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Research on the Construction of the Integrated Practice System of “Three Learning” Education for Physical Education Normal Students Empowered by Artificial Intelligence

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ABSTRACT

Under the background of the comprehensive promotion of teacher education professional certification and education digitization strategy, the practice system of "education probation-education study-education practice" of physical education normal students has exposed structural deficiencies in content cohesion, guidance quality, evaluation accuracy and technology integration, and it is urgent to realize systematic reconstruction through artificial intelligence. By using the methods of literature analysis, demand investigation, system construction and typical practice verification, this paper constructs an AI-enabled "three learning" education integration practice system of "policy-technology-practice" trinity. The results show that AI has achieved remarkable results in the internship environment of virtual and real integration, intelligent analysis of teaching behavior, dual tutor collaborative platform, personalized ability portrait and evidence-based learning support, which can effectively improve the core abilities of physical education students, such as teaching design, classroom management, reflection improvement and intelligent literacy. Based on the research findings, three countermeasures are proposed: The first is to build a through-type “three learning”system with the intelligent platform as the core, and strengthen the ability advancement and the whole process data support; the second is to improve the coordination mechanism between universities, governments and primary and secondary schools, and systematically improve the AI competency of tutors; the third is to establish a unified data standard, an intelligent evaluation system and a continuous improvement closed loop to promote the high-level and intelligent development of the training quality of physical education teachers.

Keywords: *Artificial intelligence, Physical education students, Educational probation, Educational research, Educational practice, Integrated practice system.*

1. INTRODUCTION

In the macro context of the revitalization of teacher education and the continuous advancement of teacher professional certification in the new era, as well as the reform of education driven by artificial intelligence, the policy orientation at the national level requires the construction of a systematic and whole-process practical training system for normal students to meet the strategic needs of teaching modernization. This paper takes the integrated practice system of "education probation-education study-education practice" (referred to as "three learning") of physical education normal students as the research object, aiming to explore how to reshape the practice field and ability training path under the empowerment of artificial intelligence, so as to improve the professional competence and intelligent literacy of physical education normal students. Its research value is reflected in the composite perspective of connecting education policy, teaching practice and technological innovation. In view of the fact that the digitization, personalization and precision of educational practice have become the trend of the times, promoting the deep integration of AI technology and "three learning" education is not only the inherent requirement of educational

modernization, but also the realistic necessity of improving the quality of normal students and meeting the needs of classroom teaching in the new era. At present, there are still some outstanding problems in the practical training of physical education teachers, such as the disconnection between probation and study, the formalization of study activities, the lag of practice guidance and evaluation system, the lack of school resources and technical support, and the general low intelligence literacy of teachers and students, which restrict the training effect of high-quality physical education teachers. Based on this, this paper focuses on three core research questions: what are the key functions that AI can play in the "three learning" chain, how to construct an operational AI-enabled integrated practice system and form an effective operation mechanism, and how the system can improve the teaching ability and intelligent literacy of normal students in empirical application, so as to respond to the era proposition of education modernization and intelligent education. Therefore, a set of artificial intelligence-enabled “three learning” education integration system with both theoretical explanatory power and practical operability is proposed and verified. Through literature analysis, demand research, system design and typical practice verification, it not only enriches the theoretical framework of physical education teachers ' education, but also provides a scalable technical path and policy recommendations for collaborative education between universities and primary and secondary schools.

2. THE CONNOTATION EVOLUTION AND CURRENT SITUATION OF THE ' THREE LEARNING ' EDUCATION PRACTICE SYSTEM OF PHYSICAL EDUCATION NORMAL STUDENTS

The "three learning" education practice system consists of three links: educational probation, educational research and educational practice. The three are connected with each other in time sequence and functional objectives: educational probation focuses on observation and imitation, and cultivates normal students' cognitive understanding of classroom and school environment. Educational research emphasizes participation and reflection, and deepens the integration of theory and practice through discussion, case analysis and teaching design. Educational practice requires independent teaching practice to realize the systematic application of professional skills and educational ability. The professional certification standard of normal education clarifies the quality requirements of "three learning" education in the training of normal students. The educational practice mode of physical education normal students at home and abroad shows that developed countries are characterized by school-local coordination, virtual simulation and tutorial system guidance. However, there are still some problems in domestic practice, such as scattered links, imperfect guidance and evaluation system, which provides institutional and practical reference for the construction of a systematic and integrated “three learning” education system.

With the gradual penetration of artificial intelligence technology in teacher education, it is mainly used in intelligent evaluation, motion capture and analysis, virtual simulation classroom, learning behavior analysis, teaching data visualization and other scenarios, which significantly improves the fine management ability and personalized teaching level of educational practice. In terms of theoretical basis, AI empowerment education practice usually relies on constructivism, situational learning theory, cognitive load theory, etc., emphasizing learners' active construction of knowledge and ability in real or simulated situations. Artificial intelligence technology not only provides a visual and quantifiable means of teaching process, but also provides new tools and methods for normal students to carry out action observation, teaching design, classroom management and reflection in the "three learning" education link, and provides theoretical support for the integration and innovation of educational practice and technology.

Although some achievements have been made in the construction of the "three learning" education system and the application of AI education, there are some problems, such as scattered research, insufficient coverage of sports professional scenes, insufficient integration of policy orientation, technology application and practice design, which limit the guiding value of the research results to the improvement of practice. Therefore, based on the analysis framework of 'policy-technology-practice' trinity, this paper takes policy requirements as theoretical support and institutional guarantee, artificial intelligence technology as a means of practical empowerment, and educational practice as an application scenario. By systematically integrating the relationship between the three, this

paper constructs an operable and evaluable integrated practice system of 'three exercises' education for physical education normal students, and provides theoretical basis and practical path for the future intelligent and systematic training of normal students.

3. PHYSICAL EDUCATION STUDENTS' 'THREE LEARNING' EDUCATION PRACTICE PRESENT SITUATION AND PROBLEM ANALYSIS

At present, the goal of the "three-study" education practice of physical education normal students in China is connected with the graduation requirements of "practicing teachers' ethics, learning to teach, learning to educate, and learning to develop" in the "teacher-training professional certification standards". In the talent training program, most physical education teachers' colleges and universities clearly position the goal of “three learning” education practice to improve the teachers' moral experience, teaching practice ability, class management ability and teaching and research development ability. For example, the physical education major of East China Normal University emphasizes the specific requirements of "loving physical education and caring for students", "having problem awareness and critical thinking methods" and "building a learning community" in the "three learning" educational practice goals, which reflects the detailed decomposition of "one practice and three learning" (Dong Cuixiang et al., 2023). However, in the actual implementation, there are still some problems such as generalization and abstraction in the expression of objectives, which are not closely connected with the actual needs of physical education in primary and secondary schools. Especially at the level of "learning to develop", the training objectives of normal students' reflective research ability, international vision and lifelong learning ability are not clear and specific enough.

At the present stage, the “three learning” education practice of physical education normal students has formed a segmented curriculum system with the main line of "education probation-education research-education practice" in the content arrangement. The education probation is mostly arranged in the sixth semester, with classroom observation, teaching basic skills training, and "experiential" teaching as the main content. The education practice is concentrated in the seventh semester, covering practice mobilization, primary and secondary school teaching practice, class teacher work, reflection and supplementary training; the control study runs through the whole course in the form of the second classroom, including literature retrieval, academic lecture participation, science and technology project practice, etc. Some colleges and universities, such as East China Normal University, have tried to construct the operation mode of the practice system of "one main line, two combinations and three coordination", emphasizing the organic combination of " three learning " and the second classroom, and using the mixed mode of " online + offline " and " on-campus + off-campus " to carry out practice. However, on the whole, there is a lack of cohesion and progression between the content of " three studies, " and there is a lack of effective transition mechanism between probation and internship. The study link is often independent of probation and internship, and it fails to form an integrated content chain with deep mutual embedding and continuous feedback.

In terms of evaluation mechanism, colleges and universities generally try to establish a "double tutor" evaluation system that combines process evaluation and summative evaluation, and the participation of college tutors and middle school tutors. The evaluation content covers internship attitude, teaching preparation, classroom teaching process, teaching effect, teacher quality, etc., and pays attention to the collection of process materials such as teaching reflection, lesson plan writing, and classroom video (Wang Qingbo et al., 2025; Li Peng et al., 2024). However, the scientificity and operability of the evaluation criteria are still insufficient, especially the lack of detailed evaluation indicators in the dimensions of teaching innovation ability, educational effectiveness, teaching and research potential. In addition, the evaluation results are mostly used for performance evaluation, which fails to form an effective closed loop with the personalized feedback and continuous improvement of normal students.

In summary, the current "three learning" education practice of physical education normal students faces multiple structural problems, and its core lies in the overlapping influence of "separation of practice links, outdated content, virtual guidance, single dimension of evaluation and lagging technology". First of all, educational probation, internship and research are often implemented in isolation, and there is a lack of integrated design and advanced connection, which makes it difficult

for normal students to form a coherent ability advancement (Shao Guanghua et al., 2023; li Guanghai et al., 2023). Secondly, the practice content still focuses on the traditional skill teaching, which is obviously out of line with the new requirements of core literacy cultivation, health education integration and interdisciplinary teaching emphasized by the reform of physical education curriculum in primary and secondary schools (Dong Cuixiang et al., 2023). In terms of the implementation mechanism, the 'double tutorial system' has insufficient coordination, vague guidance responsibilities, and lack of effective collaboration and process supervision between universities and middle school tutors, which affects the effectiveness of guidance (Zhou Weikang et al., 2022). At the same time, the evaluation method relies too much on summative and subjective evaluation, lacks the collection and analysis of process data such as teaching behavior and classroom interaction, and is difficult to provide accurate improvement feedback (Wang Zhen, 2025). It is particularly prominent that there is a serious lack of smart education scenarios, and the application of artificial intelligence, big data, virtual simulation and other technologies in practical environment, behavior analysis, teaching and research support is obviously lagging behind, which not only limits the space-time extension and personalized guidance of practical teaching, but also forms a gap with the digital process of basic education (Jiang Ruige et al., 2023), which restricts the systematic cultivation and sustainable development of the practical ability of physical education normal students as a whole.

4. THEORETICAL CONSTRUCTION OF ARTIFICIAL INTELLIGENCE ENABLING “THREE LEARNING” INTEGRATION

By systematically analyzing the practical dilemma of "three learning" education for physical education normal students, this paper will explore the internal logic of artificial intelligence empowerment from the theoretical level, establish the core principles of system construction, and construct an "AI + three learning" integrated system driven by artificial intelligence technology and taking ability advancement as the main line. The theoretical model provides framework support for the design of implementation path.

4.1 AI Enabling Logic: The Way to Reconstruct the "Three Learning" Education Practice System

The core of artificial intelligence empowerment should fundamentally reconstruct the operation logic and ecology of the "three learning" education practice system. Mainly reflected in the following three aspects: First, the intelligent environment: to build a virtual and real integration, full-time global practice scenarios. Aiming at the problems of fragmentation of practical links and uneven quality resources, AI technology can integrate virtual simulation, etc., and build a highly immersive and repeatable 'virtual trainee-internship field' such as: physical education normal students can face in the virtual classroom. In the virtual classroom, students with different learning conditions and different behavioral characteristics generated by AI can conduct risk-free teaching trials; people can observe and intelligently analyze a large number of real classroom videos of famous teachers anytime and anywhere, breaking through the space-time and resource constraints of traditional probation. This provides a continuous practice space for the seamless connection of 'three learning'.

4.2 Driven by Data: To Achieve Accurate Evaluation and Personalized Feedback of Process and Accompanying

Aiming at the problems of single-dimensional evaluation and lagging feedback, AI can automatically collect, process and analyze the multi-dimensional data of normal students' voice, expression, body movements, teacher-student interaction and classroom atmosphere in microteaching and internship classrooms through multi-modal learning analysis technology, generate accurate classroom teaching behavior analysis reports (such as question frequency, patrol scope, student participation, etc.), and correlate text data such as teaching plans and reflection logs written by normal students. Based on these procedural data, AI system can realize the transformation from "group evaluation" to "individual diagnosis", provide personalized ability portraits and targeted improvement suggestions for each normal student, and automatically push the adaptive learning resources and training tasks, forming a closed loop of "evaluation-feedback-intervention-reevaluation", thus strongly supporting the certification concept of "continuous improvement".

4.3 Synergy Enhancement: To Improve the efficiency of "University-Middle School-AI System" Ternary Collaborative Education

Aiming at the problem of weak coordination of "double tutorial system", AI can play the role of "intelligent assistant tutor" and build a unified intelligent coordination platform. The platform can structurally record the theoretical guidance and suggestions of university tutors, the practical comments of middle school tutors, the behavior analysis data of AI system and the reflection records of normal students, so as to realize multi-party information synchronization and dialogue. Based on the preset ability model, AI can intelligently match tutor resources, remind guidance nodes, generate collaborative guidance reports, and assist tutors in more scientific process evaluation. This can not only reduce the burden of tutors, but also promote the deep dialogue and standard alignment between college theoretical guidance and middle school practical guidance, and form a new guiding community with human-machine coordination and complementary advantages.

5. AI EMPOWERING THE PRACTICE PRINCIPLE OF "THREE LEARNING" EDUCATION AND THE IMPLEMENTATION PATH DESIGN OF EACH LINK

The construction of the integrated practice system of "three learning" empowered by artificial intelligence should follow the fundamental purpose of "educating people as the basis and technology as the application", always take students as the center, and ensure that the design and application of technology serve the systematic cultivation of core abilities such as teachers' morality, teaching, education and development. Furthermore, with the core concept of "data-driven and evidence-based improvement", the operation of the system is built on the multi-source and accompanying educational data collected, and the teaching diagnosis, ability evaluation and system optimization are promoted from empirical judgment to objective evidence support. On this basis, the system needs to follow the law of teachers' professional growth, carry out the integrated reconstruction of " through design and step-by-step progress", and use technology to realize the spiral connection and data sharing of objectives, contents and evaluations in each stage of probation, internship and research; finally, at the implementation level, the operational guidelines of "human-machine collaboration and complementary advantages" are implemented, and the auxiliary boundaries of AI in data analysis and resource management are clarified. Combined with the leading role of human tutors in emotional guidance, value judgment and complex teaching innovation, a clear and efficient division of labor and cooperation mechanism is jointly constructed.

Based on the logic and design principles of empowerment, this paper proposes a theoretical model of 'AI-enabled physical education normal students' 'three-learning' integrated practice system' (as shown in "Figure 1"). The model takes the 'intelligent support platform' (data platform and AI engine), which gathers the whole process data and provides intelligent services, as the core center, and supports the 'goal-content', 'implementation-activity' and 'evaluation-feedback ' three-tier main practice system: the target layer guides the intelligent organization 's probation, internship and research content with a refined ability standard map; the activity layer uses VR / AR, behavior analysis, knowledge map and other technologies to realize the integration and flexible switching of 'intelligent probation-internship-study'. The evaluation layer generates multi-dimensional digital portraits and personalized feedback through accompanying data collection and AI analysis. The whole model relies on the two two-way cycles of 'data-intelligence-practice' and 'evaluation-feedback-improvement' to drive the operation. The practice generates data, and the data is processed into intelligent insights to optimize the practice. At the same time, the intelligent evaluation results continue to drive the students, tutors and management system to dynamically adjust and improve, thus forming an organic coordination, dynamic adaptation and sustainable evolution of educational practice ecosystem.

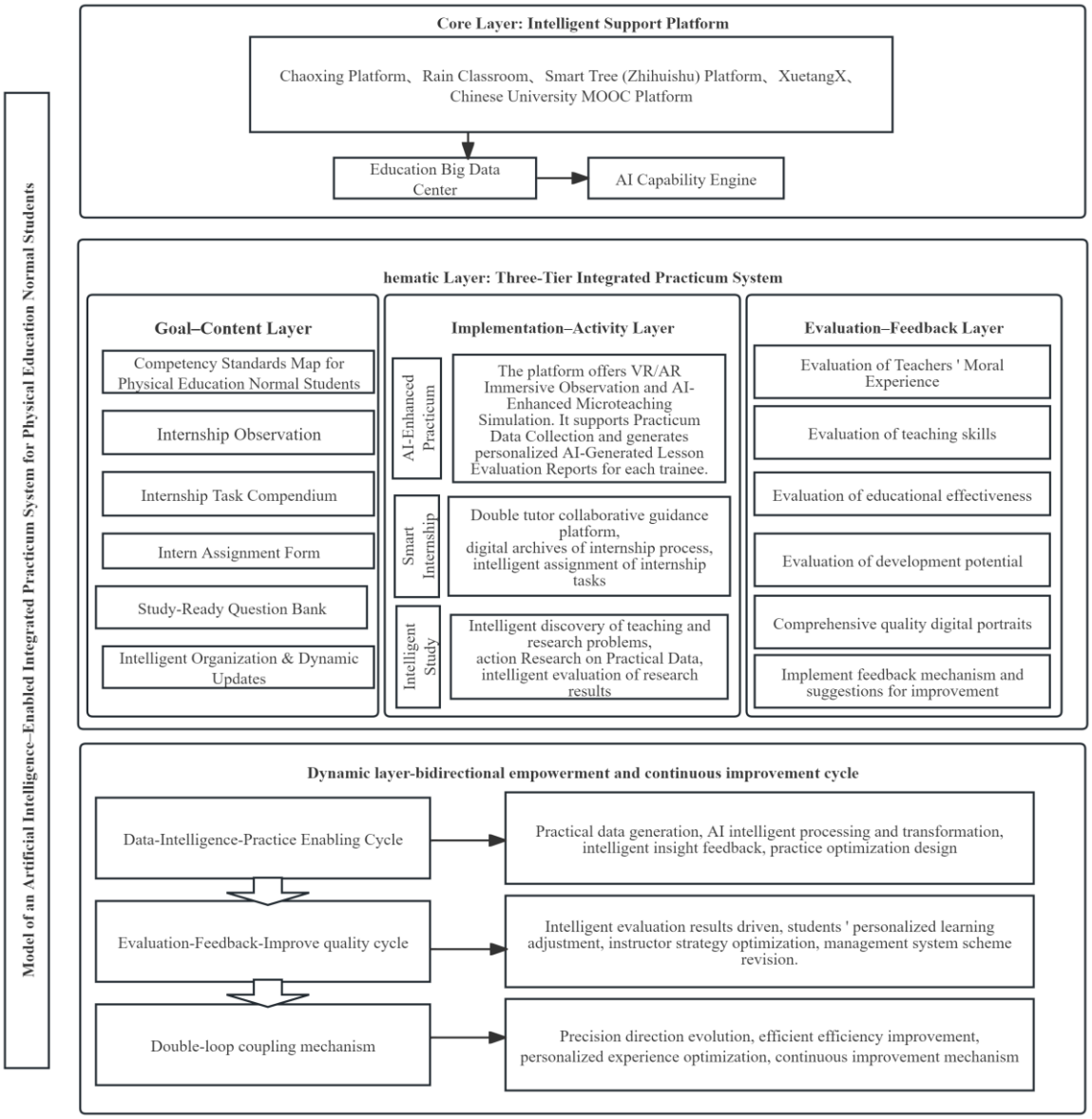

Figure 1 Model of an artificial intelligence–enabled integrated practicum system for physical education normal students.

6. THE IMPLEMENTATION PATH AND GUARANTEE SYSTEM OF AI-ENABLED “THREE LEARNING” EDUCATIONAL PRACTICE

6.1 Educational Probation: from Passive Observation to Immersive Intelligent Preview

It is necessary to construct an "AI+VR/AR Immersive Observation Library" that integrates high-quality physical education lesson examples from primary and secondary schools across the country, internationally advanced teaching cases, and panoramic videos of various typical teaching scenarios. Normal students can use VR equipment for immersive observation, and AI system synchronously provides picture focus guidance, key teaching behavior labels and voice explanation. Secondly, the 'microteaching intelligent simulation laboratory' is developed. In the virtual classroom, normal students can teach in the face of AI-driven student avatars with different personality and physical fitness levels. The system can analyze the

effectiveness of its teaching language, demonstration actions, and classroom instructions in real time, and generate analysis reports containing specific improvement suggestions (such as 'the density of explanations is too high, it is recommended to add students 'independent practice links in the 10th minute'), to achieve the leap from 'seeing others do' to 'doing it safely yourself', and to lay a solid preview foundation for educational practice.

6.2 Educational Practice: from Experience Teaching to Data-driven Precise Practice

The internship process will be transformed into a quantifiable, traceable and interventionable stage of precise training. The core is to deploy 'classroom teaching behavior intelligent analysis system'. Through the built-in sensing devices and wearable devices in the smart classroom, multimodal data such as voice, moving trajectory, teacher-student interaction frequency, student practice density and facial expression of interns' classroom teaching are automatically collected. Based on the professional standards of physical education teaching, the AI model automatically generates classroom analysis reports and accurately diagnoses its advantages and disadvantages in each link of 'explanation, demonstration, organization and feedback'. At the same time, a 'double tutor intelligent collaborative platform' is built. University and middle school tutors can view AI analysis reports, electronic teaching plans and reflection logs written by interns at any time, and perform asynchronous annotation, synchronous meeting and evaluation scoring on the platform. According to the ability shortcomings of interns, the platform intelligently pushes relevant theoretical literature, excellent lesson fragments or targeted training tasks to form a personalized growth loop of 'practice-data-feedback-learning', which significantly improves the accuracy and collaborative efficiency of internship guidance.

6.3 Educational Research: from Isolated Scientific Research to Evidence-based Research Based on Practical Data

The research activities will be deeply rooted in the real problems and data generated by the internship and internship, and realize the integration of teaching and research. First of all, using the 'teaching problem intelligent mining tool', the semantic analysis of classroom video, teaching reflection text, student feedback and other data accumulated by interns is carried out, and the common and individual teaching problems are automatically identified by clustering (such as 'How to effectively carry out differentiated physical exercise?', 'new lesson introduction method is single'), and it is transformed into a subject for research. Secondly, the 'sports teaching research knowledge map and intelligent literature assistant' is constructed. When the interns determine the research intention, the system can intelligently recommend relevant classical theories and cutting-edge literature, reveal the research network, and assist them in literature review. Finally, to support 'design-based research and action research', interns can quickly verify the effect of their instructional design improvement program in a virtual simulation environment, and then use the real internship field to practice, and track the data changes before and after the intervention through the intelligent analysis system, so that their research results directly feed back into the teaching practice, and cultivate the evidence-based ability of 'practice-reflection-research-improvement'.

7. THE GUARANTEE SYSTEM OF AI EMPOWERING 'THREE LEARNING' EDUCATIONAL PRACTICE

7.1 Construction of "U-G-S" Tripartite Collaborative Community

To build a collaborative framework of 'university (U) -government (G) -primary and secondary schools (S)', and form a new ecology of 'U-G-S' collaborative education. It is necessary to set up a permanent management organization composed of three representatives to jointly formulate the standards of intelligent practice base, data sharing and privacy protection agreements, intellectual property ownership methods and other systems. Local governments (education administrative departments) should play a coordinating and policy incentive role; colleges and universities are responsible for the integration of educational theory and curriculum; primary and secondary schools provide real application scenarios and practical feedback. Through regular joint meetings, cooperative R & D projects, and mutual employment of personnel, we will ensure that the goals are unified, the responsibilities are clear, and the resources are complementary.

7.2 Implementation of the "Tutor AI Literacy Promotion Plan"

The competency of instructors is the key to the implementation of the system. It is necessary to systematically implement the ' double tutor AI literacy special training '. The training content not only includes the operation and use of the intelligent platform, but also should go deep into the data interpretation ability (how to understand the teaching behavior report generated by AI), human-computer collaborative guidance strategy (how to combine AI feedback with students for in-depth reflective dialogue) and technical ethics education. Establish a ' tutor digital competency certification and incentive mechanism ', and incorporate the effective use of intelligent technology to guide normal students into the tutor work assessment and professional title evaluation system. At the same time, the ' Intelligent Education Practice Research Project ' is set up to encourage university tutors and middle school tutors to cooperate to carry out research based on practical data, so as to jointly improve the teaching research and guidance ability in the intelligent environment.

7.3 Building an Integrated Intelligent Cloud Platform and Data Standards

The robustness of the technology platform and the interoperability of data are the basis. It is necessary to invest special funds to build or introduce an 'intelligent practice cloud platform for physical education normal students', which integrates virtual simulation, intelligent recording and broadcasting, behavior analysis, collaborative management, digital portfolio and other functions. The platform needs to have high reliability, scalability and good user experience. More importantly, it is necessary for the collaborative community to jointly formulate a unified 'education practice data standard and interface specification', clarify the format, meaning and collection methods of various teaching behavior data, evaluation data and achievement data, and ensure that the data generated from different scenarios and tools can be aggregated, integrated and analyzed to truly form valuable 'education big data' and avoid the formation of new data islands. At the same time, it is necessary to establish a strict data security and privacy protection system.

7.4 Embedded Intelligent Authentication and Continuous Improvement Closed Loop

There is a must to deeply integrate intelligent evaluation into the continuous improvement mechanism of teacher professional certification. On the one hand, the 'digital portrait of normal students' comprehensive quality' and 'big data of practical teaching process' generated by the system can be directly used as objective evidence of 'achievement evaluation' in professional certification to prove the achievement of graduation requirements. On the other hand, it is necessary to establish a 'normal monitoring and early warning mechanism for professional training quality based on platform data'. Through the longitudinal analysis of the practice data of the previous students, we can find the common problems in the curriculum setting and practice arrangement in the training program (such as 'a certain type of teaching skills are generally weak'). Through the horizontal analysis of the guidance data of the practice base, the guidance quality of each base can be evaluated. These data-driven insights will become the most direct basis for the revision of the curriculum system, the dynamic adjustment of the practice base, and the decision-making of teaching reform, so as to build a real data-driven, continuous self-optimization closed-loop training of high-quality normal students.

8. CONCLUSION

This study constructs an artificial intelligence-empowered integrated "Three-Practice" system for physical education teacher trainees, addressing the dual demands of teacher education certification and digital transformation. In response to current issues such as fragmented practical stages, superficial guidance, one-dimensional evaluation, and technological lag, it proposes an integrated model framed by "policy-technology-practice" and centered on an intelligent platform. Supported by a virtual-real integrated environment, a multimodal data-driven approach, and human-machine collaboration, the system facilitates a paradigm shift from "discrete and experience-based" to "continuous and data-informed," and from "uniform and scaled" to "personalized and precise". The research systematically designs implementation pathways encompassing "intelligent practicum, data-driven internship, and evidence-based inquiry", and establishes a four-dimensional safeguard system that includes a collaborative community, mentor competency enhancement, a cloud platform

with data standards, and an intelligent certification and improvement mechanism. This system not only provides an operable framework for cultivating the core competencies of physical education teacher trainees but also offers theoretical and practical references for the intelligent and evidence-based development of teacher education practice. Further research is needed to validate the applicability of this system across different contexts and to continuously explore issues such as optimizing the educational specificity of AI models, data integration, and ethical boundaries, thereby promoting the more scientific, precise, and sustainable development of teacher training.

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