

The Development Connotation and Three-Dimensional Construction of College Sports from the Perspective of Smart Campus

Wei Fan

School of Sport Law, Shanghai University of Political Science and Law, Shanghai, China

Abstract: In the era of profound advancement in educational digital transformation and smart campus construction, the drawbacks of traditional college physical education teaching, venue operation and maintenance, and physical fitness assessment models have become increasingly prominent. Smart upgrading has become an inevitable trend for the high-quality development of college physical education. Based on the context of smart campus construction and combined with the current development status of smart sports in colleges and universities at home and abroad, this paper clarifies the value core and development logic of smart sports in colleges and universities in the new era. It focuses on three core dimensions: smart venues, smart courses, and smart physical fitness assessments to define their development connotations. It builds a three-tier architecture of bottom-level hardware, middle-level talents, and upper-level systems to construct a three-dimensional development system for college physical education, addressing the current challenges of fragmented, homogenized, and inefficient digital construction in college physical education. The research aims to enrich the theoretical system of digital reform in college physical education, providing practical paths and theoretical support for the intelligent transformation of college physical education, the improvement of educational effectiveness, and the modernization of physical education development.

Keywords: Smart Campus; College Sports; Development Connotation; Three-Dimensional Construction; Sports Digitization

1. Introduction

The "Strategic Action for Digitalization of Education" issued by the Ministry of Education clearly states that digital technology should be used to empower educational and teaching reforms, comprehensively promote the construction of smart campuses, optimize the allocation of educational resources, innovate educational development models, and enhance the quality of higher education in nurturing talents. At the same time, the "Opinions on Comprehensively Strengthening and Improving School Physical Education in the New Era" emphasizes the need to innovate traditional school physical education development models, optimize the sports resource supply system, improve the management mechanism of students' physical health, and consolidate the core position of physical education in cultivating moral character and nurturing talents. Under the dual policy guidance, the construction of smart campuses has become the core focus for the transformation and upgrading of various disciplines in universities, and it has also provided a new breakthrough path for the innovative development of traditional university physical education [1,2].

At the assessment level, the manual physical assessment process is cumbersome and has significant errors, and annual single assessment cannot reflect the dynamic changes in students' physical fitness. At the management level, there is a lack of digital and refined management methods, resulting in insufficient precision in sports education and weak service efficiency. The traditional development model of university sports has been unable to adapt to the core requirements of high-quality development in higher education in the new era, and reform and upgrading are imminent.

With digital technology as its core support, a smart campus can achieve intelligent integration of campus resources, precise collection of teaching data, efficient provision of public

services, and intelligent upgrading of management systems. It completely breaks down the spatial and temporal barriers and resource limitations of traditional campus education, providing a mature technological carrier and development platform for the reform and innovation of college sports. Under the empowerment of a smart campus, college sports have completely shaken off the traditional limitations of single classroom teaching and offline sports training, and built a new sports ecosystem integrating intelligent teaching, intelligent operation and maintenance, intelligent evaluation, intelligent services, and intelligent management. Based on this, this article, from the perspective of the development of a smart campus, sorts out the development experience of smart sports in colleges and universities at home and abroad, deeply explores the new development connotation of college sports, and addresses the current issues of fragmented and superficial development in domestic smart sports construction. It proposes a multi-level three-dimensional development system and targeted optimization paths to promote the comprehensive transformation of college sports from "traditional experience-based" to "digital smart-based", and to assist in the high-quality and sustainable development of college sports [3,4].

2. Current Development Status of Smart Sports in Domestic and Foreign Universities

2.1 Current Development Status Abroad

Developed countries such as Europe, America, Japan, and South Korea have mature digital technology development and an early start in the construction of higher education informatization. The construction of smart campuses and smart sports in universities has gradually taken off since the beginning of the 21st century. After more than two decades of iterative development, a development pattern has been formed, featuring deep technology integration, a comprehensive and robust system, full coverage of application scenarios, and mature support mechanisms. This has achieved comprehensive and deep integration of digital technology with university physical education teaching, venue operations, health management, event services, and scientific research innovation. In the field of smart venue construction, foreign universities have completely phased out

traditional manual management models and established a fully integrated intelligent venue operation and maintenance system. Renowned universities such as Harvard University, Stanford University, and the University of Tokyo in Japan have leveraged Internet of Things (IoT), intelligent sensing, and AI visual recognition technologies to achieve intelligent management of the entire process of sports venues, encompassing multiple functions such as venue reservation, crowd monitoring, equipment operation and maintenance, energy consumption regulation, safety warning, and environmental optimization. The system can intelligently allocate resources based on the sports needs of teachers and students as well as the frequency of venue usage, dynamically regulating the water, electricity, lighting, and ventilation equipment in the venues. While improving the utilization rate of venue resources by over 30%, it significantly reduces operation and maintenance energy consumption and safety risks, achieving refined, low-carbon, and intelligent development of venue operations. Additionally, data collection terminals deployed throughout the venues can record sports data of teachers and students in real time, providing massive data support for physical education teaching optimization, health management, and academic research.

In the field of smart curriculum development, foreign universities have taken the lead in achieving personalized, scenario-based, and digital teaching transformation, completely breaking the "one-size-fits-all" teaching drawbacks of traditional physical education classrooms. Relying on digital technologies such as virtual reality, motion simulation, and 3D dynamic modeling, they have built a diversified teaching scenario that integrates online and offline elements, transforming various sports projects into visual and interactive digital teaching resources. At the same time, relying on big data algorithms, they have constructed personal sports portraits of students, accurately analyzing students' physical fitness foundation, sports weaknesses, interest preferences, and physical adaptability, and customizing personalized course content and training programs for students based on their stratification and classification. In addition, foreign universities have established a cross-border sports resource sharing platform, integrating high-quality physical education teaching resources from around the world,

achieving collaborative development of physical education teaching between schools and internationally, greatly enriching the content and educational forms of physical education teaching [5,6].

In the field of intelligent physical fitness assessment and health management, foreign universities have established a full-cycle, normalized, and precise student health management system. Through campus-wide unobtrusive data collection devices and student smart wearable terminals, data such as students' exercise duration, intensity, physical fitness indicators, and physical state are collected around the clock, establishing a dynamic health archive that covers the entire student's time at school. The system conducts in-depth analysis through big data to accurately identify students' physical weaknesses and sports health risks, automatically pushing personalized training plans, dietary advice, and health intervention strategies, truly realizing a closed-loop education from "physical fitness assessment" to "health empowerment". Overall, foreign universities have mature technology and a well-established system for intelligent sports construction, but there are issues such as insufficient localization and adaptation of technology, lack of humanistic sports education, and over-reliance on digital technology weakening teacher-student interaction.

2.2 Current Domestic Development Status

The construction of smart sports in domestic universities has closely followed the national digital development strategy for education and entered a rapid advancement phase over the past decade. Driven by policy guidance, technological iteration, and educational reforms, major universities in China have gradually embarked on the digital upgrade of the sports sector. They have successively carried out intelligent renovations of sports venues, developed online quality sports courses, updated intelligent physical testing equipment, and established smart sports service platforms. The development concept of smart sports has gradually become popular, application scenarios have continued to be enriched, and a development trend featuring technology empowerment and scenario expansion has initially taken shape [7].

Domestic "Double First-Class" universities and key undergraduate institutions have taken the

lead in carrying out pilot projects for smart sports, resulting in a number of practical achievements that can be referenced. Tsinghua University and Peking University have established an integrated smart sports service platform, integrating multiple functions such as venue reservation, online courses, physical fitness test inquiry, exercise check-in, and health consultation, achieving digital integration of sports services. Guangxi University of Science and Technology has completed the intelligent transformation of all sports venues on campus, deploying AI gait recognition and non-sensory data collection equipment to enable students to conduct physical fitness tests independently and automate sports data collection, significantly improving the efficiency of sports work.

However, from the perspective of overall national development, the construction of smart sports in Chinese universities is still in the initial exploratory stage, and a systematic and integrated mature development system has not yet been formed. There are many prominent shortcomings. Firstly, the problem of fragmented construction is prominent. Most universities only focus on single equipment procurement and single scene transformation. The three core scenes of smart venues, smart courses, and smart physical fitness testing are isolated from each other, with inaccessible data, unintegrated resources, and independent systems, making it difficult to form a collaborative educational force. Secondly, the level of data utilization is relatively shallow. Most universities only achieve basic collection and simple statistics of sports data, lacking in-depth mining and value transformation of massive sports data, teaching data, and physical fitness data. The core advantages of data-based education and data empowerment have not been fully utilized. Thirdly, talent support is weak. Most physical education teachers have solid sports teaching abilities, but they lack sufficient digital teaching, intelligent equipment operation, and big data analysis capabilities. At the same time, there is a lack of professional smart sports technology operation and maintenance talents, resulting in a large number of intelligent equipment and digital platforms being idle and wasted. Fourthly, institutional guarantees are lagging behind. Most universities have not introduced special management systems, evaluation systems, and incentive mechanisms that are suitable for the development of smart

sports. The construction of smart sports presents short-term and formalized characteristics, lacking long-term development momentum.

2.3 Comparative Analysis of Domestic and International Development Status

To precisely identify the shortcomings in the development of smart sports in domestic universities and clarify the gap between

domestic and international development, this article conducts a systematic comparison of the current development status of smart sports in universities both domestically and internationally, focusing on five core aspects: construction dimensions, technology application, data utilization, talent allocation, and institutional guarantees. The specific details are shown in the Table 1.

Table 1. Comparison of the Current Development Status of Smart Sports Programs between Domestic and Foreign Universities

Comparison Dimension	The Development of Smart Sports in Foreign Universities	The Development of Smart Sports in Domestic Universities
Development Dimension	Integrated development, achieving deep integration of venues, courses, and physical fitness assessments, with coordinated advancement across the entire system.	The development is fragmented, with each dimension evolving independently, resulting in insufficient synergy and overall coherence among scenarios.
Technology Application	AI, VR, big data, and the Internet of Things are fully deployed across all domains, providing intelligent coverage in every scenario.	Basic intelligent technologies are widely adopted, whereas high-end digital technologies have limited practical applications.
data utilization	Deeply leverage data value to comprehensively support personalized teaching and precise health management.	The focus is primarily on basic data collection and statistics, with insufficient in-depth data analysis and value utilization.
Talent Acquisition	A dedicated technical operations team combined with versatile physical education teachers, ensuring a well-balanced talent composition and high professional expertise.	Physical education teachers lack adequate digital literacy, and there is a severe shortage of professionals with specialized expertise in sports operation and maintenance.
institutional guarantee,	The supporting management systems, evaluation frameworks, incentive mechanisms, and safeguard mechanisms are well-established and mature.	The supporting systems are lagging and inadequate, lacking targeted management, evaluation mechanisms, and long-term safeguard measures.

3. Core Development Connotation of College Sports from the Perspective of Smart Campus

University sports empowered by smart campuses represent a new development form that deeply integrates digital technology with physical education. It completely overturns the traditional development model of sports, which emphasizes skills over literacy, results over process, and uniformity over differentiation, and reconstructs the educational logic and development connotation of university sports. In the new era, smart sports in universities are supported by digital technology, centered on precise education, guided by comprehensive services, and aimed at health empowerment. They form a core development system that integrates smart venues, smart courses, and smart physical fitness tests, achieving comprehensive upgrades in university

sports teaching, services, management, and education.

3.1 Smart Venues: Sports Service Carriers Featuring Resource Intensification and Intelligent Operation and Maintenance

Smart venues serve as the physical foundation for the construction of smart sports in universities. They are the core scenarios for the implementation of smart courses, smart physical fitness testing, and student-led sports activities. Additionally, they are the primary carrier for the application of smart campus technology in the sports field. Compared to the drawbacks of traditional sports venues, such as inefficient manual management, imbalanced resource allocation, extensive operation and maintenance, and energy waste, smart venues leverage Internet of Things (IoT), intelligent sensing, and

AI visual monitoring technologies to achieve comprehensive intelligent upgrades in venue resources, equipment operation and maintenance, and scenario services. The core essence of these upgrades is reflected in three aspects: resource intensification, intelligent operation and maintenance, and digitalization of scenarios. Intensive resource allocation is the fundamental function of smart venues. The core advantage of smart venues lies in the intelligent upgrade of operation and maintenance. The digital extension of scenes represents a value upgrade for smart venues [8,9].

3.2 Smart Courses: A Core Platform for Education with Precise Teaching and Diversified Modes

Smart courses serve as the core vehicle for universities to fulfill the fundamental task of cultivating students' moral character.

The core essence of smart courses lies in the precision of teaching content. Leveraging big data technology, smart courses integrate students' physical fitness data upon enrollment, classroom learning data, daily exercise data, and physical change data. This integration allows for the precise construction of a portrait of students' physical education literacy, clearly identifying each student's physical shortcomings, sports weaknesses, and interest preferences. Based on individual differences among students, layered and categorized teaching is implemented. Physical fitness improvement courses are set up for students with weak foundations, specialized skill courses for students with a sports foundation, and adaptive fitness courses for students with special physical conditions. This approach completely breaks the "one-size-fits-all" teaching model, truly achieving individualized teaching and precise education.

Diversified teaching modes are the core feature of smart courses. Smart courses construct an integrated teaching mode of "online autonomous learning + offline practical teaching + virtual simulation training", breaking the spatial and temporal constraints of traditional teaching. Offline classes focus on practical training, movement correction, and collective guidance to consolidate students' sports foundation; online cloud platforms integrate resources such as quality courseware, movement demonstrations, and event popularization, supporting students to preview, review, and improve independently

anytime and anywhere; virtual simulation technology is applied to the teaching of high-risk and complex sports projects, building immersive teaching scenarios, avoiding safety risks in offline teaching, and enriching the scenarios and forms of physical education teaching.

Scientific teaching evaluation is a crucial guarantee for smart courses. Smart courses abandon the traditional single-ended summative evaluation model and establish a comprehensive evaluation system that is multi-dimensional, whole-process, and dynamic. The system automatically integrates quantitative data such as student classroom attendance, classroom performance, daily exercise check-ins, physical fitness improvement, skill mastery, and autonomous learning, and combines it with qualitative evaluations from teachers to form an evaluation result that emphasizes both process and outcome, and combines quantitative and qualitative evaluation. This comprehensively and objectively reflects students' physical education literacy and growth trend, fully leveraging the motivating and guiding role of evaluation.

3.3 Smart Physical Fitness Testing: A Digitalized Assessment and Whole-Life Health Management System

Smart physical fitness testing serves as a crucial support for physical health education in colleges and universities. It represents the core approach to implementing student physical health monitoring and promoting campus fitness for all. Traditional college physical fitness testing, primarily relying on manual operations, faces issues such as cumbersome processes, significant errors, low efficiency, data lag, and short monitoring cycles.

Firstly, the process of physical fitness testing has been digitized and standardized. Smart physical fitness testing relies on fully automated intelligent physical fitness testing equipment and AI-based seamless data collection system, comprehensively covering all testing items stipulated in the National Physical Fitness and Health Standards. The entire process achieves automated testing, automatic data collection, real-time uploading, and intelligent statistics, completely eliminating errors caused by manual operations.

Secondly, health monitoring should be normalized and cover the entire cycle. Smart physical fitness testing breaks the limitations of

traditional annual single-time assessments and establishes a normalized physical fitness monitoring system that spans the entire four-year college life of students. Through campus-wide data terminals and smart wearable devices, it continuously tracks students' daily exercise status, physical fitness changes, and physical fitness fluctuations. It creates dynamically updated personal health records, enabling the entire process of students' physical fitness to be monitored, traced, and analyzed, and accurately grasping the development patterns of students' physical fitness.

Thirdly, health guidance is personalized and precise. The core value of smart physical fitness testing lies in data-enabled health management. The system deeply analyzes students' physical weaknesses, sports risks, and health hazards through big data algorithms, and customizes personalized physical fitness improvement plans, sports training plans, and health conditioning suggestions for students. At the same time, it provides data support for teachers to adjust teaching priorities and optimize teaching plans, and provides scientific basis for schools to improve campus sports systems and optimize the atmosphere of national fitness, truly realizing the transformation from "passive evaluation" to "active health management" [10].

4. The Three-Dimensional Construction System of College Physical Education from the Perspective of Smart Campus

Based on the core development connotation of smart sports, and taking into account the current development status both domestically and internationally, as well as the pain points in domestic construction, this paper adheres to the principles of integrity, collaboration, and practicality. It constructs a three-dimensional construction system comprising "underlying hardware support, mid-level talent empowerment, and upper-level institutional guarantee". The three-tier architecture progresses layer by layer, collaborates with each other, and is indispensable. The underlying hardware lays a solid physical foundation, the mid-level talent activates development momentum, and the upper-level institutions provide long-term guarantees, jointly building a comprehensive, integrated, and sustainable development pattern for smart sports in universities.

4.1 Underlying Hardware Layer: Laying a Solid Foundation for the Digital Development of Smart Sports

The underlying hardware serves as the physical foundation for the implementation of all scenarios and functionalities in smart sports. The level of perfection, standardization, and integration of hardware facilities directly determines the overall quality of smart sports construction. In response to the current issues of scattered hardware construction, incompatible equipment, and unconnected data in domestic universities, it is necessary to comprehensively promote the upgrading of hardware across the entire domain and build a fully covered, standardized, and integrated hardware support system.

Firstly, we will promote the intelligent upgrade of all sports venues. Standardized smart renovations will be carried out for all sports venues such as campus track and field fields, gymnasiums, ball fields, and fitness centers. AI visual recognition, intelligent sensing, crowd monitoring, safety warning, and energy consumption control equipment will be deployed across the entire area. A fully automated venue operation and maintenance system will be established to achieve comprehensive intelligence in venue management, equipment operation and maintenance, environmental control, and safety protection, creating a digital smart sports scenario. Secondly, we will equip ourselves with standardized smart physical fitness testing equipment. Fully automated and unobtrusive testing equipment will be configured in strict accordance with national physical fitness testing standards. An integrated indoor and outdoor smart physical fitness testing scenario will be established to meet the needs of routine physical fitness monitoring and centralized physical fitness testing, ensuring accurate and efficient collection of physical fitness testing data.

Meanwhile, we will improve the digital network infrastructure, achieve full coverage of 5G networks and the Internet of Things in campus sports areas, optimize network transmission speed and stability, and address technical issues such as data transmission stuttering, delay, and disconnection, ensuring real-time uploading and synchronous updating of massive sports data. Finally, we will unify the standards for data collection terminals across the entire domain, integrate various data ports such as venue

equipment, physical fitness testing instruments, smart wearables, and classroom monitoring, break down barriers between device data, and achieve unified collection and interconnection of sports data across all scenarios, providing precise and complete data support for talent application and institutional implementation.

4.2 Middle-Level Talent Layer: Activating the Momentum for High-Quality Development of Smart Sports

Talent is the core driving force behind the construction of smart sports. The value of hardware equipment and digital technology is fully leveraged through the support of a professional and composite talent team. The core reasons for the current situation of smart sports construction in China, such as becoming a mere formality, equipment idleness, and technological waste, lie in the lagging talent team construction and insufficient digital sports literacy among teachers and students. To address this, comprehensive efforts should be made in three dimensions: teacher cultivation, operation and maintenance reserves, and literacy improvement, to activate the endogenous driving force of smart sports.

Firstly, cultivate a team of composite smart sports teachers. Addressing the shortcomings in digital capabilities of physical education teachers, we should establish a normalized teacher training mechanism, regularly conduct specialized training in smart curriculum design, intelligent equipment operation, big data analysis, virtual simulation teaching, etc., guide teachers to master digital teaching skills, and

4.3 Upper Institutional Level: Consolidating the Guarantee for the Long-Term Development of Smart Sports

The institutional system serves as the fundamental guarantee for the long-term and stable development of smart sports. It can standardize the construction process, unify development standards, activate the vitality of the main body, and address the current issues of fragmentation, disorder, and short-termism in the construction of smart sports. In combination with the actual development of college sports, four core institutions are established to form a comprehensive and long-term guarantee system. Firstly, establish a specialized management system for smart sports. Introduce specialized

promote the transformation of teachers from traditional skill-based to digital education composite. At the same time, we should build inter-school teaching and research, school-enterprise exchange platforms, encourage teachers to carry out research on smart sports teaching reform, and continuously enhance digital education capabilities.

Secondly, establish a professional technical operation and maintenance team. Through talent introduction, internal training, and collaborative education between schools and enterprises, reserve a group of professional technical talents proficient in the Internet of Things, big data, and platform operation and maintenance, who are specifically responsible for smart sports hardware maintenance, system upgrades, data operation and maintenance, security assurance, and other tasks. This will address the industry disorder of "emphasizing construction and neglecting operation and maintenance" and ensure the stable operation of the smart sports system.

Thirdly, enhance the digital sports literacy of teachers and students across the entire school. Conduct practical training and science popularization education on smart sports for students, guiding them to proficiently utilize smart sports resources for independent exercise and health management. Provide digital management training for sports management personnel, enhancing their ability to conduct refined and data-driven governance, and comprehensively strengthening the talent foundation for smart sports construction.

management measures for smart venue operation and maintenance, smart course construction, and smart physical fitness testing implementation, clarify operational standards, job responsibilities, and operational norms for each sector, so that all aspects of smart sports can be carried out in a well-regulated and standardized manner, eliminating issues such as blind construction, disorderly operation, and resource waste. Secondly, improve the diversified teaching evaluation system, reconstruct an evaluation system that is compatible with smart sports, establish a comprehensive evaluation mechanism that emphasizes both process and results, and combines quantitative and qualitative evaluation, comprehensively assess students' comprehensive physical literacy, and leverage the value of evaluation in educating

students.

Thirdly, we should establish a resource sharing and guarantee system. Relying on the smart campus platform, we should break down barriers within school scenarios and inter-school resource barriers, and establish a mechanism for the co-construction and sharing of sports courses, venues, and data resources, maximizing the educational value of smart sports resources. Fourthly, we should improve the long-term assessment and incentive system. We should incorporate the effectiveness of smart sports construction, teachers' digital teaching achievements, and students' participation in smart sports into the assessment and evaluation system, and establish special incentive mechanisms to fully mobilize the enthusiasm of teachers and students to participate in smart sports construction, ensuring the sustainable development of smart sports.

5. Optimization Paths for the Development of College Physical Education from the Perspective of Smart Campus

5.1 Promote the Integrated Development of Software and Hardware to overcome the dilemma of Fragmented Development

Addressing the current fragmented issues in university smart sports, such as emphasizing hardware over software, isolated scenarios, and disconnected data, we adhere to the concept of systematic and integrated construction, coordinating the advancement of hardware upgrades and software iterations. We abandon the extensive construction model of blind equipment procurement and scattered scenario transformation, and precisely arrange hardware facilities based on the school's scale and educational needs, ensuring that hardware equipment meets the actual demands of teaching, assessment, and management. Simultaneously, we prioritize upgrading the comprehensive smart sports service platform, breaking down data barriers across three major scenarios: smart venues, smart courses, and smart physical tests. This achieves interconnection and interoperability of data across all scenarios, resource sharing, and a comprehensive development pattern with full hardware coverage, integrated software, and seamless scenario integration, thoroughly resolving the fragmented development dilemma.

5.2 Deepen Industry-Education Integration and Talent Cultivation, and Build a Composite Talent Team

Focusing on industry-education integration and school-enterprise cooperation, we aim to address the shortage of smart sports talents. Universities proactively connect with sports technology enterprises and digital education research and development institutions, establishing long-term and stable cooperation mechanisms between schools and enterprises. Together, they build smart sports training bases, teaching reform platforms, and technology research and development centers. Leveraging advanced technologies and professional resources from enterprises, we provide platforms for teachers to engage in digital teaching research and technical practical training, continuously enhancing their smart teaching capabilities. We also cultivate professional operation and maintenance, and data management talents to fill the gap of professional talents within schools. Simultaneously, we establish a normalized teacher assessment and growth mechanism, using teaching and research exchanges, skill competitions, and teaching reform projects as platforms. Through competitions and research, we promote learning and advancement, continuously building a high-quality, composite team of smart sports talents.

5.3 Improve the Long-Term Evaluation Mechanism and Promote Quality and Efficiency Development

To prevent the construction of smart sports from becoming a mere formality with insufficient follow-up efforts, it is necessary to establish a long-term development mechanism featuring normalized operation, dynamic evaluation, and continuous optimization. Special funds for smart sports should be set up and included in the school's annual budget to ensure the funding needs for hardware iteration, software upgrades, talent training, and daily operation and maintenance. At the same time, a multi-dimensional quantitative evaluation system should be constructed, and regular assessments should be conducted from six dimensions: hardware operation and maintenance quality, curriculum construction effectiveness, physical fitness testing service level, resource utilization efficiency, educational outcomes, and system implementation status, to accurately identify construction shortcomings

and operational loopholes. A problem rectification and dynamic optimization mechanism should be established, combining policy updates, technological iteration, and changes in student demands, to continuously optimize smart sports scenarios, models, and systems, and promote the transformation and upgrading of smart sports in universities from basic construction to quality improvement and efficiency enhancement.

6. Conclusion

The in-depth advancement of smart campuses and educational digitization has provided new development opportunities for the reform and innovation of traditional college sports, completely reshaping the development model, core essence, and educational value of college sports. It has propelled college sports into a new stage of digitalization, intelligence, precision, and systematization. In the perspective of smart campuses in the new era, college sports, with smart venues as the service carrier, smart courses as the core of education, and smart physical fitness testing as the support for health, have formed a new three-in-one development essence, achieving comprehensive upgrades in sports resource intensification, teaching precision, scientific evaluation, and efficient management.

The three-dimensional construction system of "underlying hardware, middle-level talent, and upper-level system" established in this paper provides layered support and collaborative linkage, comprehensively covering the core elements of smart sports construction. It can effectively overcome the current bottleneck of digital transformation in university sports.

In the context of the new era, universities must adhere to the core essence of cultivating students' moral character and promoting health through sports. Guided by the digitalization strategy of education, they should continuously promote the integrated and coordinated construction of software and hardware, deepen the integration of industry and education in talent cultivation, improve the long-term evaluation and operation mechanism, continuously enrich the application scenarios of smart sports, deeply explore the value of digital technology in educating students, and perfect the development system of smart sports. Through systematic smart reforms, universities should comprehensively enhance the quality of sports

education and service efficiency, and fully leverage the important supporting role of university sports in students' comprehensive development, promoting national fitness, and building a strong sports nation.

References

- [1] Zhao Gang. Research on the Application of Internet of Things Technology in the Management of Smart Sports Venues in Colleges and Universities. *Sports Science and Technology*, 2022(04): 112-114.
- [2] Wang Ping, Wu Junjie. Smart Sports: Technology as a Tool, Culture as a Medium - Exploring the Practice of Smart Sports in Colleges and Universities in the New Era. *Journal of Physical Education Research in Colleges and Universities*, 2025(11): 45-48.
- [3] Li Juan. Research on the Construction of a Smart Sports Service System in Colleges and Universities Empowered by Digital Technology. *Sports World*, 2024(02): 78-80.
- [4] Zhang Feng. The Path of Smart Transformation of Physical Education in Colleges and Universities in the Context of New Productivity. *China Higher Education*, 2025(06): 62-64.
- [5] Liu Yang. Research on the Transformation of Campus Sports Scenarios Empowered by AI+ Sports. *Shaanxi Education*, 2026(04): 36-38.
- [6] Chen Liang. Research on the Innovation and Practice of Physical Education Teaching Mode in Colleges and Universities under the Background of Smart Campus. *Sports Perspective*, 2023(18): 92-94.
- [7] Wang Mingyuan. The Practical Dilemmas and Optimization Paths of Smart Sports Construction in Colleges and Universities. *Contemporary Sports Technology*, 2024(10): 167-169.
- [8] Zhao Tianrui. Research on the Path of Improving Digital Literacy of Physical Education Teachers. *Physical Education Teacher Training*, 2025 (01): 78-83.
- [9] Sun Jiaqi. Exploration of Privacy and Security Management Strategies for Campus Sports Big Data. *Education Data Security*, 2024 (03): 45-50.
- [10] Han Wenjie. Research on the Integration of Artificial Intelligence into College Sports Training Teaching Practice. *College Sports Research*, 2025 (02): 90-95.