Research on the Integration Strategy of AI and Traditional Teaching Methods in College Gymnastics Public Physical Education

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Abstract: Against the dual backgrounds of the advancement of the"Healthy China"strategy and the deepening of education digital transformation, the traditional teaching mode of college gymnastics public physical education is faced with such problems as the lack of personalized guidance, insufficient teacher-student interaction and a single evaluation system. Based on the educational objectives of college physical education, this paper systematically discusses the technical support and practical paths for the integration of artificial intelligence (AI) technology and traditional teaching methods, and constructs an integration strategy covering teaching objectives, teaching content, teaching methods and teaching evaluation. By giving play to the advantages of AI technology in precise empowerment and the advantages of traditional teaching in systematization and humanism, this paper expects to promote the transformation of college gymnastics public physical education from single skill teaching to comprehensive literacy cultivation, and improve the quality and effectiveness of curriculum education.

***Keywords*:** college gymnastics public physical education, AI, traditional teaching methods, teaching integration

1. Current Situation and Dilemmas of Traditional Teaching Methods in College Gymnastics Public Physical Education

Traditional teaching methods of college gymnastics public physical education take teachers as the core and present the characteristics of one-way skill transmission, and the teaching process generally follows a linear teaching flow of"explaining movement essentials-teachers demonstrating standards-students imitating practice-collective consolidation and improvement-teachers conducting centralized error correction". In the setting of teaching content, this mode takes standardized gymnastics routines as the core carrier, adopts a unified advancement mode for teaching progress, and focuses on emphasizing students' mastery of the specified movement specifications and the integrity of complete sets of movements[1]. In the teaching evaluation link, traditional teaching mostly adopts a result-oriented single evaluation system, with the evaluation core centered on movement standardization and routine completion, ignoring the attention and evaluation of students' inquiry ability, collaborative awareness and artistic expression in the learning process.

Although this teaching mode can guarantee the systematization and standardization of teaching to a certain extent, its inherent limitations have gradually emerged against the background of education digital transformation and the prominent demand for personalized education. First, personalized teaching is lacking. Restricted by teaching energy and observation scope, teachers are difficult to accurately capture the individual differences of different students in physical conditions, sports foundation and learning ability, and cannot provide precise guidance for students' problems such as movement weaknesses and force defects, thus leading to the teaching imbalance phenomenon of"top students not learning enough and underachievers failing to keep up". Second, the depth of interaction is insufficient. Teaching interaction is mostly limited to teachers' one-way error correction for students, and the collaboration among students is mostly mechanical group practice, lacking in-depth communication and exploration based on problem-solving, which is difficult to effectively stimulate students' learning initiative and creativity. Third, teaching methods are rigid and technology integration is inadequate. Traditional teaching methods mostly rely on teachers' own demonstration and multimedia video playback, failing to realize the in-depth integration of technology and teaching process, which restricts the further improvement of teaching quality.

2. Technical Support for the Integration of AI and Traditional Teaching Methods

Sports data collection and analysis technology is the core technical support to break through the limitations of teachers' observation in traditional gymnastics teaching[2]. Among them, the markerless motion capture system can track students' limb movement trajectories in real time through intelligent cameras, generate quantifiable data such as joint movement angles and movement completion rhythm, accurately locate problems such as disordered force application sequence and

insufficient body balance control that are difficult for teachers to perceive with the naked eye in traditional teaching, and provide objective data basis for targeted error correction. Wearable sensing devices can monitor students' muscle activation degree and physical energy consumption status in real time, provide personalized optimization suggestions for strength training planning and physical energy allocation schemes in traditional teaching, and make up for the limitations of relying on teachers' experience for guidance in traditional teaching.

Intelligent interaction and generation technology plays an enabling role in addressing the shortcomings of insufficient interaction depth and weak innovation guidance in traditional gymnastics teaching[3]. Among them, the virtual coach system can rely on natural language processing technology to respond to students' personalized questions about movement technology and practice methods in real time, supplementing the answering needs that teachers are difficult to fully cover due to limited energy in traditional teaching. Generative AI technology can combine the theme of gymnastics teaching with students' sports ability level to generate a diversified database of basic movement combination materials, provide ideological support for the movement creation link in traditional teaching, and effectively stimulate students' creative initiative. The above technologies are not intended to replace traditional teaching, but form a complement to the systematic and humanistic advantages of traditional teaching through precise and personalized technical empowerment, so as to ensure the effective implementation of the integrated teaching mode.

3. Implementation Strategies for the Integration of AI and Traditional Teaching Methods in College Gymnastics Public Physical Education

3.1 Integration of Teaching Objectives

In the aspect of teaching objective integration, teachers should establish a three-dimensional objective system of"synergy between traditional core objectives and AI-empowered expanded objectives". Teachers need to adhere to the core skill objectives such as mastery of movement specifications and understanding of routine arrangement logic in traditional teaching, and supplement personalized literacy training objectives relying on AI technology. Specifically, teachers can analyze students' ability weaknesses in limb control and rhythm perception through sports data collection technology, and set differentiated skill improvement objectives for different students; integrate process objectives such as the cultivation of independent inquiry ability and collaborative innovation ability combined with intelligent interaction technology, so that the teaching objectives not only continue the normative requirements of traditional teaching, but also conform to the development needs of modern education for personalized education.

3.2 Integration of Teaching Content

The integration of teaching content needs to take technology as support to achieve hierarchical dynamic adaptation, and the teaching team should build a modular resource library of"basic norms+personalized expansion". In the basic module, teachers retain the links of standardized movement demonstration and essential explanation in traditional teaching, and generate movement skeleton disassembly animations with the help of markerless motion capture technology to assist students in understanding the movement force principle. In the advanced module, teachers can push movement combination materials adapted to students' ability level through artificial intelligence generation technology based on the feedback of students' sports data, and guide students to carry out secondary creation practice. In the expansion module, teachers construct situational practice content combined with the virtual coach system, such as simulating stage performance scenes through intelligent interaction technology, strengthen the cultivation of students' movement expression, and solve the problems of rigid content and insufficient adaptability in traditional teaching.

3.3 Integration of Teaching Methods

The integration of teaching methods needs to construct a trinity mixed teaching mode of"teacher-led, AI-empowered and student-centered". In the classroom teaching link, teachers take the lead in key links such as explaining core movement essentials and demonstrating standards, and collect students' practice data in real time with the help of markerless motion capture system, display the differences between students' movements and standard movements synchronously through large screens, and assist teachers in carrying out precise error correction. In the after-class extension link, teachers rely on wearable sensing devices and mobile learning platforms to push personalized practice tasks for students, monitor practice effects in real time through AI systems and feed back adjustment suggestions, forming a teaching closed loop of"in-class centralized guidance-after-class independent practice-data feedback optimization". In the collaborative learning link, teachers organize group creation tasks, provide creative material support with the help of artificial intelligence generation technology, collect process data of group discussions through intelligent interaction systems, help teachers accurately grasp the effect of group

collaboration, and then implement targeted guidance.

3.4 Integration of Teaching Evaluation

The integration of teaching evaluation needs to construct a diversified collaborative evaluation system combining"AI data quantitative evaluation and traditional humanistic qualitative evaluation". In the process of evaluation implementation, teachers can obtain quantifiable indicators such as students' movement completion and rhythm stability with the help of sports data collection technology, replacing the vague evaluation only based on teachers' experience in traditional teaching; introduce intelligent interaction technology to record process data such as the frequency of students' classroom questions and the duration of independent practice, expanding the evaluation dimensions. At the same time, teachers need to retain the qualitative evaluation of students' collaborative awareness, artistic expression, learning attitude and other difficult-to-quantify dimensions in traditional evaluation. Through the organic combination of quantitative data and qualitative evaluation, a comprehensive and objective evaluation of students' learning effects is realized. In the whole evaluation process, teachers need to dynamically optimize teaching strategies based on evaluation results, forming a sound teaching improvement mechanism of"evaluation-feedback-optimization".

4. Conclusion

By systematically sorting out the technical basis for the integration of AI technology and traditional teaching methods of college gymnastics public physical education, this paper deeply explores the integration and implementation paths of the four major links including teaching objectives, teaching content, teaching methods and teaching evaluation, forms a trinity mixed teaching mode of"teacher-led, AI-empowered and student-centered", and establishes a diversified collaborative evaluation system. The systematic integration scheme formed in this paper is conducive to solving the problems such as the lack of personalized guidance and rigid content in traditional gymnastics teaching, and provides reference practical ideas for the digital reform of college physical education.

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