Research on the Transformation of Vocational Education Talent Cultivation Empowered by Artificial Intelligence

Wang Liping, Lu Guangda, Guo Tinghang

[**Abstract**] At present, vocational education is in the flood of the rapid development of the AI era, and should explore its new way of development, but the problem of talent cultivation faced in this process is relatively prominent. The development of artificial intelligence has brought brand-new possibilities for the development of vocational education. Taking the demand of the state and society for skilled talents in the AI era as the guide, combining with the current development of intelligence and digitization, and focusing on the problems related to the cultivation of talents in vocational education, we can start from updating the goals and concepts of vocational education, constructing the AI accompanied by the vocational teaching mode, optimizing the vocational education teaching staff, remodeling the thinking mode of students, and effectively strengthening the adaptability of vocational education.

[**Key words**] artificial intelligence (AI); vocational training; cultivation of talent; vocational education; integration of industry and education

[**About the author**] Wang Liping (1997—), female, from Pingdingshan, Henan, China, affiliated with School of Automation and Electrical Engineering, Tianjin University of Technology and Education, master. Research interests: vocational and technical education. Lu Guangda (1978—), male, from Baoding, Hebei, China, vice dean and professor in School of Automation and Electrical Engineering, Tianjin University of Technology and Education. Research interests: vocational and technical education, artificial intelligence, rehabilitation robotics. Guo Tinghang (1984—), male, from Jining, Shandong, China, lecturer in School of Automation and Electrical Engineering, Tianjin University of Technology and Education. Research interests: vocational education, artificial intelligence.

[Fund] This paper is the research program on undergraduate teaching quality and teaching reform of Tianjin ordinary higher education institutions in 2023 (Project Number: B231006601).

[**DOI**] https://doi.org/10.62662/kxwxy0207006

[**Website**] www.oacj.net

1 Introduction

In recent years, artificial intelligence has swept through all walks of life with the momentum of a tornado, becoming the core technology driver leading the development of the times. The newly revised *Vocational Education Law of the People's Republic of China* in 2022 emphasizes the integration of vocational education informatization construction and intelligent technology, which fully demonstrates that the talent cultivation and teaching mode of vocational education are being pulled and even reconstructed by artificial intelligence technology. Vocational education, as the type of education with the highest intimacy between the education field and the frontline field of industry, bears the important responsibility of cultivating high-quality technical and skilled talents for the country. Therefore, it is necessary to accelerate the reconstruction of the teaching mode of vocational education and the change of talent cultivation mode, seize the opportunity of the fifth industrial revolution, deeply excavate the value connotation of artificial intelligence to vocational education, and promote the high-quality development and change of vocational education in the era of artificial intelligence.

2 The value of artificial intelligence enabling change in vocational education

2.1 Firmly adhere to the positioning of vocational education and reshape the paradigm of ability cultivation in the age of intelligence

Vocational education, as a unique type of education, centers on the training of workers with technical application skills and vocational adaptability. *The White Paper on the Development of Vocational Education in China* (2023) shows that China's vocational education delivers 10 million technical and skilled talents to society every year, supporting the economic chassis where the added value of the manufacturing industry accounts for 27.4% of the GDP, and that this essential attribute requires that vocational education must adhere to the two major principles of employment-orientation and integration of industry and education. The distinguishing features of the AI era are the intelligence of tools, the intelligence of activities, and the platformization of collaborative relationships. These characteristics have fundamentally triggered the structural upgrade of skills demand—from single operation to the synergistic development of man-machine. Vocational education should anchor on the distinctive features of the changes in the world of work on the basis of adhering to the essential orientation, analyze in depth the technical skills that are compatible with the future world of work, so as to reshape the teaching mode of vocational education in all aspects, achieve the organic and dynamic coupling of vocational education and the world of work, and help students precisely master the composite skills that are compatible with the requirements of the future world of work, so as to enable them to have a sustainable development in their careers.

2.2 Adhere to the people-centered view of education and create a benign interaction of "individual—AI—vocational education"

With the opening of the artificial intelligence era, the popularity of AI technology has caused the trapping and alienation of teacher-student interactions, mainly stemming from the current cult of AI technology and technology abuse. Teacher-student interaction is gradually instrumentalized and materialized, and reduced to an accessory of AI technology, which is also true in the field of vocational education. Therefore, in the era of artificial intelligence, the key to avoid vocational education losing its way lies in adhering to the essence of vocational education and constructing a humanistic and life-oriented view in the perspective of educational technology. Vocational education should be based on its nature and the inherent development law, in-depth exploration of the value of artificial intelligence, there is an urgent need to re-examine the interrelationship between individuals, AI and vocational education. It is urgent to re-examine the interrelationship between individuals, AI and vocational education, and to build a positive interaction between individuals, AI and vocational education for synergistic development. "Technology is an extension of human", AI in vocational education should be developed towards human-machine integration. Two-way information interaction is established between people and machines, people start to consciously think about the tasks they usually perform unconsciously, and machines deal with the personalized habits and preferences of the collaborators, and led by the humanistic concept, promote the in-depth integration of the two and synergistic development, so as to realize the harmonious coexistence of individual-AI-vocational education, innovate the mode and connotation of vocational education in all aspects, and provide adherence support to the sustained development of vocational education.

2.3 Hold on to the anchor of educational equity against the digital divide in the age of artificial intelligence

In December 2024, the China Academy of Information and Communication Research released the *Report on the Development of Artificial Intelligence* (2024), which showed that global artificial intelligence maintains a high rate of growth, and the data showed that the global artificial intelligence industry maintains a high rate of growth. However, the report on the digital development of vocational education published in 2024 shows (as shown in

Figure 1) that the imbalance in digital development between secondary and tertiary education and between different regions still exists. It can be seen that the digital reform of vocational education has not been more modernized with the blowout of artificial intelligence, and the education gap in various regions has not been narrowed. On the contrary, because of the different degrees of socio-economic development among the regions of China, there is a large gap in the digital teaching basis of vocational education, and the backward regions are unable to enjoy timely access to high-quality vocational education resources and educational opportunities, forming a disconnect phenomenon between vocational education and intelligence era. Therefore, in the age of intelligence, we should always uphold the core concept of educational equity, steadily promote the construction of digital infrastructure, gradually eliminate the gap between different regions and groups in terms of digital learning environments and hardware facilities, and realize the sharing and balanced allocation of high-quality vocational education resources in order to resist the digital divide in the age of artificial intelligence.

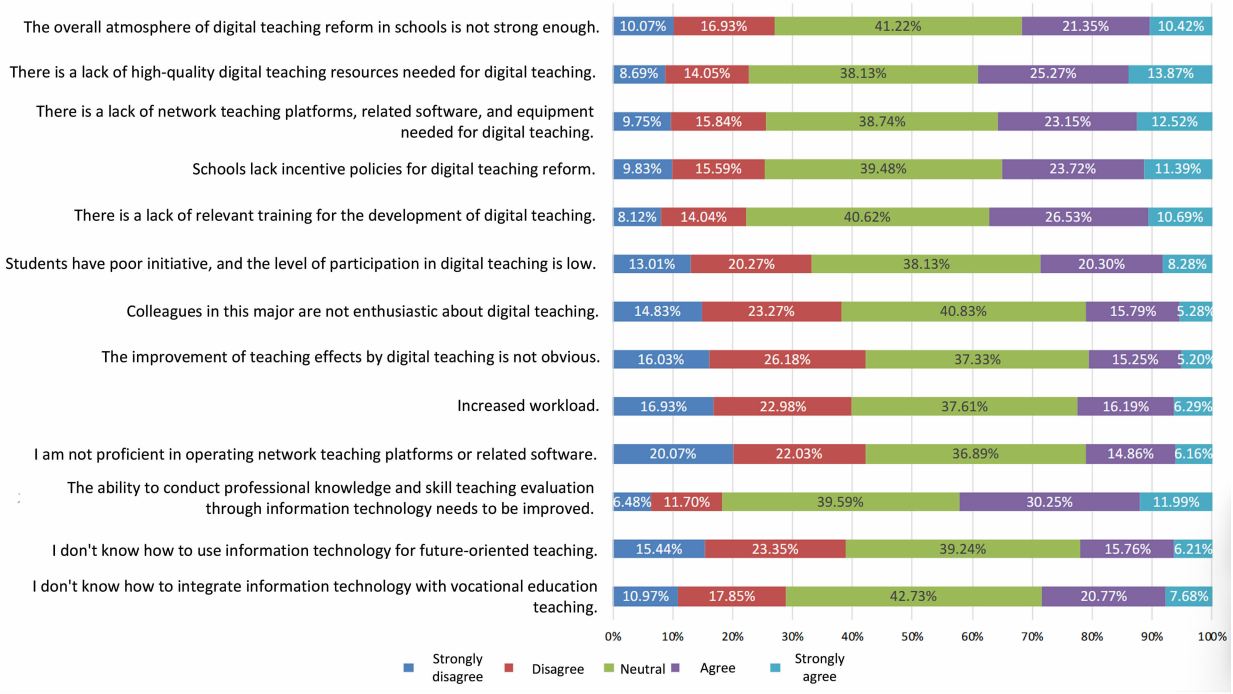

Figure 1. Influencing factors of IT teaching and learning application in vocational colleges and universities

3 Opportunities for artificial intelligence technology to drive change in vocational education

3.1 Innovative teaching methods in vocational education

The in-depth integration of artificial intelligence technology and vocational education teaching methods promotes the development of teaching methods towards intelligence and digitalization. First, artificial intelligence technology can realize digital intelligent teaching platform and online teaching tools. Artificial intelligence technology is integrated into classroom teaching, develops multimodal teaching methods based on computer vision, builds intelligent learning scenarios, realizes online and offline immersive teaching, presents students with rich and vivid teaching content, forms a close connection between pre-course, in-course and post-course, creates a modern intelligent classroom, and fosters students' innovative thinking, providingall-round and multi-dimensional three-dimensional intelligent teaching support for vocational education. Secondly, artificial intelligence technology provides an intelligent analysis and evaluation system. It collects data on students' classroom learning activities online, analyzes it, and records current stage information. This enables the system to provide students with personalized learning paths tailored to their individual characteristics and offer teachers more customized teaching

plans, thereby enhancing the quality of classroom instruction. Based on computer vision technology, behavioral analysis techniques are developed to establish a three-dimensional feature information model of students. By analyzing the behavioral states students may exhibit during learning—such as sitting upright when concentrating, leaning back when slightly fatigued, or resting their head on the desk when extremely tired—the system uses three-dimensional basic probability assignment methods to determine students' learning behaviors (as shown in Figure 2).

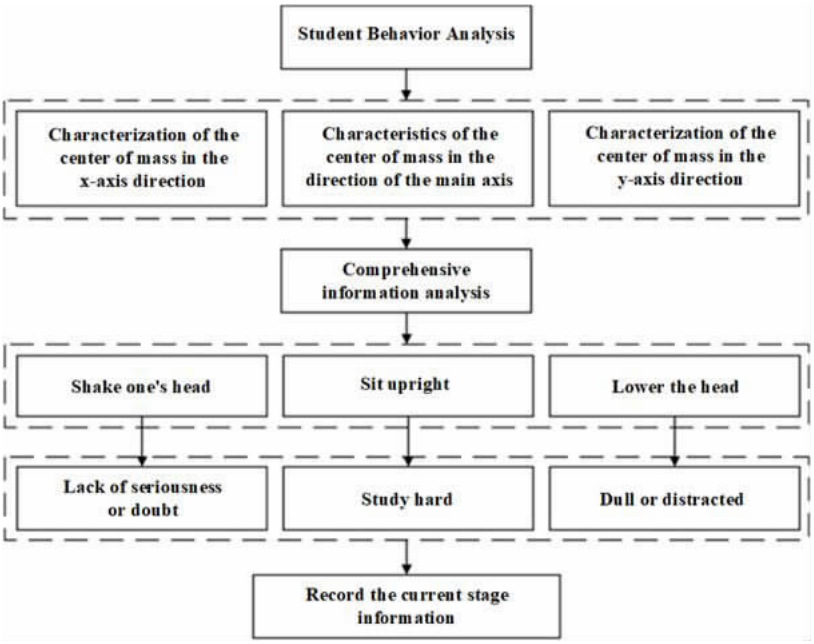

Figure 2. Analysis flow of students' learning behaviors

3.2 Promoting diversity in vocational education and employment

New technologies represented by artificial intelligence are driving the rapid development of China's economy, and the accompanying socio-economy is booming. First, AI technology promotes the upgrading of traditional sectors and industries, as well as the birth and development of new industries. The upgrading of productivity and the substitution effect generated by the development of AI technology have led to changes in the demand for skills in society. It will also create a large number of complex skills and support staff jobs. A new type of labor market with polarized skills will be formed, deriving and creating new jobs, thus expanding more diversified forms of employment. Second, artificial intelligence technology promotes industrial upgrading and cross-border integration. The technological progress of the position of the mandatory requirements more and more obvious, employment positions according to the skill level from "high-medium-low" skill level, to "high-low" type skill level evolution, and vocational education, as the closest link with the industry, industry and the pedagogical categories. Vocational education, as the educational discipline with the closest link to industry, can cultivate complex technical and skilled personnel to meet the demand of the current skill level, thus promoting the diversification of employment in vocational education. From a philosophical point of view, the logical relationship between technological progress and employment is as follows: Technological progress—substitution effect—change in skill demand level—expansion of employment space.

3.3 Expanding the audience reach of vocational education

As the scope of application of artificial intelligence further expands (as shown in Figure 3), the advanced technology it spawns promotes the level of socio-economic development by improving the vocational skill level of workers. Firstly, the popularization of AI gives the audience group more opportunities to receive vocational education. The shift in the type of social demand for skills has led to the willingness of more workers to upgrade

their vocational skill levels, to receive specialized vocational education through AI, to enhance the competitiveness of vocationally skilled workers in the job market, and to expand the coverage of vocational education. Secondly, AI provides accurate matching of supply and demand by analyzing regional industrial data and learner profiles (skill gaps, career inclinations, etc.). From there, it builds a dynamic course recommendation system and generates customized teaching programs based on machine learning algorithms. The era of artificial intelligence promotes the inclusive development of vocational education, relying on low-cost, personalized learning paths constructed by AI and Internet technology, which provides new ways for laborers to improve their skills and career transformation, effectively broadening employment channels and adapting to the needs of jobs in the new era.

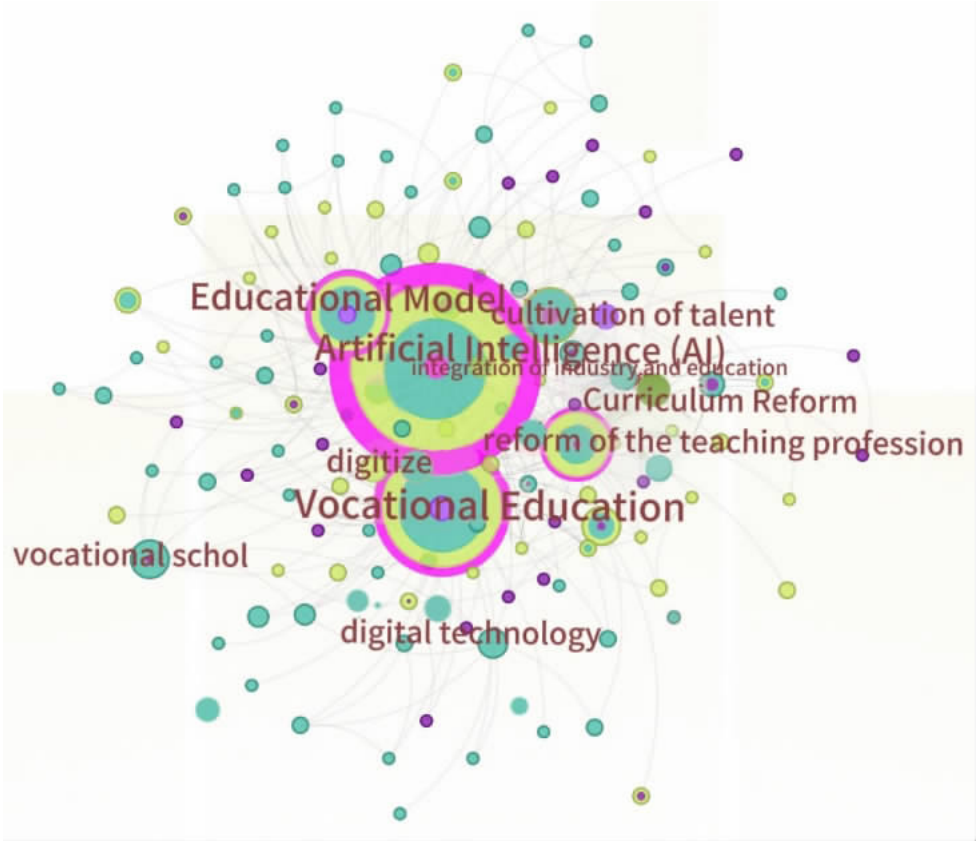

Figure 3. Artificial intelligence, vocational education keywords co-occurrence network mapping

4 Transformation path of artificial intelligence-enabled vocational education

4.1 Updating the goals and concepts of vocational education and promoting the deep integration of education and artificial intelligence

The era of artificial intelligence drives the transformation of vocational education to the model of dual integration of digital intelligence and craftsmanship. Vocational colleges and universities should build a talent training system that takes into account the types of talents demanded by industries and society in the era of artificial intelligence. Firstly, the cultivation goal of vocational education should be anchored in the strategic needs of the country, take serving the social and economic development as the root of vocational education, be based on the demand for talents in the digital era, docking with the needs of cutting-edge technology and industrial upgrading, and build a customized talent cultivation path. The second is to update the concept of vocational education, with the service of "new industries" as the main focus, focusing on national strategic new industries. In 2021, the Ministry of Education issued the *Catalogue of Vocational Education Professions* (2021), which emphasizes that higher vocational schools can independently set up and adjust higher vocational professions in accordance with the

requirements of relevant regulations, and can independently demonstrate the setting up of professional directions. The catalogue aims to serve as a policy guide for the professional setting of vocational colleges and universities, giving schools the right to be able to adjust their majors according to their own characteristics and the development trend of new industries and trades, optimizing the positioning of talent training through new or adjusted professional settings, and satisfying the synergistic development of vocational education and industries and trades in the era of artificial intelligence.

4.2 Constructing an innovative teaching model for vocational education and reaching a deep collaborative cooperation between man and machine

AI technology boosts the comprehensive innovation of vocational education. Firstly, through the construction of virtual and real integration of immersive intelligent teaching space, the teacher teaching can break through the physical and virtual boundaries, to achieve cross-school, cross-regional collaboration, the use of AR technology and VR technology to develop an online, virtual, and intelligent teaching practice platform, dynamic docking the needs of the new production model, so that students can master knowledge that can match the new production model in a timely manner and accurately match the needs of enterprises. Secondly, digital teaching resources are actively developed to support a more flexible and personalized learning experience. Artificial intelligence technology is used to meet the personalized needs of educated people according to their learning foundation, knowledge structure, learning motivation, cognitive structure, learning habits, etc. Access to individual relative teaching resources and development of customized teaching plans for personalized vocational education.

4.3 Optimizing vocational education teachers and tapping into the new meaning of education in the age of intelligence

Vocational education teachers are the core of vocational education. Against the background of AI era, vocational education teachers face the double challenge of insufficient quality and quantity. The state issued the *Reform Implementation Program on Deepening the Vocational Education "Double Teacher" Teacher Team Construction in the New Era* in October 2019, emphasizing the creation of a high-level structural teacher teaching innovation team. To address these issues, the first is to build a system of vocational education teachers, improve the policy of introducing highly educated and highly skilled people, improve the closed-loop mechanism of "introduction, education and evaluation", realize the integrated training of pre-vocational and post-vocational training, attract more highly educated graduates from colleges and universities to teach in schools, and systematically improve the academic structure of the teaching staff and the degree of appropriateness of the industry and industry. Secondly, a dynamic updating mechanism for teachers in the integration of production and education has been constructed. Supporting a group of "migratory bird-type" high-skilled personnel in key enterprises, implementing a school-enterprise rotation system, and realizing the simultaneous upgrading of technological iteration and teaching capacity, Establishment of a tiered and categorized training system and improvement of the academic qualification upgrading program for teachers in schools. Talent training is carried out in accordance with the requirements of "dual-teacher" teachers, and individualized training programs are formulated for teachers, aiming to make up for the deficiencies of different types of in-service teachers in terms of professional knowledge, practical skills, teaching skills, and ability to educate people, soas to realize a closed-loop design for the enhancement of the competence of vocational education teachers.

4.4 Reshaping students' cognitive thinking patterns and developing new approaches to learning in vocational education

Driven by AI technology, the cognitive paradigm of vocational education students urgently needs profound transformation. Through personalized learning path planning, flexible resource allocation, and support for autonomous learning decisions, the cognitive process can be transformed into a non-linear adaptive learning

process, thereby reshaping thinking and cognitive patterns and opening up new ways of learning. Deep learning, as the core technology of the AI era, is generally based on neural networks and uses multi-level nonlinear transformations to model and learn data. This includes Artificial Neural Network (ANN), which forms the foundation of deep learning. ANN consists of neurons, each of which has multiple inputs and one output. Vocational education covers a wide range of professional categories, with significant differences in the knowledge and skill pathways across different fields. Therefore, we should deeply analyze the core pathways of students' cognitive thinking in the era of artificial intelligence, enabling it to deeply empower the cultivation of students' innovative cognitive thinking. In addition, we should enable students to fully utilize artificial intelligence technologies (such as ChatGPT and DeepSeek), enabling them to conduct independent learning using artificial intelligence technologies. Specifically, this manifests as: first, the ability to efficiently search for and integrate information; second, multi-round interactive dialogue and role-playing interaction; third, evaluation and feedback; and fourth, generation and creation.

Artificial intelligence has strongly promoted the innovation of learning mode, giving rise to innovative modes such as deep learning, distributed learning, ubiquitous learning, etc., which can help learners independently select learning content, plan the learning process, and choose learning modes based on their unique learning characteristics, thus reshaping the cognitive mode of thinking, and at the same time, obtaining high-quality learning resources based on the strong support of data resources, and opening up new ways of vocational education and learning.

5 Conclusion

Today's society is undergoing profound changes unseen in a century. Not only does it require a large number of top-notch innovative talents to overcome "bottleneck" technologies, but it also needs hundreds of millions of high-quality applied talents. As an important channel for cultivating applied talents, vocational education is particularly important in the current era of rapid development of artificial intelligence and digitalization.

References:

[1] Ministry of Education: New *Vocational Education Law* Will Open up Upward Mobility for VET Students [EB/OL]. http://www.moe.gov.cn/fbh/live/2022/54414/mtbd/202204/t20220428_623062.html, 2024-3-25.

[2] Li Donghai, Liu Xing, Wang Peng. The Value, Challenges and Innovative Paths of Artificial Intelligence Enabling High-quality Development of Vocational Education[J]. Education and Vocation, 2023(4): 13-20.

[3] Shen Xiaojuan, Sun Na. Typological Development of Vocational Education: Connotation, Dilemma and Promotion Strategy[J/OL]. Journal of Shanghai University of Technology (Social Science Edition), 2025-4-17.

[4] *Report on the Development of Vocational Education in China* Released[EB/OL]. https://www.chinazy.org/info/1006/18643.htm, 2025-4-17.

[5] Shi Wenping, Lin Yurong. Changes in Talent Training Mode of Vocational Education in the Era of New Technology[J]. China Electrification Education, 2021(1): 34-40.

[6] Xu Ziyan, Shi Zhongying. Truth Issues and Educational Responsibility in the Age of Artificial Intelligence [J]. Educational Research, 2024, 45(10): 26-37.

[7] Amu Guleng, Dong Qinqin. High-quality Development of Higher Vocational Education: Connotation, Value Interpretation and Practical Progress[J]. Educational Theory and Practice, 2023, 43(33): 16-21.

[8] Liu Wei, Tan Wenzhi. Teacher-student Interaction in the Age of Artificial Intelligence: Difficulties and Breakthroughs[J]. Open Education Research, 2022, 28(2): 54-63.

[9] China Academy of Information and Communication Research. Blue Book[EB/OL]. https://www.caict.ac.cn/kxyj/qwfb/bps/202412/t20241210_647283.htm, 2025-1-13.

[10] Vocational Education Digital Development Report (2023 Edition) Graphic Interpretation Version[EB/OL]. https://xxhjzw.ccit.js.cn/info/1059/1133.htm, 2025-1-12.

[11] Guo Da, Yin Chenxi. Fundamental Transformation of Vocational Education Talent Cultivation under the Triple Substitution Effect of Skill-Task-Occupation of Artificial Intelligence[J]. Education and Vocation, 2024(6): 54-61.

[12] Guo Tinghang, Lu Guangda, Han Yu. Exploring the Connotation of Vocational Education Teachers and Talent Cultivation Mode under the Background of Artificial Intelligence[J]. Vocational Education Research, 2022(2): 67-72.

[13] Cheng Chengping, Peng Huan. The Mechanism of Artificial Intelligence Affecting Employment and China's Countermeasures[J]. China Soft Science, 2018(10): 62-70.

[14] Li Kexin, Yu Qi. Research on the Construction of Intelligent Learning Space for Meta-universe-enabled Vocational Education[J]. Vocational Education Research, 2024(5): 12-18.

[15] Zeng Guang, Li Xinhua. Technical Characterization, Internal Mechanism and Innovative Path of Classroom Teaching Reform in Vocational Education Empowered by Intelligent Technology[J]. Education and Vocation, 2023(13): 84-89.

[16] Vocational Education Channel[EB/OL]. https://zhijiao.eol.cn/2022/07/20/9917959.html, 2024-1-11.

[17] Chang Xiaoyong. The Construction of "Dual-teacher" Teachers in Vocational Colleges and Universities in the Context of High-quality Development: Progress, Dilemmas and Breakthrough Paths[J]. Vocational and Technical Education, 2024, 45(7): 58-64.

[18] Wang Hui. Research on the Construction of Collaborative Cultivation Mode of "Dual-teacher" Teachers in Higher Vocational Colleges under the Background of High-quality Development[J]. Vocational and Technical Education, 2023, 44(36): 50-54.

[19] Dong Yan, Chen Hui. Generative Artificial Intelligence Enabling Interdisciplinary Innovative Thinking Cultivation: Intrinsic Mechanism and Mode Construction[J]. Modern Educational Technology, 2024, 34(4): 5-15.