



Developing Intelligent Education in China

Jian Wang^(✉)

School of Foreign Languages and Culture, Geely University of China, Chengdu 641423, China
wangjian@bgu.edu.cn

Abstract. Integrating intelligent technologies into education impacts educational practice and research. This article zooms in on the factors driving the development of intelligent education and provides suggestions for improving intelligent education. Multiple factors are mentioned, including the changes in talent training goals, the reform of the internal elements of the education system, the paradigm shift of educational science research, and the optimization of the existing educational discipline system. It is crucial to elucidate the discipline orientation, value collaborative innovation, and remold the talent training system.

Keywords: Intelligent Education · AI Technology · Digital Transformation

1 Introduction

Situated in the increasingly digitized world, education has been also going through dramatic changes brought by advances in a wide range of modern technologies [1]. To date, the rapid development of information technology such as artificial intelligence (AI) has revolutionized education at all levels, with human-machine collaboration at the heart of modern education. In this context, there is an urgent need to develop intelligent education to adapt traditional education to social development and changes. This article endeavors to clarify key reasons for developing intelligent education and provide constructive suggestions for implementing intelligent education in China.

2 Reasons for Developing Intelligent Education

2.1 Important Shift in Talent Training Goals

Intelligent technologies accelerate the explosive growth of information space and integrate with the physical space and social space to form an “information-physics-society” ternary space, supporting human production and practice in the new era. These technologies are also integrated with various fields, promoting digital transformation, intelligent upgrading, and innovation of the whole society. In this situation, the gap between artificial intelligence and human intelligence will be gradually narrowed, and the two-way collaboration between intelligent machines and humans will lead to an intelligent society that is people-centered and features virtual-real fusion. The emergence of this kind of

society has led to major changes in the existing production mode in various industries, and the social division of labor has become increasingly complex with higher requirements for the quality of workers. In this case, cultivating students' innovative thinking abilities has become an urgent task for every practitioner in the education sector. To achieve this goal, education must be innovated with new technologies.

2.2 Rapid Development of AI and Its Continuous Integration into Education

Historically, the advances in AI and the development of education transpired almost simultaneously. The concept of “artificial intelligence” made its debut at the Dartmouth Conference in 1956. Since then, the AI industry launched perceptrons (the initial form of neural networks), mobile robots Shakey, Chatbot Eliza, etc. During the same period, the application of AI in education commenced, and computer-aided teaching increasingly became a hot spot. In 1960, the University of Illinois introduced the first computer-aided teaching system “Programmed Logic for Automatic Teaching Operations (PLATO)”. Subsequently, a new computer-aided teaching system SCHOLAR and the BIP system to assist Basic language teaching appeared. In the 1980s, AI ushered in a new stage of development, and the industry successively introduced the XCON expert system, Hopfield neural network, supercomputer “Deep Blue” and so on. Almost synchronously, intelligent education entered the exploration stage, and the intelligent teaching system became a new research hotspot. Since the start of the 21st century, AI has received unprecedented attention, and the industry has successively launched deep confidence network structure, Siri intelligent assistant, Watson question-answering system, AlphaGo program, LaMDA language model, etc. Meanwhile, the integration of AI into education began to accelerate, and personalized adaptive learning became the focus of attention in the education sector. In 2019, the first International Conference on Artificial Intelligence and Education emphasized the systematic integration of AI technology into education. In brief, advances in AI have brought profound changes in teaching, learning, and talent training, reduced teachers' burdens, improved education governance, and created an open and flexible education system [2].

2.3 Structural Changes in Education Driven by Intelligent Technologies

Intelligent technologies have engendered profound structural changes in education, and it has become an urgent task to reshape the existing education discipline system. With the continuous development and application of intelligent technologies in education, machines began to be one of the main elements in teaching activities [3]. Thus, the binary “teacher-student” or “student-student” structure that received more attention in the past was transformed into a ternary “teacher-machine-student” structure in which intelligent machines (heterogeneous elements) and people (teachers and students) constitute a community in the teaching settings. This change has expanded interpersonal interactions to human-machine collaborations. Intelligent machines are superior to people in computing, memorization, etc., but people are superior to intelligent machines in terms of emotions and innovation. To combine the advantages of AI and human intelligence and develop large-scale and personalized intelligent education, it is necessary

to fully understand the “teacher-machine-student” structure. In the evolution of pedagogy, the interaction between inheritance and innovation is the main driving force for the development of education [4].

At present, a stronger tension has been formed between the huge demand brought about by technological breakthroughs and the limited supply in education, which constitutes the main driving force for educational reform and innovation in the new era. Changes in the dynamic structure of educational development have promoted the transformation of educational forms, and new educational forms inevitably need to develop new disciplines that adapt to them. Educational development cannot always keep up with technological innovations, so solving complex and systematic problems in education increasingly requires large-span and multi-level discipline integration. Therefore, it is imperative to develop intelligent education, explore the use of AI to empower human intelligence [5], and promote the cross-integration of education, cognitive science, data science, and other disciplines.

2.4 Intelligent Technologies’ Positive Role in Educational Science Research

Intelligent technologies promote the development of educational science research and shift its research paradigm to a data-intensive one. The profound changes in the talent training goals and the internal elements of the education system have led to corresponding changes in the problems faced by educational science research. China attaches great importance to scientific research in the field of education. This is evidenced by multiple facts. For example, while zooming in on interdisciplinary scientific research which combines multiple fields with education, researchers introduced the self-discipline research paradigm into educational research and actively explored new methods to understand the universal rules of education. In January 2018, the National Natural Science Foundation of China added “Education Information Science and Technology” to the list of research directions to specifically support basic research on the integration of information technology and education. In August 2022, the Ministry of Science and Technology helped promote the deep integration of intelligent technologies and education. Intelligent technologies can bring data-intensive knowledge production, and educational researchers can use computers to obtain valuable results directly from big data, making educational research no longer rely solely on hypotheses, surveys, etc. In March 2022, the National Intelligent Education Public Service Platform was officially launched, which, as of November 2022, connected 529,000 schools and served 18.44 million teachers and 291 million students and learners. This platform may become an important source of data for education research.

3 Suggestions for the Development of Intelligent Education

At present, intelligent education is still in the preliminary stage. The Ministry of Education and the Chinese Academy of Engineering proposed the “Intelligent Education Strategy Research” project to call scholarly attention to the basic issues related to intelligent education and to call for suggestions on the development of intelligent education. To this end, constructive suggestions are provided in what follows.

First, the discipline positioning of intelligent education should be clarified. Intelligent education is mainly based on theories and approaches in multidisciplinary fields like education, psychology, information science, and brain science. In this context, intelligent education can be listed as a first-level discipline under the interdisciplinary category. Therefore, it is necessary to study the positioning, value, and structure of intelligent education promptly, including the nature, the overall positioning, and the development direction of this discipline, etc. It is also important to start constructing the disciplinary system of intelligent education as soon as possible.

Second, collaborative innovation should be carried out in the field of intelligent education. Scholars should systematically conduct collaborative innovation research related to intelligent education, pool the advantages of related disciplines, and explore the universal rules of intelligent education. In addition, it is essential to upgrade the teaching facilities and build a new teaching environment that is more immersive, connected, open, and intelligent [6]. Besides, the development of intelligent education should be closely combined with Chinese traditional culture and thus a Chinese model of intelligent education can be created [7].

Third, the talent training system of intelligent education needs continuous improvement. To this end, it is necessary to establish the knowledge system, curriculum system, and talent training system of intelligent education to meet the practice and research needs of intelligent education. Special attention should be paid to the theoretical research and practical exploration of education under the ternary structure of “teacher-machine-student”. It is crucial to establish the human-computer collaborative teaching system and interaction model, explore the intelligent identification and intervention methods for special children, and promote a more inclusive, fairer, and better-quality lifelong education [8]. It is also necessary to combine digital transformation and intelligent development to formulate a talent training program that considers the education law of internal and external relations [9] and standardizes the methods and contents of teaching, evaluation, and management. Moreover, great importance should be attached to students’ digital literacy and skill cultivation [10]. Finally, the professional teaching staff is needed to provide a fundamental guarantee for the construction of a high-quality training system for specialized talents in intelligent education.

4 Conclusion

In the future, humanity, digital technology, and digital society are likely to be intricately intertwined. In this situation, educators need to devote more energy to exploring and imagining a broader digital space. Based on their academic research and teaching practice, education practitioners need to discuss the trends and challenges of future education development from such aspects as curriculum design, educational philosophy, learning environment, and teaching evaluation.

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