ISSN 2618-1576 Vol. 7, Issue 4: 93-100, DOI: 10.25236/FSR.2025.070415

Exploration of Public Sports Reform Driven by Artificial Intelligence in Colleges and Universities

Xinyuan Li[a,*], Bin Guo[b]

College of Physical Education & Sports Science, Hengyang Normal University, Hengyang, 421000, China
[a]lixinyuan@hynu.edu.cn, [b]18570567023@163.com
[*]Corresponding author

Abstract: *Existing intelligent perception and control methods primarily focus on basic data recording, lacking dynamic analysis and refined intervention of students' athletic performance, physical and mental state, and learning feedback. This paper introduces the fusion of artificial intelligence and the Internet of Things (AIoT) to construct an integrated teaching and management model combining "intelligent perception-dynamic analysis-precise feedback." Based on wearable smart devices, this paper collects multi-dimensional physiological indicators in real time and integrates AI algorithms to dynamically model students' athletic load, technical movements, and psychological fluctuations. Leveraging a smart sports management platform, personalized training content delivery and risk warnings are implemented. Experimental results show that in terms of 50-meter running speed, the average scores of the experimental group students dropped from 8.2 seconds and 8.6 seconds to 7.5 seconds and 7.9 seconds, respectively, an average improvement of 0.7 seconds, a significant speed increase.*

Keywords: *Public Physical Education in Colleges and Universities; Artificial Intelligence; Internet of Things; Intelligent Evaluation; Precision Teaching*

1. Introduction

In recent years, with the continuous advancement of the Healthy China strategy and the popularization of the concept of national fitness, public physical education courses in colleges and universities play an important role in cultivating students' health literacy and lifelong sports awareness. However, due to the inherent limitations of the traditional teaching model, public physical education in colleges and universities generally has problems such as single course evaluation, lack of process management, and insufficient personalized guidance, which makes it difficult to effectively meet students' diverse and personalized sports learning needs. On the one hand, traditional courses are often based on concentrated lectures, unified training and final examinations, ignoring the real-time feedback and dynamic adjustment of students' sports process, resulting in insufficient interest in sports and low participation initiative. On the other hand, teachers' teaching methods are relatively traditional, lacking data support, and the feedback cycle of teaching effects is long, lacking pertinence and scientificity.

At present, some studies have tried to apply intelligent technology to physical education in colleges and universities, but most of them focus on single sports data collection or individual functional interventions, and overall lack a comprehensive reform path of "full process, full chain, and full dimension". In response to the above pain points, this paper takes "intelligent perception-dynamic analysis-accurate feedback-continuous guidance" as the core logic to build a new intelligent teaching and evaluation system for public physical education courses in colleges and universities, focusing on exploring the specific application effects of AIoT fusion technology in public physical education course evaluation reform, teaching model innovation, and teacher digital ability improvement, providing a feasible practical path and theoretical reference for smart sports education.

2. Related Works

In recent years, with the continuous deepening of global sports education reform, scholars around the world have conducted extensive research on issues such as sports curriculum transformation, teaching model innovation, and educational equity. The following literature provides important

ISSN 2618-1576 Vol. 7, Issue 4: 93-100, DOI: 10.25236/FSR.2025.070415

theoretical references and practical inspiration for public sports reform in colleges and universities.

Alfrey and O'Connor explored sustainable resources for sports curriculum transformation and implementation through a case study of a middle school in Australia. The results showed that multi-dimensional resources such as structured support, continuous leadership, clear vision, professional learning, and time jointly promoted curriculum change [1]. Alfrey et al. analyzed the health and physical education policies in Australia, the United States and Wales, and used Bacchi's problem representation method to reveal the idealized and missing representations of learners in the policies, shaping problematic identities such as "sedentary learners", "uneducated learners" and "naive learners" [2]. Calderón and MacPhail proposed to redefine the framework of physical education teacher education practice by integrating multiple teacher education paradigms. Drawing on the theories of Zeichner and Rink, they emphasized the complementarity of different educational philosophies and advocated the integration of multiple paradigms in curriculum design to enhance the transformation experience of normal school students and help them adapt to diverse teaching environments [3]. Tolgfors and Barker used the International Association of Higher Physical Education's Sports Assessment Position Statement as an example, combined with the Swedish sports education tradition, and applied the "global localization" theory to explore the conflict and integration between global sports assessment discourse and local education traditions [4]. Popel et al. conducted a survey of 52 university teachers and 450 sports students to analyze the problems in sports education curriculum planning and put forward optimization suggestions. Based on the subject correlation matrix, the learning sequence and correlation of courses and disciplines were determined, and it was recommended to focus on the core biomedical courses [5]. Tanure Alves et al. explored the problem of ableism faced by students with disabilities in physical education classes through observation and interviews with three physical education teachers over a school year. The results showed that there was a general body-centered normalization process in physical education classes, which made it difficult for students with disabilities to truly integrate [6]. Isgren Karlsson et al. studied Swedish physical education teachers' cognition of digital technology in outdoor education and found that teachers' views on digital technology were influenced by curriculum standards and regulated by multiple factors such as knowledge domain, grade, equipment selection, student needs, and teacher ideology [7]. Ferraz et al. reviewed the teaching model in physical education and analyzed 28 related literature. The results show that in order to address the problem of declining sports participation, it is necessary to strengthen the combination of teaching theory and practice, improve the effectiveness of physical education through innovative teaching models, strategies and content, and promote children and adolescents to participate in sports activities throughout their lives [8]. Alfrey explored the views of Australian middle school students on existing physical fitness tests through focus group interviews. The results showed that physical fitness tests caused anxiety and pressure to some students, but students were also able to propose new testing methods that were more suitable for school teachers and students, reflecting their positive thinking and ability to improve physical fitness tests [9]. Wibowo et al. introduced the concept of "Bildung" from the Nordic-German cultural circle as the theoretical basis for student-centered teaching in health and physical education. Bildung emphasizes students' holistic self-growth through cognitive, physical, emotional, social and aesthetic aspects, and emphasizes that individuals achieve self-development through reflective practice. It has similarities with social constructivism and social emotional learning concepts [10]. Lundvall and Fröberg explored the significance of integrating sustainable development education into physical education and analyzed the requirements of sustainable development goals for education. They proposed to promote the transformation of physical education and teacher training through curriculum revision, reshaping of learning perspectives, and new understandings of health and well-being, so as to promote reflection on existing culture and practice and achieve sustainable development education goals [11]. Existing research focuses on policy analysis and curriculum model discussion, lacking dynamic evaluation and personalized teaching empirical research based on intelligent technology empowerment.

3. Methods

3.1 Intelligent Technology Empowers the Upgrade of Sports Curriculum Evaluation System

The introduction of artificial intelligence has brought about a more efficient and scientific transformation in the evaluation of public physical education courses in colleges and universities. Traditional physical education course evaluation mainly relies on teachers' subjective judgment and students' test results, and often faces problems such as long evaluation cycles, one-sided results, and heavy subjective factors. With the help of intelligent sensing equipment and sports data collection

ISSN 2618-1576 Vol. 7, Issue 4: 93-100, DOI: 10.25236/FSR.2025.070415

systems, students' sports performance can be recorded in real time, and dynamic tracking and comprehensive analysis can be carried out in combination with AI algorithms. For example, wearable devices can collect key data such as exercise duration, heart rate, speed, and cadence in real time, and evaluate students' physical load, skill mastery, and exercise effects through AI algorithms. Image recognition technology further expands the evaluation dimension, especially for team projects. It analyzes students' collaboration level and technical specifications through motion capture, and ultimately realizes a personalized, dynamic, and objective course evaluation model. AI-assisted evaluation not only improves evaluation efficiency, but also makes teaching plans more scientific and personalized.

3.2 Intelligent Transformation of Teaching Models

Intelligent technology promotes the deep integration of public sports teaching scenes and models, giving rise to diversified teaching forms. First, immersive technologies such as virtual reality (VR) and augmented reality (AR) reshape physical education classrooms, breaking through time and space limitations. Students can experience specific sports environments such as plateau training and Olympic venues, and achieve immersive interactive learning. Secondly, OMO (online + offline) hybrid teaching supported by intelligence is becoming increasingly popular, relying on open course platforms such as MOOC to form a hybrid teaching framework of "theory online + practice offline". For example, Beijing Normal University has applied the digital human anatomy system to the "Sports Anatomy" course, realizing three-dimensional visualization and interactive learning. Furthermore, the intelligent evaluation system breaks the single result evaluation model, and through process tracking and value-added analysis, it pays full attention to students' physical condition, sports performance and psychological feedback. The physiological data collected by smart devices combined with sports psychology assessment realizes a full-chain evaluation system from skill mastery to mental health, promoting the overall improvement of physical education teaching effects.

3.3 Digital Transformation of Physical Education Teachers

Artificial intelligence has profoundly reshaped the role positioning and ability requirements of college physical education teachers. Teachers have gradually transformed from traditional "movement demonstrators" to "learning designers" and "data guides". By analyzing students' sports data through AI algorithms, teachers can accurately grasp the differentiated characteristics of students and design personalized teaching plans. For example, Tsinghua University's "AI teaching assistant" system can automatically detect students' sports injury risks and provide rehabilitation training suggestions, greatly improving the scientific nature of teachers' teaching decisions. At the same time, teachers' professional qualities also need to be upgraded synchronously. Mastering multiple abilities such as data analysis, smart device application, and digital teaching resource development has become a basic requirement for modern college physical education teachers. The "Digital Competence Model for Physical Education Teachers" constructed by East China Normal University covers six dimensions, including the use of smart teaching aids, data analysis, and digital resource development, providing a clear growth path for teachers to improve their digital literacy.

3.4 Multi-dimensional Intelligent Evaluation System for Teachers' Teaching Ability

In order to solve the subjective and singular problems in the teaching evaluation of college physical education teachers, artificial intelligence provides a powerful tool for establishing a multi-dimensional and scientific evaluation system. Starting from the four dimensions of teaching attitude, implementation, academic literacy and teaching development, this study constructs a systematic evaluation index for public physical education teachers in colleges and universities. Based on the BP neural network and the least squares support vector machine (LSSVM) algorithm, it can process large-scale, multi-type complex data and improve the scientificity and accuracy of the evaluation. Compared with traditional methods, this model better solves the problems of data imbalance and single evaluation results. By integrating process data and result data, it dynamically tracks the diverse performance of teachers in the teaching process, provides real-time feedback and precise guidance for teacher development, and helps the high-quality development of public sports teaching staff in colleges and universities.

ISSN 2618-1576 Vol. 7, Issue 4: 93-100, DOI: 10.25236/FSR.2025.070415

3.5 Optimization Path for the Construction of Basic Smart Sports Facilities

The development of smart sports cannot be separated from solid infrastructure support. In the process of promoting smart sports teaching, colleges and universities need to work simultaneously on both hardware and software. On the one hand, intelligent sports venues should be improved, and a large-scale comprehensive system integrating AI visual recognition, sports data collection and real-time feedback should be built. Through front-end intelligent cameras, AI algorithms and big data analysis, real-time monitoring and analysis of multiple projects, multiple students and the entire cycle can be achieved. For example, the AI smart sports system can support simultaneous tracking of a variety of projects such as sit-ups, pull-ups, running, basketball poles, etc., providing efficient assistance for regular courses and special tests. On the other hand, the promotion of smart wearable devices, such as smart bracelets and smart insoles, facilitates the collection of core physiological indicators such as heart rate, cadence, and calorie consumption, realizes the full-process monitoring and feedback of students' physical condition, and helps teachers adjust the training load scientifically.

3.6 Student-centered Practice of Precision Teaching

The precision teaching concept enabled by AI integrates "student-centered" throughout all aspects of physical education courses. Before class, teachers use the AI system to collect students' multi-dimensional data such as physical fitness, health, and interests, and make accurate portraits, and reasonably set stratified teaching goals and tasks based on individual differences. In class, smart devices provide real-time feedback on students' exercise status, and teachers can dynamically adjust teaching strategies, taking into account safety and training effectiveness, and optimizing classroom rhythm and content. After class, with the help of digital teaching platforms, students can obtain customized training suggestions and after-class tasks. AI continues to track extracurricular exercise data, realizing full-scene and full-process intelligent guidance from classroom to after-class, truly implementing students' personalized development needs, and enhancing the role of physical education courses in promoting students' all-round growth.

4. Results and Discussion

4.1 Experimental Subjects

A total of 180 college students aged 18-21 years old enrolled in the 2025 public physical education course of a certain university were selected as the experimental subjects and randomly divided into:

The experimental group (90 people) adopted the AI smart physical education teaching model;

The control group (90 people) adopted the traditional physical education teaching model.

Ten public physical education teachers of the school were selected as the teacher sample, who participated in the intelligent teaching system training and assisted the teaching of the experimental group.

4.2 Experimental Methods

(1) Teaching model

The experimental group introduced smart wearable devices (heart rate bracelets), AI sports data platforms, and smart physical examination systems to carry out smart sports courses with data feedback, dynamic adjustment, and personalized push as the core. The teaching stage adopted the "AI monitoring + VR scenario + OMO hybrid teaching" model.

The control group adopted a conventional classroom teaching model, with teachers' subjective guidance, unified exercise content, and regular assessment as the main focus.

(2) Teaching cycle

The experimental cycle is a full semester (16 weeks), with a course frequency of 2 times a week, each time for 90 minutes. Physical fitness tests, skill tests, and psychological feedback surveys were conducted before and after the experiment.

ISSN 2618-1576 Vol. 7, Issue 4: 93-100, DOI: 10.25236/FSR.2025.070415

4.3 Experimental Process

Pre-test phase:

Collect students' basic physical data (BMI, heart rate, 50m run, sit-ups, etc.)

Complete the pre-test questionnaire on learning interest and learning attitude.

Teachers conduct digital teaching competency assessment.

Intervention phase (16 weeks):

The experimental group conducts AI smart sports teaching, and the system records the data of the whole process.

The control group teaches according to the original regular teaching plan.

Collect phase data every 4 weeks (sports skills, psychological feedback).

Post-test phase:

Physical fitness and sports skills tests were conducted again.

Teachers conducted post-test evaluation of teaching ability.

4.4 Data Analysis

This study set experimental indicators from four dimensions: student sports performance, learning feedback, teacher teaching ability, and AI system use, to comprehensively evaluate the actual effectiveness of AI-enabled public physical education in colleges and universities.

Table 1: Comparison of changes in student sports performance (pre-test vs. post-test)

Student ID	1	2	3	4	...
Group	Experimental Group	Experimental Group	Control Group	Control Group	...
50m Sprint (s) Pre-test	8.2	8.6	8.3	8.5	...
50m Sprint (s) Post-test	7.5	7.9	8.1	8.3	...
Heart Rate Recovery (bpm) Pre-test	38	40	39	41	...
Heart Rate Recovery (bpm) Post-test	32	34	37	39	...
Sit-ups (reps/1 min) Pre-test	30	28	29	27	...
Sit-ups (reps/1 min) Post-test	39	36	31	30	...

According to the data in Table 1, after one semester of teaching intervention, the sports performance of students in the experimental group and the control group has improved to varying degrees, but there are obvious differences in the extent of improvement. First, in terms of 50-meter running speed, the average time of the experimental group students dropped from 8.2 seconds and 8.6 seconds to 7.5 seconds and 7.9 seconds, respectively, with an average improvement of 0.7 seconds, and the speed has increased significantly. The control group only dropped from 8.3 seconds and 8.5 seconds to 8.1 seconds and 8.3 seconds, with an average improvement of 0.2 seconds, which is a small improvement. Secondly, in terms of heart rate recovery ability, the experimental group students dropped from 38 and 40 times/minute to 32 and 34 times/minute, and the recovery speed of cardiopulmonary function increased, with a more significant difference. The control group dropped from 39 and 41 to 37 and 39 times/minute, with limited improvement. Thirdly, in terms of core strength of sit-ups, the experimental group increased from 30 and 28 times to 39 and 36 times, with an average increase of more than 8 times; the control group only increased from 29 and 27 times to 31 and 30 times, with an average increase of less than 4 times. Overall, the experimental group using AI intelligent teaching intervention showed a better improvement trend in the three indicators of speed, cardiopulmonary endurance and core strength, indicating that personalized training assisted by artificial intelligence can more effectively promote the overall improvement of students' physical fitness.

As can be seen from Figure 1, the students in the experimental group are significantly better than those in the control group in terms of satisfaction and participation in physical education. Specifically, the experimental group's average score for "I like the current physical education teaching mode" is 4.58, while the control group's score is 3.74, with a significant difference ($p=0.002$), indicating that the AI-enabled teaching model can better meet students' psychological expectations and needs. In terms of "I feel the PE content matches my needs", the experimental group scored 4.42, which was significantly

ISSN 2618-1576 Vol. 7, Issue 4: 93-100, DOI: 10.25236/FSR.2025.070415

higher than the control group's score of 3.66 (p=0.009), reflecting that intelligent personalized teaching is more targeted in course design. In the score of teachers' teaching methods to stimulate interest, the experimental group also led (4.60 vs 3.70, p=0.001), indicating that intelligent feedback and interactive teaching have improved students' enthusiasm for classroom participation. In addition, students' cognitive clarity of their own physical fitness status scored the highest in the experimental group (4.51 vs 3.45, p<0.001), reflecting the role of intelligent monitoring technology in promoting students' self-management ability. Finally, the experimental group scored 4.33 in terms of willingness to exercise independently after class, which was significantly higher than the control group's 3.38 (p=0.012), indicating that AI-assisted personalized guidance effectively stimulated students' initiative in extracurricular exercise. The overall results show that the integration of AI and IoT technology not only improves teaching satisfaction, but also significantly promotes students' enthusiasm and initiative in physical education learning.

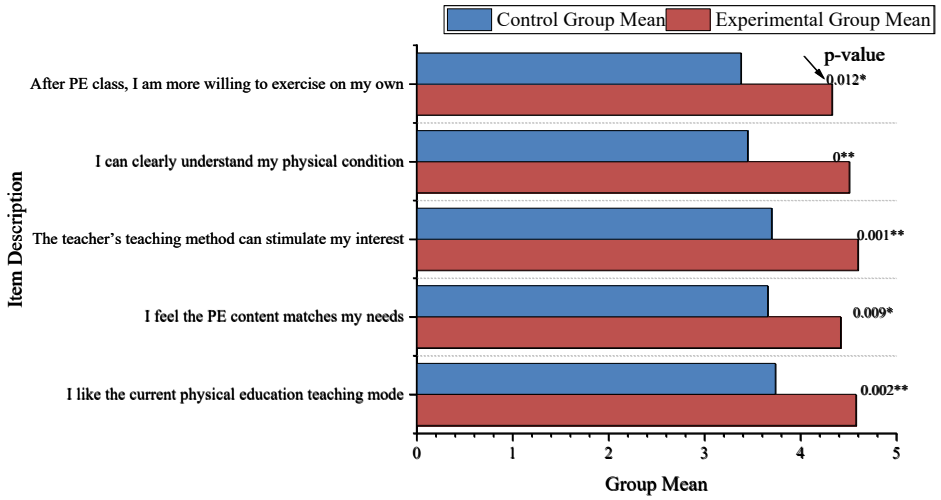

Figure 1: Student learning feedback survey

Note: * p < 0.05, ** p < 0.01

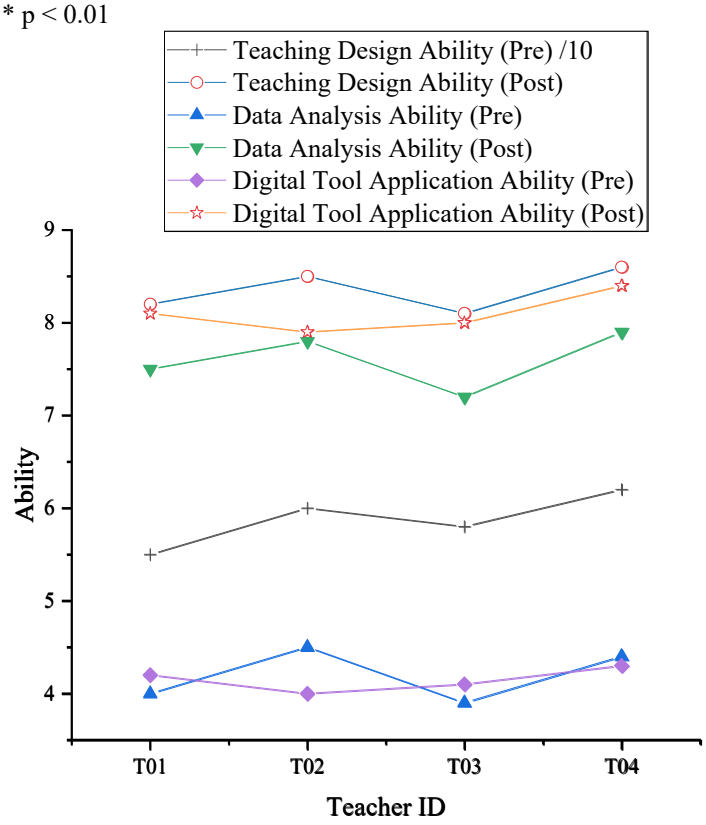

Figure 2: Evaluation form of changes in teachers' teaching ability (pre- and post-test)

The data in Figure 2 shows that after training and application of AI-assisted teaching, the teaching

ISSN 2618-1576 Vol. 7, Issue 4: 93-100, DOI: 10.25236/FSR.2025.070415

ability of teachers participating in the experiment has significantly improved in multiple dimensions. Specifically, the teaching design ability has increased significantly from an average of 5.88 points in the pre-test to an average of 8.35 points in the post-test, indicating that teachers have made significant progress in designing personalized, data-driven course plans. In terms of data analysis ability, teachers' scores increased from an average of 4.2 to 7.6, reflecting that teachers' understanding and application of students' sports and learning data have been greatly enhanced, which helps to accurately adjust teaching strategies. The ability to use digital tools has also improved significantly, from an average of 4.15 points in the pre-test to 8.1 points in the post-test, indicating that teachers' mastery of smart sports-related software and hardware has made a qualitative leap. These changes not only improve teachers' digital competence, but also promote the transformation of public physical education in colleges and universities towards intelligence and precision, improving teaching quality and student experience. Overall, the improvement of teachers' professional capabilities enabled by AI technology has laid a solid foundation for the sustainable development of smart physical education.

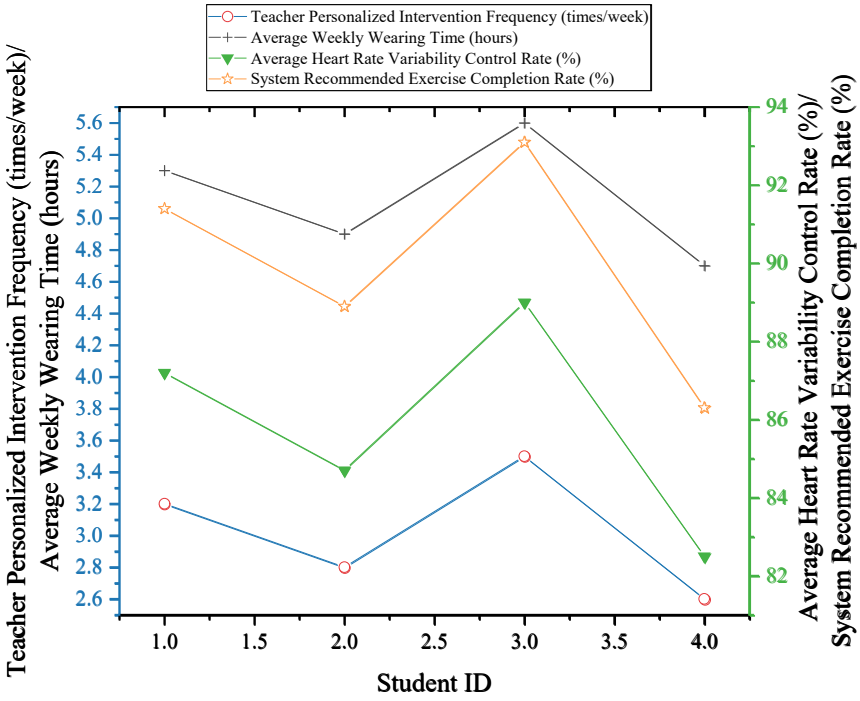

Figure 3: AI system usage frequency and teaching intervention record table (experimental group)

The data in Figure 3 show that the students in the experimental group are active in the frequency of use of the intelligent sports system and teaching intervention. The average weekly wearing time of students is about 5 hours, indicating that the usage rate of smart wearable devices is high, which can ensure the continuous collection and real-time monitoring of sports data. The average heart rate fluctuation control rate is maintained between 82.5% and 89.0%, reflecting that the students' exercise intensity is reasonably regulated under the guidance of the AI system, avoiding excessive fatigue and improving training effects. The completion rate of the exercises recommended by the system is generally high, averaging between 86.3% and 93.1%, indicating that the execution of personalized training programs is strong and helps students achieve differentiated goals. The number of personalized interventions by teachers remains at 2.6 to 3.5 times per week, reflecting that teachers actively use intelligent data to guide students to adjust their training plans and enhance teaching interaction and pertinence. Overall, the AIoT-integrated intelligent sports system has effectively promoted the standardization of students' sports behaviors and the precision of teachers' teaching, and promoted the intelligent upgrade of public physical education in colleges and universities.

5. Conclusions

This paper systematically introduces the integration technology of artificial intelligence and the Internet of Things to build a smart sports teaching model that integrates "intelligent perception, dynamic analysis, precise feedback, and continuous intervention" based on the actual needs of public physical education curriculum reform in colleges and universities. Through multiple technical means

ISSN 2618-1576 Vol. 7, Issue 4: 93-100, DOI: 10.25236/FSR.2025.070415

such as smart wearable devices, AI algorithm analysis, VR/AR scenario teaching, and OMO hybrid classroom, the dynamic tracking of students' sports performance, physical and mental state, and learning feedback is realized. Although this study has achieved positive results in improving teaching effectiveness and the intelligence of the evaluation system, there are still certain limitations. First, the sample size of the experiment is relatively limited, mainly concentrated in a single university, lacking extensive verification in different regions and different disciplinary backgrounds; second, the deep intelligent intervention of AIoT technology, such as emotion recognition and detailed identification of sports skills, still needs to be further improved. Future research can continue to expand in terms of expanding sample coverage, enriching personalized intervention paths, and improving the adaptive intelligence level of AI systems, so as to provide more solid technical support and practical guidance for the reform of public physical education courses in colleges and universities.

Acknowledgements

This work was sponsored in part by (1)Research project on teaching reform of ordinary colleges and universities in Hunan Province(HNJG-2022-0225), (2) Research Project on Ideological and Political Education in Hunan Provincial Colleges and Universities, 2024 (24SZ37).

References

[1] Alfrey L, O'Connor J. Transforming physical education: an analysis of context and resources that support curriculum transformation and enactment [J]. Physical Education and Sport Pedagogy, 2024, 29(1): 1-17.

[2] Alfrey L, Lambert K, Aldous D, et al. The problematization of the (im) possible subject: An analysis of health and physical education policy from Australia, USA and Wales [J]. Sport, education and society, 2023, 28(4): 353-368.

[3] Calderón A, MacPhail A. Seizing the opportunity to redesign physical education teacher education: Blending paradigms to create transformative experiences in teacher education [J]. Sport, Education and Society, 2023, 28(2): 159-172.

[4] Tolgfors B, Barker D. The glocalization of physical education assessment discourse [J]. Sport, Education and Society, 2023, 28(1): 1-16.

[5] Popel S, Mazin V, Maksymchuk B, et al. Network Planning at the Faculties of Physical Education and Sport in the Postmodern Era[J]. Brain. Broad Research in Artificial Intelligence and Neuroscience, 2023, 14(1): 554-570.

[6] Tanure Alves M L, Van Munster M A, Alves I S, et al. The 'normal'physical education classes: The ableism facing the inclusion of disabled students [J]. Disability & Society, 2024, 39(2): 469-484.

[7] Isgren Karlsson A, Alatalo T, Nyberg G, et al. Exploring physical education teachers' perceptions and attitudes towards digital technology in outdoor education [J]. Journal of Adventure Education and Outdoor Learning, 2023, 23(4): 510-524.

[8] Ferraz R, Branquinho L, Sortwell A, et al. Teaching models in physical education: current and future perspectives[J]. Montenegrin Journal of Sports Science and Medicine, 2023, 19(1): 53-60.

[9] Alfrey L. An expansive learning approach to transforming traditional fitness testing in health and physical education: Student voice, feelings and hopes [J]. Curriculum Studies in Health and Physical Education, 2024, 15(1): 24-39.

[10] Wibowo J, Krieger C, Gaum C, et al. Bildung: A German student-centered approach to health and physical education [J]. European Physical Education Review, 2023, 29(2): 233-250.

[11] Lundvall S, Fröberg A. From individual to lifelong environmental processes: Reframing health in physical education with the sustainable development goals [J]. Sport, Education and Society, 2023, 28(6): 684-696.