

# Establishment of Educational AI System Based on Man-machine Coordination

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**Abstract.** Educational AI based on man-machine coordination is the most likely and reasonable form of education under current technological conditions. This paper analyzes the development of educational artificial intelligence. On the basis of investigating the practical problems of educational artificial intelligence, it analyzes the concept, composition and role transformation of educators, educatees and educational artificial intelligence based on human-computer cooperation, and puts forward the basic principles for establishing an artificial intelligence education system based on human-computer cooperation from four aspects of ideas, management, application and support, analyzed the structure and algorithm model.

**Keywords:** Man-machine coordination; Educational AI

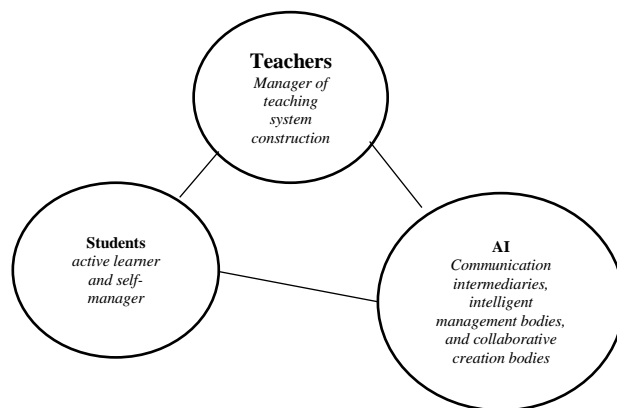
## 1 Introduction

Artificial intelligence is a science that studies how to build human-like intelligent machines or systems to simulate human activities and thinking, extending and expanding human intelligence [1]. As the highlight of the world's scientific and technological innovation and development, artificial intelligence leads a new wave of scientific and technological changes, bringing significant changes to human development worldwide, as well as overall changes and new opportunities to education, particularly higher education. In 2017, the State Council, China issued the New Generation Artificial Intelligence Development Plan [2], which made specific plans for artificial intelligence talent training and educational AI. In 2018, the Ministry of Education of China released the Action Plan of Artificial Intelligence Innovation in Colleges and Universities[3], which guides and supports colleges and universities to improve their abilities of independent innovation in the field of artificial intelligence, personnel training and serving the needs of the country. China's higher educational AI talent training has made new progress after several years of development, and the artificial intelligence talent training system has been improved. From 2018 to 2022, 533 colleges and universities added artificial intelligence majors, and AI has gradually integrated into China's higher education system. However, there are some issues with China's educational AI at the moment, such as a low level of application, poor coordination, and the failure to form an effective educational AI system.

## 2 Basic Definition

The activities that people and machines coordinate and collaborate on in order to know and transform the world together are referred to as man-machine coordination. The history of man-machine collaboration can be traced back to the industrial revolution. People invented the steam engine and other machines, which significantly increased human labor productivity. Humans entered the field of man-machine coordination for the first time. However, at the time, man-machine coordination was simply a simple way for people to use machines. In today's world, the emergence of cross-era inventions such as computers, Internet information technology, artificial intelligence, big data, and so on has facilitated a new round of deep collaboration between man and machine, as well as the continuous development of Internet information. Machines are no longer just passive receivers and users, but may be masters who do their best work, learn from each other's strengths, know, perceive, think, make decisions, collaborate, understand, restrict, and monitor each other [4]. Lickleide argues that the concept of human-computer symbiosis, in which people and electronic devices are closely coupled, enables computers to facilitate formulaic thinking, and allows humans and computers to work together to make decisions to control complex situations without relying on predetermined procedures [5].

The organic interaction and deep integration of teachers, students, and artificial intelligence devices constitute the educational AI system based on man-machine coordination. It is also the standardization, process, and systematization of educational participants via educational AI in order to strengthen educational management, improve learning effect, and achieve teaching objectives. Teachers can use educational AI devices to strengthen comprehensive monitoring and mastery of students' learning states, realize accurate teaching, manage and evaluate students' teaching, hand over mechanical and repetitive work to artificial intelligence devices, and communicate and answer questions with students all day. Students can improve their learning autonomy and pertinence by using artificial intelligence devices, master knowledge by using artificial intelligence learning platforms, and improve their metacognitive ability and self-management ability by using artificial intelligence devices, as well as strengthen all-around real-time communication with teachers. Artificial intelligence equipment replaces teachers in order to strengthen mechanical and repetitive work, improve the algorithm, knowledge transmission mode, and teaching management mode through big data. Teachers, students, and artificial intelligence devices must all adapt to this new system. Teachers' roles should be shifted from knowledge imparter to manager of teaching system construction. Students' roles should shift from passive learner to active learner and self-manager, and they should actively use and manage their own artificial intelligence equipment and systems. With their own technological revolution, artificial devices promote the new situation of education and teaching, from external devices to knowledge transmission carriers, communication intermediaries, intelligent management bodies, and collaborative creation bodies. See *Figure 1* for a model of the relationship between teachers, students, and artificial intelligence.



**Fig. 1.** a model of the relationship between teachers, students, and artificial intelligence

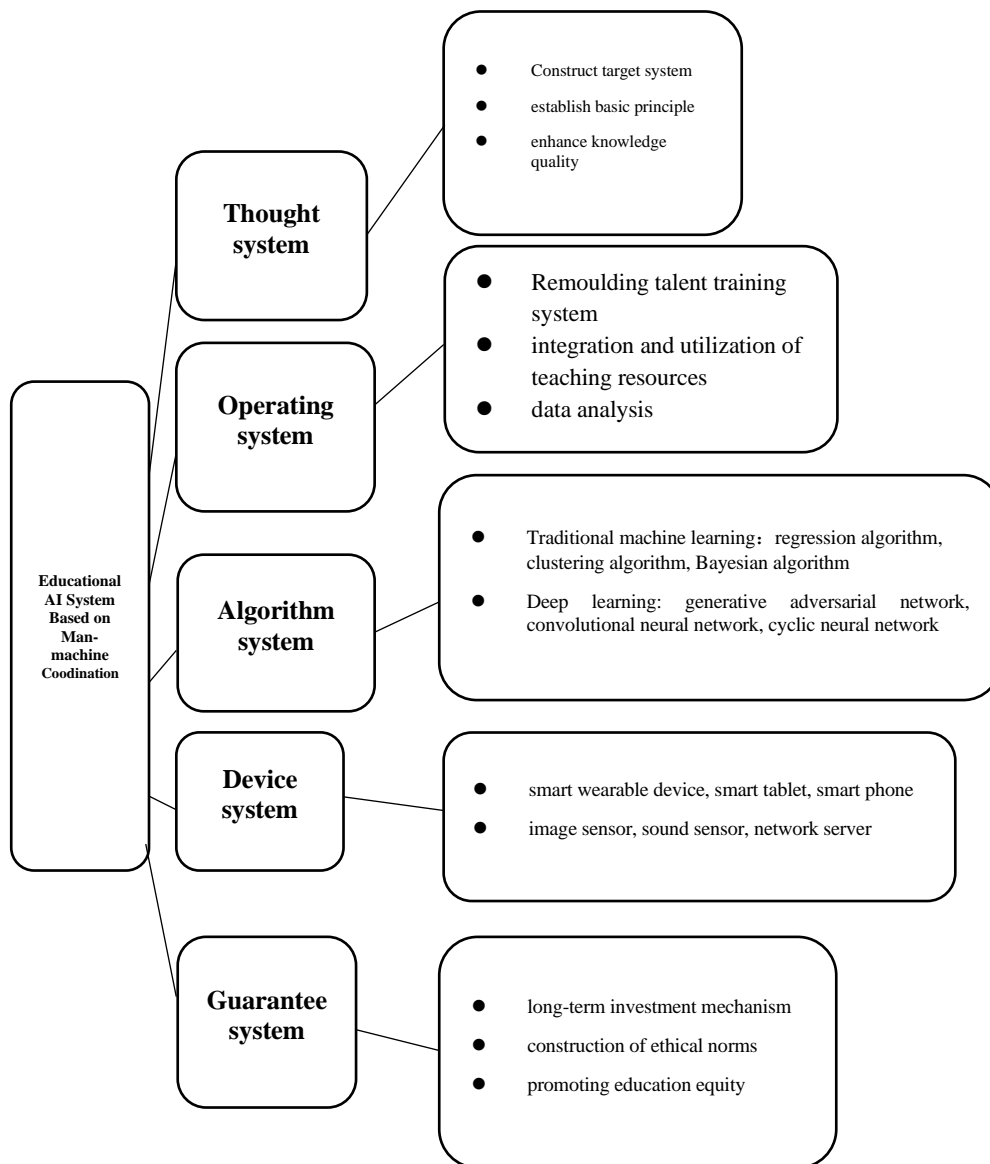
The educational AI system based on man-machine coordination represents a significant departure from the current educational model. The original teaching methods, teaching processes, and talent training mode will be profoundly changed by deep learning, intelligent images, intelligent voice, virtual/augmented reality, human-computer interaction, and other technologies. People's learning is no longer limited by time and space, and can become a topic anywhere. People can also easily and precisely obtain customized learning content to achieve lifelong learning.

However, given the current state of education in China, the development of educational AI must be improved. The limitations of artificial algorithms, low application appeal, technological development bottlenecks, and massive financial investment have all hampered the development of educational AI. According to the Blue Book of Artificial Intelligence Education in 2022 [6] jointly published by East China Normal University, China Institute of Educational Science, Tencent Research Institute, etc., more than 50% of schools have not applied artificial intelligence technology in classroom teaching, and 66% of students have never used any learning tools of artificial intelligence. The application and development of educational AI must be strengthened and promoted further, which necessitates the collaboration of the government, businesses, and schools in related fields to promote the development of educational AI systems based on man-machine coordination.

### **3 The Path of Build Educational AI System Based on Man-machine Coordination**

The development and enhancement of an educational AI system based on human-machine coordination is a lengthy process. The depth and breadth of the application of educational AI are constantly expanding, and the utilization rate of educational AI by schools, teachers, and students is constantly increasing, thanks to the government's attention and the efforts of enterprises in related fields. Man machine cooperation is not a necessary choice in the intelligent age, but a basic idea to guide man machine interaction. This thought implies the

triple meanings of security, development and innovation [7]. We can further construct and improve the educational AI system based on man-machine coordination from four dimensions: ideas, collaborative management, practical application, and support system, in light of the problems that exist in current application practice, such as backward ideas, a lack of overall planning and coordination, insufficient depth and breadth of practical application, and an imperfect support system, the structure of educational AI system based on man-machine coordination see *Figure 2*.



**Fig. 2.** The Structure of Educational AI System Based on Man-machine Coordination

### 3.1 Thought system

The educational AI system based on man-machine coordination must first be based on the recognition and understanding of educational AI technology by all participants in educational activities. Therefore, it is necessary to establish a correct understanding of the educational AI system by all participants in educational activities and deepen the reserve of relevant knowledge in the thought system.

**Establish Basic Principles.** Basic principles must be established by the designers and users of educational AI systems. The basic principles of an educational AI system based on man-machine coordination should include, but are not limited to, the following: educational AI technology should not harm the physical and mental health or any interests of participants in educational activities; educational AI technology must adhere to the correct political direction, advocate educational fairness and justice, strive to create equal opportunities for every educational participant, and abide by public order and law; and educational AI technology must adhere to the correct political direction, advocate educational fairness and justice, strive to create equal opportunities for every educational participant. Educational AI should be used in conjunction with stimulating students' learning autonomy, and it should be used gradually. These fundamental principles and frameworks must be embedded in the underlying logic framework of the educational AI system to ensure that the educational AI system's construction stays on track and avoids the problems of artificial intelligence dominating humans and students losing their learning autonomy.

**Enhance Knowledge Literacy.** All participants in the activity must improve their knowledge and literacy of educational AI technology, including basic logic, operation, and application. Specifically, educational activity organizers and managers, the majority of whom are teachers, must comprehensively improve their understanding of educational AI technology, master modern information technology theory, have certain operational ability, and be able to undertake daily management and use tasks. Educatees should also have a basic understanding of artificial intelligence technology, be able to use artificial intelligence equipment and related applications skillfully, and have the corresponding knowledge and self-control ability at various ages.

### 3.2 Practical Application

**Remodel the Talent Training System.** The core of the educational AI system based on man-machine coordination is to use artificial intelligence technology to reshape the talent training system. The current talent development system is based on the traditional education model and does not make use of artificial intelligence. As a result, beginning with the preparation of the talent training program, the use of an artificial intelligence platform to preview before class, real-time monitoring of classroom students' states, after-class assessment, and revisiting learning are all included in the talent training program. Simultaneously, student autonomy in learning is emphasized, and student autonomy in learning via the talent intelligence platform is an important component of the talent training system. The educational AI system based on man-machine coordination must also strengthen students' artificial intelligence literacy training and gradually add information literacy education in the lower grades of basic education, such as the use of smart devices, stem courses, programming, internet addiction prevention, and so on. In terms of curriculum planning, the artificial intelligence platform is used to make overall

curriculum planning and design, tailor different learning plans for each different student, give full play to different students' specialties, fully stimulate students' potential, and teach students in accordance with their aptitude.

**Integration and Utilization of Teaching Resources.** Synergistic intelligence enhancement is to emphasize that educational stakeholders and machines, together with corresponding resources and individuals, can jointly complete a task or achieve a goal in the whole process of education, so as to achieve the common development of human and computer [8]. The use of AI systems for collaborative intelligence enhancement requires the deep mining of teaching resources and materials, and the realization of deep links among educators, educates and resource stakeholders. Teachers and students are provided with rich teaching resources and materials in addition to traditional teaching resources, which not only gives teachers more options, but also fully saves teachers' time for preparing lessons, and also helps students further explore relevant curriculum topics and master more knowledge points independently. At the same time, we can use artificial intelligence to screen out high-quality teaching resources, accurately push effective teaching resources, update the most recent teaching resources in real time, and solve the pain points and difficulties of front-line teachers.

**Analysis and Application of Data.** The artificial intelligence image recognition technology analyzes the student's movement and expression, understanding the student in the classroom real-time control situation. Teachers can gain a better understanding of their students' easy to make mistakes and learning difficulties by analyzing similar mistakes made by similar students, which is more conducive to accurate teaching. Analysis and collation of data related to teachers' teaching via the artificial intelligence platform, support and assistance in carrying out teaching-related research. Furthermore, a thorough examination of various types of campus data, such as people, student activity range, classroom brightness, catering data, library use frequency, and so on, improves overall campus management. Local education departments can obtain real-time data from relevant regional schools, while national education departments can obtain real-time data from schools all over the country to sort and study the relevant data and identify practical problems and difficulties. Solving the problem through a variety of channels and methods can improve resource matching, teacher team construction, overall teaching level, and so on. As a result, it can achieve the goal of improving overall education management and effectively promoting educational development. For example, Chinese teaching guidance applications such as Yuanfudao can monitor students' real performance in real time through background data, and improve teaching quality through classroom attention assessment. We can use the back propagation algorithm of convolutional neural network for data analysis and statistics, the mathematical expression is as follows:

$$\left(\frac{\partial \mathbf{E}}{\partial \mathbf{A}}\right)_{i,j}^l = \sum_{k=1}^{K_l} \sum_{x=1}^f \sum_{y=1}^f \left[ \mathbf{w}_k^{l+1}(x,y) \left(\frac{\partial \mathbf{E}}{\partial \mathbf{A}}\right)_{s_0 i+x, s_0 j+y, k}^{l+1} \right] f'(\mathbf{A}_{i,j}^l)$$

$$\mathbf{w}^l = \mathbf{w}^{l+1} - \alpha \left(\frac{\partial \mathbf{E}}{\partial \mathbf{w}}\right)_k = \mathbf{w}^{l+1} - \alpha \left[ \mathbf{A}^{l+1} \left(\frac{\partial \mathbf{E}}{\partial \mathbf{A}}\right)_k^{l+1} \right]$$

Based on the convolutional neural network, we can use the facial features of students to conduct scene positioning and data training, further extract the facial expression features of students, and improve the decision-making effect of participation evaluation. We collected the facial micro-expression recognition data of 103 college students in two classes of a university in southern China, and calculated them using algorithms. The evaluation accuracy of the student class participation evaluation system is always higher than that of the traditional student class participation evaluation system. The experimental results are shown in Table 1.

**Tab. 1** The experimental results of the new student class participation evaluation system and Traditional student class participation evaluation system

Number of tests	The numerical value of new student class participation evaluation system	The numerical value of traditional student class participation evaluation system
1	0.931	0.792
2	0.930	0.853
3	0.954	0.843
4	0.927	0.868
5	0.893	0.844

**Development of AI Teachers.** The emphasis and difficulty of an AI-based educational system based on human-machine cooperation is the creation of learning assistants or AI teachers. There are currently educational learning assistants available on the market, such as AI instructors and ape tutors. It is difficult to call them "artificial intelligence" because their functions are relatively simple and the teaching effect needs to be improved. The indispensable component of the educational AI system based on human-machine cooperation is the auxiliary function of the learning assistant/AI teacher, which is responsible for assisting students to complete the learning content outside of the classroom, achieve the learning objective, and realize the ubiquity, intelligence, and personalization of teaching. Therefore, it is necessary to strengthen the development of hardware and software associated with this field. For example, Patikorn has described ASSISTments, a system that simulates mathematics teachers providing feedback on problem-solving clues to students. The system integrates with the mathematics learning process to provide progressive prompts for learners, which can effectively improve the efficiency of exploratory learning [9]. The AI Good Teacher, developed by the Advanced Innovation Center for Future Education at Beijing Normal University, uses natural language processing technology in the field of artificial intelligence to build a task-driven dialogue system and conduct in-depth analysis of individual students' education problems [10]. These examples demonstrate the power of AI teachers and learning assistants, and we must accelerate the development of relevant hardware and software.

### 3.4 Support System

**Construction of Long-term Investment Mechanism.** The establishment of an AI-based educational system requires substantial long-term capital expenditures. This necessitates not only the long-term support of government funds, but also a market-oriented operation that can consistently generate profits for developers in order to advance educational AI. Therefore, it is necessary to establish a long-term investment mechanism for educational AI systems so that developers who enter the market actively can survive and achieve sustainable growth. Establishing a healthy market ecology and actively constructing an educational AI industrial chain from hardware equipment, program design, network operation, and market service is required. It is necessary to exploit the innovative and pioneering role of key technologies in educational AI and to continuously shape the new kinetic energy of the industry's growth.

**Construction of Ethical Norms.** Establishing an ethical standard for an AI-based educational system is far more crucial and significant than other artificial intelligence. Education relates to the development of the next generation and is a career oriented toward the future. Educational AI must be approached with extreme caution. And the government should establish the corresponding ethical standards and evaluation criteria for educational AI. The government should take the lead in establishing review institutions, supervise every device and application throughout its entire life cycle, ensure that educational AI does not deviate from the fundamental goal of promoting human development, and prevent educational AI from becoming a destructive force in human society and a means of disseminating negative information. It is necessary to strengthen humanistic guidance and realistic care for users of educational AI, to ensure that the use time of equipment and screens does not exceed the required limit, to ensure the necessary communication time for users and educational administrators, to promptly provide feedback on inappropriate educational activities, and to promptly protect their legitimate rights and interests. Collecting the personal information of relevant participants and establishing a database is necessary for educational AI. To prevent information leakage and illegal use, the government, relevant businesses, and schools must strengthen the supervision and management of relevant information collection in accordance with applicable data laws.

### References

- [1] BAHRAMMIRZAEI A.A comparative survey of artificial intelligence applications in finance:Artificial neural networks,expert system and hybrid intelligent systems.Neural computing and applications, 2010,19(8):1165-1195.
- [2] China Government Network. A new generation of artificial intelligence development planning. July 2017.
- [3] Ministry of Education official website. Action Plan for Artificial Intelligence Innovation in Higher Education.April 2018.
- [4] Yang, Canjun, Chen, Ying. Research on human-computer integration for collaborative decision making. Systems Engineering Theory and Practice, 2000(05):24-29.
- [5] Licklider J C R.Man-Computer Symbiosis.Ire Transactions on Human Factors in Electronics, 1960, HFE-1(1):4-11.



- [6] East China Normal University, China Institute of Educational Science, Tencent Research Institute. Blue Book of Artificial Intelligence Education in 2022. March 2022.
- [7] Mao Gang, and Wang Lianghui. Man machine collaboration: a way to understand and build the future educational world. *Education Development Research* 41.01 (2021): 16-24.
- [8] Zhu Zhiting, Han Zhongmei, and Huang Changqin. Educational Artificial Intelligence (eAI): A New Paradigm of Human based Artificial Intelligence. *Audio Visual Education Research* 42.01 (2021): 5-15.
- [9] Patikorn T, Heffernan N T. Effectiveness of Crowd-Sourcing On-Demand Assistance from Teachers in Online Learning Platforms. *Seventh(2020)ACM Conference on Learning.ACM,2020.*
- [10] Penghe Chen, Yu Lu, Yan Peng, Jiefei Liu, and Qi Xu. Identification of Students' Need Deficiency Through A Dialogue System. *International Conference on Artificial Intelligence in Education (AIED), Cyberspace (online), 2020.*