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Application, Challenges and Strategies of Pedagogical Agent in Primary School Information Technology Teaching

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Abstract: With the deep integration of AI and education, the Pedagogical Agent in primary school information technology teaching has become a future development trend. By playing the three roles of subject experts, teacher assistants and learning peers, the Pedagogical Agent shows its unique value in supporting deep learning, realizing accurate teaching, deepening understanding and thinking development. However, in practical application, it still faces multiple challenges such as insufficient adaptation of personalized dialogue, deviation of teacher role positioning, lack of basic resources and teacher literacy, and ethical and security risks. In order to deal with these problems, the article puts forward strategies such as optimizing the dialogue algorithm, clarifying the main position of teachers in education, improving resource allocation and teacher training, and improving the ethical prevention and control system, aiming to promote the effective integration of Pedagogical Agent and primary school information technology teaching, and help the high-quality development of education.

Keywords: Pedagogical Agent; Primary School Information Technology; Human-computer Collaboration.

1. Introduction

At present, we are in an era where digital technology has profoundly transformed society. Since 2018, China has successively released the Education Informatization 2.0 Action Plan, China's Education Modernization 2035 and other documents to clearly promote the deep integration of artificial intelligence and education[1]. With the promulgation and implementation of the Compulsory Education Information Technology Curriculum Standards (2022 Edition), primary school information technology teaching has officially entered a new stage oriented by the cultivation of core literacy. The curriculum emphasizes the cultivation of students' information awareness, computational thinking, digital learning and information innovation capabilities through problem solving in real situations. And social responsibility for information. The improvement of this goal puts forward higher requirements for teaching methods and tools. With the rapid development of science and technology, artificial intelligence has given rise to Pedagogical Agent with independent perception, decision-making and interaction capabilities in the field of education. Its unique advantages in personalized services, situational creation, resource integration, etc. form a natural fit with the educational needs of primary school information technology teaching. The application of Pedagogical Agent in the teaching of information technology in primary schools has become a trend of the times.

Pedagogical Agent (PA), also known as teaching agent, presents the characteristics of dynamic perception, autonomous decision-making and continuous evolution under the drive of large models and other technologies, and has the new potential of empowering role-playing, human-computer collaboration and intelligent symbiosis[2]. Pedagogical Agent is an intelligent program that integrates specific educational functions. It can integrate the learning environment, analyze the status of students, and help teachers teach better through dialogue with students, assigning tasks to guide students, and process evaluation. There are abstract knowledge points in primary school information technology, which are not conducive to the cognitive development of primary school students who focus on image thinking. Pedagogical Agent can transform abstract concepts in information technology into interactive exploration processes to help students better understand abstract knowledge points. In the process of teaching information technology in primary schools, there are a large number of repeated mechanized exercises, which will wear out the patience of primary school students and reduce their learning motivation. Pedagogical Agent can transform mechanical exercises into interesting challenges, stimulate primary school students' interest in learning, and improve primary school students' learning motivation. In traditional large-class teaching, teachers face a large number of students who may not be able to take into account each student, but the Pedagogical Agent can assist students in learning one-on-one, providing new possibilities for students' personalized learning and teachers' precise tutoring. In primary school information technology, which is a curriculum with both knowledge, skill and thinking, Pedagogical Agent shows its unique application potential.

At present, many places in China have initially applied the Pedagogical Agent to the daily teaching of schools, such as the "Ren Xiaoshi" intelligence body of the experimental primary school affiliated to Renmin University of China. It can be seen that the use of Pedagogical Agent is the trend in the field of education in the future. In the teaching of information technology in primary schools, the Pedagogical Agent is more suitable for the three roles of experts, teacher assistants and learning peers, and can give full play to its functions to help students learn better. However, under the influence of multiple factors such as technology, teachers, security and ethics, it faces a series of challenges. In response to these challenges, this paper puts forward four coping strategies: optimizing the adaptation of dialogue algorithms, clarifying the role positioning of teachers, improving the allocation of basic resources, and improving the ethical

prevention and control system. Managers, implementers and recipients of primary school information technology education should not only face and be wary of the hidden crises and risks behind technological progress, but also take active and effective countermeasures to prevent and resolve them, so that the Pedagogical Agent can better promote the high-quality development of primary school information technology education.

2. Application of Pedagogical Agent in information technology teaching in primary schools

The essence of Pedagogical Agent is a kind of role embedded in teaching scenarios and integrating artificial intelligence technology, which can provide personalized feedback and interactive support based on learners' cognitive characteristics and learning styles[3]. At the beginning, the Pedagogical Agent was an exclusive auxiliary teacher for students, but over time, the application of the Pedagogical Agent has slowly developed from the original role of teachers who talk to students to more roles. Lu Guoqing and others divide the roles of Pedagogical Agent into experts, motivators, mentors, teaching assistants and companions[2]. In primary school information technology teaching, the most suitable and common roles of Pedagogical Agent are experts, teaching assistants and learning peers.

(1) Pedagogical Agent supports the in-depth learning of teachers and students as experts in the field of disciplines.

As an Pedagogical Agent of experts in the field of disciplines, the core is to provide accurate and systematic knowledge support for the teaching of information technology in primary schools, and help teachers and students break through the learning bottleneck and realize deep learning. With the gradual deepening of educational reform, in-depth learning is very important in cultivating students' core literacy. Therefore, how to enable primary school students to explore a knowledge point and explore in-depth learning in the information technology classroom is of great significance to improve the quality of teaching and promote the comprehensive development of students. Deep learning is also a new requirement for primary school students in the new era[4]. In traditional teaching, teachers, as the main teachers of knowledge, may not be able to keep up with the learning in time when facing the rapidly changing information technology information. With its integrated huge knowledge base and real-time information processing ability, the Pedagogical Agent can update resources and content in a timely manner. When teachers have doubts about knowledge points, Pedagogical Agent can provide professional answers to help teachers better adapt to the trend of the times. For teachers, the Pedagogical Agent is also a powerful course preparation and teaching and research partner, which can help teachers quickly clarify the teaching vein of complex concepts and obtain diversified teaching perspectives, so as to enrich teachers' own knowledge system and empower teachers to carry out more in-depth and broad teaching design.

In primary school information technology teaching, students will be exposed to many technical concepts that are close to life but have complex principles, such as simple encryption principles, the basic process of face recognition or the preliminary concept of the Internet of Things. These contents are very interesting for primary school students. Many primary school students want to discover an interesting knowledge point and continue to study in depth. In traditional teaching, teachers may not be able to take into account every student who wants to learn deeply, resulting in students' inability to study in depth. At this time, the Pedagogical Agent can play the role of a student's exclusive technical expert. For example, when students are curious about learning information encryption, the Pedagogical Agent can instantly call its knowledge base to explain the huge possibility space and the difficulty of violent cracking in metaphors and animation demonstrations, so as to give them a scientific explanation in line with the cognitive level while protecting students' curiosity; when in the project In learning, when the student group designs an intelligent campus plan, the Pedagogical Agent can act as a program consultant, provide structured professional opinions on the ideas put forward by students in terms of technical feasibility, implementation logic and even potential problems, and guide students from creative rudiment to more rigorous program design.

The role of expert assumed by the Pedagogical Agent breaks through the limitations of teachers as a single knowledge authority in the traditional classroom and shares the teaching pressure of teachers. At the same time, it provides students with an exclusive expert who can consult anytime and anywhere, with a huge knowledge reserve and patience. It can not only respond immediately to those who are empty but also extremely valuable. Value problems, protect and develop students' desire to explore, cultivate students' rigorous and realistic scientific attitude through highly reliable information feedback, and assist teachers to jointly build a learning environment with more depth and breadth of exploration.

(2) Pedagogical Agent as a teacher assistant to help teachers achieve accurate teaching

As a teacher assistant, the Pedagogical Agent mainly undertakes auxiliary teaching work to help teachers reduce the teaching burden, focus on the core of teaching, and achieve accurate teaching. In the pre-class preparation stage, the intelligent body can assist teachers to sort out teaching goals, sort out teaching resources, design teaching links, and optimize the teaching plan in combination with the overall learning level of the students in the class, so as to make the teaching plan more targeted. In the classroom, the intelligent body can pay attention to the learning status of each student in real time, record students' classroom performance, answers and knowledge mastery, quickly collect teaching feedback data, and provide a basis for teachers to adjust the teaching rhythm and teaching methods in time. After class, the intelligent body can assist teachers in correcting homework, counting wrong questions, accurately locate the common knowledge weaknesses of class students and the learning problems of individual students, and generate detailed learning analysis reports. Based on these data, teachers can clearly understand the learning differences of different students, formulate personalized tutoring plans for students with learning difficulties, and make up for knowledge gaps in time; provide appropriate expansion tasks for excellent students to meet their learning needs. At the same time, the intelligent body can also assist teachers to complete the establishment and update of students' learning files, track the long-term learning progress of students, make teachers' teaching guidance more scientific and accurate, and effectively improve teaching efficiency and quality. More importantly, when intelligent bodies can help teachers free themselves from a lot of repetitive labor and devote more

energy to higher-value teaching activities. Teachers can focus more on designing complex project-based learning tasks, organize effective group collaboration and discussion, pay attention to students' communication, critical thinking and other comprehensive abilities in cooperation, and provide personalized guidance on students' learning methods and scientific and technological ethics.

The role of teacher assistant assumed by the Pedagogical Agent breaks through the limitations of one-sided data collection and learning situation judgment relying on experience in traditional teaching, shares the burden of teachers in process monitoring and data analysis, and provides teachers with an objective and continuous way to record students' learning process. It can not only transform student behavior in classroom teaching and after-class practice into an interpretable and operational teaching basis, and assist teachers from empirical decision-making to evidence-driven professional judgment, but also make talent-based teaching in large-scale classes feasible through automated resource organization and personalized task push, so as to Auxiliary teachers will focus more on teaching design and teacher-student interaction, and jointly promote teaching practice to a more accurate and humane new stage.

(3) Pedagogical Agent as a learning companion to deepen students' understanding and thinking development

As a patient and always online learning companion, the Pedagogical Agent can have continuous interaction with students one-on-one or in groups. Learning is not only the acquisition of knowledge, but also the process of thinking construction and social interaction. In the field of education, feedback intervention theory has important application value. Teachers and learning peers can purposefully give students external feedback to awaken students' inner metacognition and promote their internal self-feedback, thus affecting learning decision-making and improving learning performance [5]. As a learning companion, the Pedagogical Agent participates in the learning process of students with an equal interactive attitude, guides students to take the initiative to think through personalized interaction, constantly gives students positive verbal affirmation, enhances students' interest in independent learning, helps students deepen their understanding of knowledge, and promotes the development of thinking ability.

For students, Pedagogical Agent is a learning partner at any time. Pedagogical Agent can play an important role in understanding abstract concepts. For example: when students learn the sequential structure in the algorithm, the intelligent body can guide students to discover the rules independently by creating life-oriented dialogue situations and step-by-step questions, instead of directly informing the definition. It allows students to build a concrete cognition of the process and sequence in thinking; when students practice skills, such as graphical Programming or word processing, the intelligent body can provide personalized challenges or support according to the students' real-time operation performance; when students make repeated mistakes, it can locate specific thinking jams, provide tips for decomposition steps, and encourage debugging. This kind of instant, specific and pointing feedback to the thinking process is difficult for teachers to give to every student in real time in the traditional classroom.

The role of learning peers assumed by the Pedagogical Agent breaks through the limitations of lagging practice feedback and insufficient personality interaction in traditional teaching, sharing the cognitive load of students in independent exploration, and providing each student with a thinking partner who can talk at their own pace and always maintain a positive response. It can not only provide immediate and specific guidance for students as'st every step of the trial and error, and protect and develop students' self-confidence and resilience in problem-solving, but also guide students to develop the habit of orderly thinking and step-by-step verification through continuous logical questioning and step-step prompts, and complement each other with teacher-led teaching activities. Benefit, and jointly create a learning ecology that supports in-depth thinking and independent construction.

3. Challenges faced by Pedagogical Agent in primary school information technology teaching

Although the Pedagogical Agent has brought many opportunities to the teaching of information technology in primary schools, in practical application, it faces a series of challenges under the influence of multiple factors such as technology, teachers, security and ethics, which not only restrict the full play of the value of technology education, but also may cause new educational problems.

(1) Insufficient adaptation of personalized dialogue, limited interaction efficiency

When carrying out personalized dialogue, the Pedagogical Agent has obvious adaptation limitations, and it is difficult to fully meet the cognitive characteristics and learning needs of primary school students. The expression ability of primary school students is uneven, and some students' language logic is loose and the expression is incomplete. Intelligent bodies often find it difficult to accurately capture their real learning confusion, and it is easy to answer wrong questions. At the same time, the learning interests and thinking directions of primary school students have strong randomness, but the dialogue design of Pedagogical Agent is mostly based on preset algorithms, which cannot flexibly follow up students' sudden ideas or questions, and it is difficult to achieve real personalized guidance. In addition, the dialogue style of the intelligent body is relatively fixed, and it is difficult to adjust the communication method according to the characteristics of students with different personalities. For students who are introverted and timid, trust cannot be established through empathetic interaction, which makes such students unwilling to take the initiative to participate in the dialogue, thus reducing the actual effectiveness of the interaction and unable to give full play to intelligence. The role of body-assisted learning.

Learning in primary school is not only the transmission of knowledge, but also the cultivation of emotions and ways of thinking. At present, it is difficult for the intelligent body to accurately identify the emotional state of confusion, discouragement or excitement revealed by students in questions or exercises, so it cannot give the right emotional encouragement or mental guidance like teachers. This kind of personalized teaching, which lacks emotional temperature and in-depth cognitive interaction, is actually still a variant of standardized response. It is difficult to achieve real talent-based teaching, which may make some students' learning needs still not be met in front of technical tools.

(2) The bias of the role positioning of teachers and the weakening of the subjectivity of education

The introduction of Pedagogical Agent aims to help teachers teach better, not to replace teachers. However, in the process of practice, if the application concept and training guidance are not in place, it is very easy to lead to the alienation of teacher roles. In the process of applying the Pedagogical Agent, some teachers are prone to role cognitive deviations, transforming from the core education subject to the supervisor of technology use, and gradually losing the subjectivity of education. Some teachers rely too much on the auxiliary functions of the intelligent body, leaving too much of the core teaching links such as classroom management, homework correction and knowledge explanation to the intelligent body. They are only responsible for supervising whether students use the intelligent body and complete the tasks assigned by the intelligent body, ignoring the real-time attention, emotional guidance and Value shaping.

This inappropriate application makes teachers subordinate to technology. It is difficult to adjust teaching strategies in time according to students' classroom reactions. It is impossible to keenly capture students' emotional changes and psychological needs, which weakens the leading role of teachers in teaching and the value of educating people. At the same time, over-reliance on intelligent bodies will also lead to less interaction between teachers and students, which will destroy the humanistic atmosphere in classroom teaching and go against the original intention of education.

(3) Insufficient basic resources and teacher literacy, low application rate

The effective application and in-depth integration of Pedagogical Agent put forward high requirements for the school's information infrastructure and teachers' digital literacy. The limited resources of school infrastructure construction and the lack of relevant literacy of teachers are important factors that restrict the popularization and application of Pedagogical Agent in primary school information technology teaching. In terms of basic resources, some schools, especially rural or weak schools, lack the network environment and terminal equipment to support the stable operation of intelligent bodies. Some equipment configurations are outdated and cannot adapt to the functional needs of intelligent bodies, which makes it difficult for intelligent bodies to be put into normal teaching and use. At the same time, some schools lack targeted teaching resource libraries, and the adaptability of intelligent bodies to existing teaching materials and teaching progress is not high, which further reduces its application value.

In terms of teachers' literacy, some information technology teachers do not have a comprehensive understanding of the functions of intelligent bodies. They only master the basic operation and cannot flexibly use intelligent bodies to design teaching activities in combination with teaching goals and student characteristics. Some teachers lack the active awareness of technology application, are accustomed to the traditional teaching mode, and the acceptance of intelligent bodies. And the willingness to learn is low. These problems directly lead to the low utilization rate of Pedagogical Agent, and it is difficult to give full play to its teaching auxiliary value.

(4) Inadequacy of ethical risk prevention and control, hidden safety hazards

The application of Pedagogical Agent in the teaching of information technology in primary schools. The application of Pedagogical Agent is accompanied by the collection of a large amount of student data, including learning behavior, interactive content, and even possible biometric information. When transmitting and storing student data, if the security policy is not in place, such as insufficient data encryption, lax access control, etc., it may lead to the illegal acquisition or misuse of data, thus leaking students' personal privacy[6]. In terms of student privacy protection, the Pedagogical Agent will collect students' learning data, personal information, operation habits and other information during the interaction process. Some schools and intelligence suppliers lack a perfect privacy protection mechanism, and there is a risk of data leakage and abuse, which harms the legitimate rights and interests of students.

In terms of value-oriented guidance, the response of the intelligent body is based on algorithms and preset data, and lacks the correct value judgment ability. If it encounters problems involving right and wrong and values, it may give a one-sided or improper response, misleading the cognition of primary school students. In addition, some intelligent bodies may have problems with vulgar content and inaccurate information. If there is a lack of a strict audit mechanism, it will have an adverse impact on the physical and mental health and learning effect of primary school students. At present, the ethical norms and audit standards of intelligent bodies for primary school teaching scenarios are still not perfect, and it is difficult to achieve comprehensive and effective prevention and control.

4. Coping strategies of Pedagogical Agent in primary school information technology teaching

In view of the key problems faced by Pedagogical Agent bodies in the teaching application of information technology in primary schools, we should take the solution of practical difficulties as the orientation and adopt a systematic and coordinated promotion strategy. Specifically, it is necessary to work together from the four key aspects of improving the interaction ability of intelligent bodies, consolidating the role of teachers in educating people, strengthening the guarantee of basic conditions, and establishing an ethical normative mechanism to form a mutually supportive implementation plan, so as to promote the effective integration and healthy development of Pedagogical Agent and primary school information technology teaching.

(1) Optimize the adaptation of dialogue algorithms and improve the quality of personalized interaction

In intelligent education applications, personalized recommendations aim to accurately match students' learning preferences and needs through intelligent algorithms, so as to provide customized learning resources to optimize the learning experience and effectiveness[7]. In view of the current problem of insufficient adaptation of personalized dialogue in Pedagogical Agent, it is necessary to focus on algorithm optimization and scene adaptation in the future to create an interactive model that is more suitable for the cognitive characteristics of primary school students. By collecting the learning dialogue data of primary school students of different ages and expression abilities, we can optimize the semantic recognition model of the intelligent body, improve the accurate interpretation ability of vague and incomplete expressions, and accurately capture the real learning confusion of students. At the same time, enrich the intelligent body dialogue database, so that it can dynamically adjust the communication method according to the students'

personality and expression habits, adopt a more gentle and guided dialogue style for introverted students, establish emotional connections, and encourage active expression. In addition, it strengthens the real-time response ability of Pedagogical Agent, breaks the limitations of preset algorithms, and can flexibly respond to students' sudden questions and ideas. Let personalized dialogue truly serve students' learning needs and improve the effectiveness of interaction.

(2) Clarify the main positioning of teachers and strengthen the main value of education

In order to avoid the problem of teachers' role deviation and the weakening of educational subjectivity, it is necessary to clarify the functional boundaries of Pedagogical Agent and teachers in the future, and strengthen the core educational status of teachers. Through the establishment of scientific application guidelines, it is clear that the intelligent body is only used as a teaching auxiliary tool to undertake repetitive and transactional work, and teachers need to focus on teaching design, emotional guidance, value shaping and other core links to give full play to subjectivity. At the same time, we should strengthen the training of teachers' teaching concepts, guide teachers to correctly understand the auxiliary value of intelligent bodies, and actively use intelligent bodies to optimize the teaching process instead of passively relying on technology.

In addition, we should build a teaching practice exchange platform, share excellent cases of intelligent and teacher collaborative teaching, so that teachers can master the teaching methods of human-computer collaborative teaching methods, improve teaching efficiency with the help of intelligent bodies, maintain in-depth interaction with students, adhere to the subjectivity of education, and build a benign teaching ecology of human-computer collaboration.

(3) Improve the allocation of basic resources and improve teachers' application literacy

In view of the problem of insufficient basic resources and low literacy of teachers leading to the low application rate of Pedagogical Agent, it is necessary to focus on resource security and ability improvement in the future to solve the bottleneck of popularization and application. In the construction of basic resources, we should increase investment in education, improve the school network environment and terminal equipment configuration, and ensure the stable operation of the intelligent body; promote the in-depth adaptation of the intelligent body to primary school information technology textbooks and teaching progress, build an exclusive teaching resource library, provide materials and functions that meet the needs of the classroom, and improve the practicality of the intelligent body. Value.

In terms of teachers' literacy improvement, we will carry out hierarchical classification training, and set up courses such as basic operation, teaching design, optimization and innovation for teachers with different technical foundations to help teachers fully master the functions and application methods of intelligent bodies; establish a long-term guidance mechanism, and equip technical specialists to provide real-time support for teachers to solve the problem of teaching applications. The practical problem. At the same time, through incentive policies, teachers should be guided to take the initiative to try, explore and innovate, transform traditional teaching concepts, improve the willingness and ability to apply intelligent bodies, and promote their widespread implementation in teaching.

(4) Improve the ethical prevention and control system and build a solid safety application bottom line

Focusing on the problem of insufficient ethical risk prevention and control, it is necessary to build an all-round and multi-level ethical norms and prevention and control system in the future to ensure the safety and compliance application of intelligent bodies. In terms of privacy protection, we should formulate strict data collection, storage and use standards, make it clear that intelligent bodies only collect student data necessary for teaching, use encryption technology to ensure data security, strictly prohibit data leakage and abuse, clarify the privacy protection responsibilities of schools and suppliers, and effectively safeguard the legitimate rights and interests of students.

In terms of value orientation and content audit, establish a special content audit mechanism for teaching intelligent body, set up an audit team composed of educators and ethical experts, strictly audit the response content and push materials of intelligent body, and ensure that it conforms to the values and cognitive laws of primary school students; optimize the intelligent body algorithm, and strengthen the value The guiding function gives correct and positive responses to questions involving right and wrong judgment and values. At the same time, we should improve the relevant supervision system and accountability mechanism, form a whole process prevention and control of pre-audit, monitoring during the event, and post-responsion, and build a solid ethical and security bottom line.

5. Conclusion

The integration of Pedagogical Agent into primary school information technology teaching marks that technology empowerment education has entered a more refined and interactive new stage. By playing the triple role of expert, assistant and learning partner, it provides new possibilities for breaking through the limitations of traditional teaching, and shows unique value in deepening knowledge understanding, realizing accurate teaching, and developing individual thinking. However, its development path is not smooth. The limitations of intelligent interaction, the adjustment of teachers' roles, the constraints of practical conditions, and the concerns about ethical safety are all real challenges that must be faced and properly addressed at present.

Looking to the future, the evolution of Pedagogical Agent will not only be the upgrading of technology, but also the process of deep integration with the educational scenario and deep coordination with the professional wisdom of teachers. The progress of technology will be committed to making it more understanding of education and warm people's hearts; the focus of application will be to strengthen rather than weakening the main position of teachers; the construction of the support system will be committed to promoting the inclusiveness and normalization of technology and in-depth application; and the improvement of ethical norms is the fundamental guarantee for all this to be healthy and sustainable.

In the end, technology has always been a tool to educate people. The ultimate meaning of Pedagogical Agent is not to show the complexity and intelligence of the technology itself, but whether it can really help teachers and effectively promote the comprehensive development of every student's information literacy, thinking quality and comprehensive ability. Only by insisting on taking students' growth as the center, leading teachers' majors, carefully planning and

steadily promoting, can this emerging technology overcome challenges, move from concept to solid practice, and finally take root and germinate in the classroom of primary school information technology, becoming a solid and warm force to promote the high-quality development of basic education.

References

[1] Zhao Yu, Wu Xin, Tian Yingchun. The Creation and Application of School Pedagogical Agent - Taking the "Renxiao Shi" Pedagogical Agent of the Experimental Primary School Affiliated to Renmin University of China as an Example [J]. Information Technology Education in Primary and Secondary Schools, 2026, (01): 105-107.

[2] Lu Guoqing, Xu Xiulian, Ba Shen, et al. Design Strategies, Role Functions, and Interaction Modes of Pedagogical Agent in Collaborative Learning [J]. Journal of Educational Technology Research, 2026, 47(01): 67-74+83.

[3] Liu Qingtang, Ba Shen, Luo Lei, et al. A Review of the Mechanism of Pedagogical Agent on Cognitive Learning [J]. Journal of Distance Education, 2019, 37(5): 35-44.

[4] Song Lihua. Research on Deep Learning Models in the Context of Blended Learning - Taking the Teaching of "Scale" as an Example [J]. Primary School Teaching Research, 2025, (26): 40-42.

[5] Gao Shuangshuang. Research on Evaluation Strategies for Project-Based Learning Oriented towards Critical Thinking Development [D]. Xinjiang Normal University, 2024.

[6] Guo Jianghao. Technology, Ethics, and Law: A Triple Examination of the Application of Virtual Digital Humans in the Field of Sports [J]. Journal of Shenyang Physical Education Institute, 2024, 43(5): 131-137+144.

[7] Huang Yingying, Yang Hong. Algorithms Empowering the Modernization of Public Cultural Governance: Logic, Symptoms, and Relief [J]. Hubei Social Sciences, 2024, (1): 60-67.