

The Significance of Educational Application of Artificial Intelligence and Its Current State in China

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Abstract: *The educational application of artificial intelligence (AI) is to integrate AI technology into the educational system including educational components and processes to achieve personalized, inclusive, and more effective education. The adoption of AI technology in Chinese education has considerably improved its efficiency and equity. The purpose of this article is to present the significance of educational application of AI and the status quo of the use of AI technologies in Chinese education.*

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IN the history of artificial intelligence (AI), 2016 is generally viewed as a landmark year, which saw a substantial increase in AI projects (Zhao & Yuan, 2016). In that year, DeepMind's AlphaGo won Go champion Lee Sedol, becoming the first computer Go-playing system to beat a professional Go player. The result of this human-machine match sparked wide attention around the world, giving fresh impetus to the development of AI technology. Driven by the AI strategies of various countries and the influx of capital, the applications of AI technology have tremendously expanded, and education is among the fields that have been most prominently impacted. The 2017 Global (Shanghai) Artificial Intelligence Innovation Summit urged further explorations of AI integration in education. Amid the rapid advances of big data, Internet, cloud computing and other technologies in the past few years, AI has played a vital role in promoting the reform of Chinese education (Zhang & Gu, 2023).

Utilizing technological advantages of AI in educational activities has the great potential to liberate educators from massive, repeated labor and to transform the interaction between teachers, students, resources, and the environment. Currently, the application of AI technology to education has become a major research area, as it affects curriculum planning, teaching methods, and the corresponding reform of overall educational frameworks. A range of relevant concepts have emerged such as "educational application of artificial intelligence," "artificial intelligence education," "educational artificial intelligence," "smart education," "intelligent education," "AI-enabled education" and more. Li (2020) argued that AI applications can serve as an assisting tool in education, with a function comparable to any other educational technology. Zhang & Ji (2018) defined "intelligent education" as a process in which students learn to apply technical tools to intelligent information processing and the construction of intelligent solutions and development systems, thus integrating individual intellectual development with intelligent technology practice. Zhu et al. (2018) pinpointed the three primary components of intelligent education: intelligent technology support, intelligent technology education, and student intellectual development. Wang & Liu (2018) asserted that the "AI educational applications" are the innovative use of AI technologies, models, and practices in the field of education and that they can be divided into three categories: basic-level applications of "computational intelligence+education," enhanced-level applications of "perceptual intelligence+education," and deep applications of "specialized cognitive intelligence+education." Yan et al. (2017) defined educational artificial intelligence as a novel field based on the combination of AI and disciplinary expertise, which focuses on exploring how to actualize and enhance learning by using AI technology and to provide users with conditions for more efficient and effective learning than traditional educational paradigms. In this study, the educational application of AI is defined as the practice of

incorporating AI technology into the entire educational system including integrating AI with key educational components (teachers, learners, administrators, educational resources and environments) and educational processes under the frameworks of accepted educational theories and AI ethics in order to provide personalized, inclusive, and more efficacious education.

The Significance of Educational Application of AI

Mutual Promotion between AI Technology and Educational Development

The efforts to apply AI theories to educational activities can be traced back to the 1980s. The program named “Intelligent Tutoring System (ITS)” in 1989 was among the early experiments to combine AI technology with instructional activities (Koedinger et al., 1997). As a result of the incremental advancements in AI, more educational technologies such as learning analytics (Gasevic, 2017) and educational data mining (Zhang et al., 2014), and the International Society of the Learning Science (Long, 2011) arose, bringing profound changes to instructional methods, learning materials, educational evaluation systems, and school management patterns. Technological breakthroughs in AI have been promoting the development of education.

Meanwhile, AI, like any other technology, can only be fully developed through practical applications. It necessitates the employment of enormous volumes of data generated by practical applications to carry out the assessment and improvement of the technology, and education is precisely one of the fields capable of producing massive amounts of data. Therefore, the application of AI in education is beneficial to the progress of AI. In addition, advances in education pose new challenges and requirements on AI technology, which in turn promotes further development of the latter.

Providing an Impetus for the Reform of Chinese Education

Since its reform and opening up, China has been committed to educational equity by implementing the compulsory education, tuition exemption program, and ethnic minority education protection policies to ensure all school-age children the right to education. After entering 21st century, the public put forward new requirements for the national education in addition to the achieved educational universalization, that is, an equal and high-quality education (Hu et al., 2020b). How to popularize high-quality education? AI

technology can provide powerful backing to expedite the popularization of high-quality education.

China's educational reform in the ICT era sets the universalization of high-quality education as its primary goal. According to papers issued by the Ministry of Education, all localities have been prompted to experiment educational AI pilot projects; AI educational applications have been spread to underdeveloped areas after being proofed effective by urban schools. Not only schools and other educational institutions are urged to implement educational AI pilot programs, but high-tech enterprises are also encouraged to play pivotal roles in executing the "AI+education" strategy. For example, an AI application developed by Squirrel AI Smart Adaptation Education can detect students' weaknesses in the learning process through machine algorithms, and then offer tailored tutoring accordingly. In addition, policy support and incentives have been inspiring in-service anchor teachers and non-governmental organizations to adopt AI technology to address the unbalanced distribution of educational resources and to ease teacher shortages in impoverished areas.

Status Quo of the Educational Application of AI in China

Educational AI Technologies in Use

The development of AI technology can be divided into three stages: perceptual intelligence, cognitive intelligence, and decision-making intelligence. With technological advances, cognitive intelligence has now become the mainstream research field, which is applied to highly complex scenarios to enable analysis and decision-making through technologies like multi-modal AI and big data. At present, a plurality of AI technologies is being used in a wide range of scenarios such as smart education platforms, virtual laboratories, instructional evaluation and feedback to construct a comprehensive ecosystem which is capable of providing personalized, multi-purpose education (China Electronics Standardization Institute, 2021).

China Electronics Standardization Institute's (2018) "White Paper on Artificial Intelligence Standardization 2018" lists machine learning, natural language processing, knowledge mapping, computer vision, human-machine interaction, biometric recognition, virtual reality, and augmented reality as the seven core AI technologies. All of them are employed in the field of education to varying degrees, with natural language processing, machine learning, and biometric recognition being used more widely. For instance, natural language processing-based translation software provides "online dictionary" for foreign language learners; biometric recognition technology-enabled face

and fingerprint recognition can be used to conduct intelligent attendance check in school routine administration; human-machine interaction technology can generate personalized analysis of learning situations of each individual student.

Roles of AI Applications in Education

According to the level of involvement they have in the educational process, AI applications assume different roles, mainly the role as educational actors, the functional role, and assistive role. Their common goal is to maximize technological empowerment through the appropriate integration of AI and education on an on-demand basis, thereby achieving the optimization of educational outcomes (Zhang & Zhang, 2017)

AI Applications as Educational Actors

When AI applications play the roles of educational actors in the educational processes such as teaching, learning, management, and educational decision-making, they are doing the work of teachers, advisors, administrators, or peers. AI applications of this category include the intelligent tutoring system, intelligent Q & A system, intelligent learning through gaming, intelligent school administration, and intelligent decision supporting system. In these applications, AI technology is the pivotal module in the system. They are aimed at liberating teachers, administrators, and decision-makers from copious, repetitive labor so that they can invest more of their time, energy, and expertise in personalized instruction, in the cultivation of student creativity, and in the design of innovative educational programs.

The Functional Role of AI Applications

In some circumstances, AI technology is embedded as supportive modules to perform functions such as learning content recommendation, learning analysis, learning evaluation, learning optimization, and data mining to help teachers, learners, and school administrators improve their performance. Programs such as adaptive learning, personalized learning, and learning through gaming are also run by embedded AI technology.

The Assistive Role of AI Applications

Assistive technology is a framework term, entailing a wide range of applications for assistive, adaptive, and rehabilitative devices for the disabled. Assistive AI technology is not intended to directly impact their academic performance, but rather to compensate for their deficiencies in physical and

mental functions and narrow the gap between the disabled and the normal population in basic educational conditions. Assistive technologies such as speech recognition, robotic arms, intelligent prosthetics, intelligent wheelchairs and more can help disabled learners regain normal behavioral functions. For example, FingerReader, a device developed by the MIT Media Lab, can be worn on the finger. With it turned on, the user only needs to move their fingertip along the text on the screen or on the paper, and FingerReader can read the text aloud in real time (Shilkrot et al., 2015).

Major Educational AI Developers and Users in China

Major Internet companies, AI companies, and educational technology companies constitute the majority of educational AI developers, who use their command of internet, AI, and big data technologies to explore how to integrate AI in education. High-tech behemoths such as Baidu and iFLYTEK have made significant achievements in this field. Through its AI applications, iFLYTEK helps Chinese schools to actualize “tailored education.” To date, more than 130 million teachers and students from over 50,000 schools have used the iFLYTEK educational AI to improve their teaching and learning outcomes (Yang & Xiao, 2023). A plurality of small- and medium-sized high-tech companies have also invested in the research and development of educational AI. For example, Shanghai Moofen Technology Co., Ltd. has used AI to give precise data analytics to schools in Sichuan, Guizhou, Chongqing, Jiangsu, and other regions (Zhou et al., 2023).

At present, Internet companies such as Alibaba, Tencent, and Baidu are providing popular AI applications such as DingTalk Future Campus, Tencent Smart Campus, and Baidu Smart Classroom. AI companies, such as iFLYTEK and SenseTime offer intelligent hardware products such as translation machines and learning machines as well as AI experiment platforms like SenseStudy and Robot Rover Mini/Pro. Educational technology companies such as New Oriental Education, Squirrel AI Smart Adaptation Education, and Huijiang Education have developed AI education platforms including N-Brain AI Learning Platform, AI Classroom Teachers, K-12 AI Adaptive Tutoring, Uni Intelligent Learning system, Hitalk Oral English Courses, etc.

Education departments, educational institutions, families, and individual learners can all be the users of AI applications, accessing them through purchasing, leasing, and other means. Chinese government has established AI education as a national strategy, which receives positive reactions from the educational communities. Reports on the 2023 Zhejiang Digital Education Conference show that AI will be included as a compulsory subject in primary and secondary curricula in Zhejiang Province and that AI knowledge will be extensively incorporated into science and mathematics.

Information technology is already one of the elective subjects in Zhejiang Province's college entrance examination, and the introduction of AI courses in primary and secondary schools will further prepare students for the AI era (Zhong, 2023). In addition, some schools have created their own intelligent teaching platforms. For example, Shandong 271 Education Group created 271Bay as a digital education platform for its more than 8,000 teachers and 90,000 students (Sun, 2022). In China, digital technology is also employed in student mental health education. For example, a mental health cloud platform in Jiangsu Province has for years committed to student mental health services such as the counseling, diagnosis, and treatment of mental health issues (Quan, 2020).

Conclusion and Prospects

Currently, the application of AI to education exhibits a growing trend. AI technology is a powerful force driving digital education in China. The educational application of AI can significantly contribute to increasing the pool of AI talent while promoting balanced, high-quality education. At the same time, as the use of AI in education increased, many issues emerged, necessitating attention from and debate among all stakeholders. Training AI algorithm models requires extensive use of educational big data, which raises concern over information security issues such as data privacy; the use of AI in the educational assessment spawns the need for relevant regulations; there is the risk of further expanding the digital divide though the application of AI is intended to heighten efficiency and equity in education. Facing AI's rapid advances and its consequential challenges, educational communities must leverage AI technologies to make adjustments in order to meet the demands of social development.

References

- China Electronics Standardization Institute. (2018). White Paper on Artificial Intelligence Standardization 2018. Available at: <http://www.cesi.cn/images/editor/20180124/20180124135528742.pdf>
- China Electronics Standardization Institute. (2021). White Paper on Artificial Intelligence Standardization 2021. Available at: <http://www.cesi.cn/images/editor/20210721/20210721160350880.pdf>
- Gasevic, D., Kovanovic, V., & Joksimovic, S. (2017). Piecing the learning analytics puzzle: A consolidated model of a field of research and practice. *Learning: Research and Practice*, 3(1):63-78. DOI: <https://doi.org/10.1080/23735082.2017.1286142>
- Hu, X, Sun, S., Yang, W., & Ding, G. (2022a).

- Artificial intelligence-powered high-quality development of education: Demands, vision, and paths. *Modern Educational Technology*, 2022(1):5-15. DOI: <https://doi.org/10.3969/j.issn.1009-8097.2022.01.001>
- Hu, X., Xu, T., Cao, Y. & Xu, H. (2020b). Information technology-enabled basic education equity in the new era: connotations, paths, and strategies. *E-education Research*, 2020(9):34-40. DOI: <https://doi.org/10.13811/j.cnki.eer.2020.09.005>
- Koedinger, K. R., Anderson, J. R., Hadley, W. H., & Mark, M. A. (1997). Intelligent tutoring goes to school in the big city. *International Journal of Artificial Intelligence in Education*, 8(1):30-43.
- Li, F., Nian, H., & Zhang, J. (2020). An overview of educational application of artificial intelligence. *Modern University Education*, 2020(1):1-8. DOI: <https://doi.org/10.3969/j.issn.1671-16100.2020.01.001>
- Long, P. (2011). Proceedings of the 1st international conference on learning analytics and knowledge. ACM.
- Quan, L. (2020). Practical analysis of mental health assistance in elementary and middle schools under COVID-19 Pandemic: A case study of City A in Jiangsu, China. *Science Insights*, 34(3):183-193. DOI: <https://doi.org/10.15354/si.20.or026>
- Shilkrot, R., Huber, J., Meng Ee, W., Maes, P., & Nanayakkara, S. C. (2015). FingerReader: A Wearable Device to Explore Printed Text on the Go. CHI '15: Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems. ACM. DOI: <https://doi.org/10.1145/2702123.2702421>
- Sun, G. (2022). Application of educational technology in holistic module learning: Citing the practice of Shandong 271 Education Group as a Case Study. *Science Insights Education Frontiers*, 11(1):1499-1507. DOI: <https://doi.org/10.15354/sief.22.or007>
- Yan, Z., Tang, X., Qin, X., Zhang, F., & Duan, Y. (2017). Definition, key technologies, and application trends of educational artificial intelligence (EAI): An analysis of the U.S.'s "Preparing for the Future of Artificial Intelligence" and "The National Artificial Intelligence Research and Development Strategic Plan." *Journal of Distance Education*, 2017(1):26-35. DOI: <https://doi.org/10.13541/j.cnki.chinade.20180427.001>
- Yang, J. & Xiao, X. (2023). Confidence in the leap of AI technology and the prospect of Chinese counterpart of ChatGPT: iFLYTEK's response. QbitAI. (2023-02-16). Available at: <https://baijiahao.baidu.com/s?id=1757982724120660133&wfr=spider&for=pc>
- Zhang, J. & Ji, L. (2018). "Intelligent education" or "education that promotes intelligence development"? Connotations and goals of intelligent education in the AI era. *Modern Distance Education Research*, 2018(2):14-23. DOI: <https://doi.org/10.3969/j.issn.1009-5195.2018.02.002>
- Zhang, K. & Zhang, J. (2017). Novel areas, misconceptions, blind spots, and forbidden areas in educational artificial intelligence application and research. *Journal of Distance Education*, 2017(5):54-63. DOI: <https://doi.org/10.15881/j.cnki.cn33-1304/g4.2017.05.005>
- Zhang, L. & Gu, X (2023). Factors influencing the innovative diffusion of artificial intelligence in education: A study based on the TOE theoretical framework. *Distance Education in China*, 2023(2):54-63+82 Doi: <https://doi.org/10.13541/j.cnki.chinade.2023.02.008>
- Zhang, L., VanLehn, K., Girard, S., Bursleson, W., Chavez-Echeagaray, M. E., Gonzalez-Sanchez, J., & Hidalgo-Pontet, Y. (2014). Evaluation of a meta-tutor for constructing models of dynamic systems. *Computers & Education*, 75:196-217. DOI: <https://doi.org/10.1016/j.compedu.2014.02.015>
- Zhao, X. & Yuan, W. (2016). The artificial intelligence is sparking a revolution. *Modern Science and Technology of Telecommunications*, 46(3):65-68.
- Zhong, H. (2023). AI is to be included as a compulsory course in primary and secondary curricula in Zhejiang Province! Will AI education begin from childhood? Tencent. 2023-03-27. Available at: <https://new.qq.com/rain/a/20230327A054HO00>
- Zhou, L., Meng, W., Wu, S., & Cheng, X. (2023). Development of digital education in the age of digital transformation: Citing China's practice in smart education as a case study. *Science Insights Education Frontiers*, 14(2):2077-2092. DOI: <https://doi.org/10.13541/j.cnki.chinade.20230327A054HO00>

<https://doi.org/10.15354/sief.23.or095>
Zhu, Z., Peng, H., & Lei, Y. (2018). Intelligent education: The practical path of smart education. *Open Education Research*,

24(4):13-24+42. DOI:
<https://doi.org/10.13966/j.cnki.kfjyyj.2018.04.002>

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