention still had a long way to go [17].

A majority of the universities endorsed AI-based learning, in the meantime some potential pitfalls deserve the special concern, such as academic integrity crisis, to what extent the output of generative AI should be acknowledged, and the legal risks of

privacy security and copyright protection. Ouyang et al. (2023) conducted an online survey to examine 31 world-renowned universities' strategies in responding to generative AI, most of which showed an open-minded attitude. As to the stance towards the usage of generative AI tools and whether relevant policies as well as guidelines had been established and issued, two German universities and Kyoto University from Japan had not given their opinions, University of California, Berkeley discouraged the usage, all the other 27 universities endorsed the practice to a variety of degrees, among which University of Michigan, California Institute of Technology and Harvard University not only issued guidelines but also provided technological support. In teaching scenarios, teaching syllabuses were to be updated so as to specify how generative AI would be involved, and what role generative AI would have in student's homework should be explicitly stated. In research situations, universities would give suggestions on how to circumvent data and copyright issues and revise the quotation codes in academic ethics [18].

6.2 Qualitative Studies

Approximately 1/4 of the 31 qualitative studies emphasized their discussion on generative AI/ ChatGPT. Xun (2023), emphasizing the intrinsic value of higher education, suggested that proper guidance should be provided to ensure the ethical application of AI [19]. Li (2023), Dai and Guo (2023), Zhou and Chang (2023), Li et al. (2024), Li and Xue (2024), Yang (2024) and Ding and Zhong (2024) discussed the potential risks in teaching, learning as well as administration that would ensue after the application of AI technologies in higher education [20][21][22][23][24][25][26], e.g. unfairness in education caused by algorithm bias, the digital application gap caused by lack of literacy, and the crisis of trust in education caused by lack of norms.

As to the potent risks as well as a realm of uncertainty in the imminent future with widespread application of AI technologies in university education, researchers provided tentative solutions: Song (2018) proposed an industry-education integration boundary analysis model [27]; Zhang (2022) advocated reshaping the education ecology through the integration of literature map, knowledge map, competence map and quality map [28]; Bie and Guo (2024) stressed the integration of virtual and real teaching spaces, robots and teachers complementing each other, and resolving conflicts between technology and ethics [29].

7 Conclusion

The development of AI technology has brought revolutionary changes to the field of higher education, including personalized learning, efficiency improvements and innovation in teaching methods. However, ethical issues have become increasingly prominent, including academic misconduct, the absence of humanism and ill-balanced learning opportunities, and so on. These ethical issues require higher education institutions to develop policies and guidelines to ensure the responsible use of AI technology and to protect the rights and interests of students and faculty. Meanwhile, AI literacy

education needs to be strengthened so that students and teachers alike can understand and effectively use AI technology. Educators, policymakers, and technology developers in China need to work together to ensure the integration of AI technologies into educational practices would promote educational equity, encourage innovation, and cultivate high-end talents.

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