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Research on the Digitization Transformation of University Physical Education

Huang Xia

Jianghan University, Wuhan, 430056, China

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Abstract: Currently, China is steadily advancing its education digitization strategy and the construction of a healthy China, two important projects. Big data, artificial intelligence, the Internet of Things, VR/AR and other digital technologies are fundamentally changing the classroom scenarios, assessment forms and management systems of university physical education. This article analyzes the value of the digital transformation of university physical education, summarizes the constraints it faces in the digital transformation, and builds a digital sports operation framework based on this. It proposes a transformation path from the aspects of top-level institutional design, software and hardware platform construction, teacher capacity cultivation, and data security governance. I hope to promote the transformation of university sports from traditional large-scale and template based teaching models, gradually creating personalized, precise, and comprehensive sports education models, and providing corresponding references for the high-quality development of sports education in major universities.

1. Introduction

University physical education is a core course in the education system of universities, which not only helps to implement the fundamental task of cultivating morality and nurturing people, but also effectively protects students' physical and mental health, helps students develop a good awareness of lifelong participation in sports, and plays an irreplaceable role in improving the physical fitness of contemporary youth and shaping students' sound personal character. Traditional university physical education teaching mainly adopts the form of unified class teaching, which is limited by many factors such as venue conditions, number of teachers, teaching time, etc., making it difficult for teachers to take into account the real situation of each student; In terms of physical fitness assessment, the main reference is the one-time final test results, and there is no continuous follow-up and recording of complete data on students' independent exercise after class, resulting in low enthusiasm for active exercise among many students. The rapidly developing digital technology provides a new approach to addressing the shortcomings of traditional physical education teaching. Various intelligent tools such as smart wristbands, AI visual recognition, smart venues, and sports big data platforms can comprehensively collect students' classroom exercise movements, classroom exercise loads, after-school exercise situations, physical fitness testing data, etc. Through algorithms, each student can establish a sports data portrait and customize personalized exercise plans, truly breaking down the barriers between classroom teaching, after-school exercise, physical fitness monitoring, and event

services, forming a complete education loop. Based on the current situation of physical education teaching in universities, this article analyzes the value and constraints of the digital transformation, and proposes an effective path for the digital transformation of physical education in universities.

2. The Value and Restrictive Factors of Digitalization Transformation in University Physical Education

2.1. The Value of Digitalization Transformation in University Physical Education

Firstly, reconstruct the teaching form to achieve personalized and precise teaching. In traditional physical education classrooms, teachers can only rely on observing students' movements with the naked eye to determine whether their posture is standard, resulting in relatively low error correction efficiency. AI motion recognition technology can capture various sports movements such as running, jumping, ball games, gymnastics, etc. of students throughout the process. The system will automatically compare and analyze them with standard motion models and provide real-time error correction prompts. Teachers can also combine students' heart rate data and exercise load data to adjust the training intensity reasonably for students with weak physical foundation and sports injuries, avoiding sports injuries from the root and truly achieving hierarchical teaching[1].

Secondly, improve the evaluation system and promote process based value-added evaluation. In the physical education assessment and evaluation of universities, the final physical examination score accounts for a large proportion. This single evaluation method completely ignores students' daily exercise efforts, the development of exercise habits, and the cultivation of sportsmanship. The digital intelligence platform can fully retain all process data of students, including classroom attendance, daily practice frequency, extracurricular running check-in, competition participation experience, and skill improvement. Based on this, a multi-dimensional evaluation system covering students' physical condition, sports skills, classroom participation, and physical literacy can be established, completely changing the previous model of determining final scores in one exam. This new evaluation method can be traced and recorded throughout the entire process, forming a scientific value-added evaluation and guiding students to truly value long-term physical exercise in their daily lives.

Thirdly, strengthen the effect of lifelong sports education. Digital tools have effectively expanded the time and space scope of university physical education, making physical education teaching no longer limited to the classroom and campus. Even if students leave school, they can continue to use the health data platform to continuously record and manage their exercise status and physical health. Through this approach, students can develop good habits of independent exercise and long-term adherence to sports, making physical exercise a normal part of life and helping to achieve the core educational goal of lifelong sports.

2.2. Restrictive factors for the digitalization transformation of university sports

The constraining factors for the digitalization transformation of university sports are shown in Table 1.

Table 1 Main Restrictive Factors for the Digitization Transformation of University Sports

Constraints	Specific manifestations
At the conceptual level	Emphasize hardware investment over teaching reform, and turn technology into tools; Teachers have conservative teaching concepts and insufficient understanding of the value of data education
At the resource level	There is a large gap in inter school funding and uneven coverage of smart venue equipment; Multiple systems operate independently, with different

	data standards, forming data islands
At the teacher level	Physical education teachers have weak abilities in data analysis and the application of AI teaching tools; Lack of interdisciplinary collaborative teaching and research mechanism
At the institutional security level	Lack of standardized management of sports data; Sensitive information such as student health and location poses privacy risks; Fake sports check-in data

3. The overall operational framework for the digital transformation of university sports

The digitalization of university sports is a multi-level closed-loop system, which is divided into a data acquisition layer, an intelligent processing layer, a teaching application layer, and an evaluation and governance layer. The four layers work together to form a continuous iterative education loop, as shown in Table 2.

Table 2: Operational Framework for the Digitization Transformation of University Sports

System Level	Main carrier	Core functionality	Output content
Data Collection Layer	Smart wristband, AI camera, automatic physical testing device, venue terminal, student mobile mini program	Multi source non sensory collection, obtaining raw data such as static physical fitness indicators, classroom movements, heart rate load, extracurricular exercise, and venue use	Original Sports and Physical Fitness Dataset
Intelligent processing layer	Big data platform, algorithm model, data cleaning module	Eliminate abnormal and falsified data, standardize data processing, construct a digital portrait of student sports, identify sports risks and physical weaknesses	Student sports profile, risk warning information, and learning situation diagnosis results
Teaching application layer	Classroom teaching terminal, resource library, exercise prescription module, smart venue system	AI action correction, personalized training plan push, online sports resource supply, intelligent scheduling of sports venues	Personalized exercise prescription, teaching resources, and venue reservation services
Evaluate the governance layer	Multidimensional evaluation module, physical fitness analysis dashboard, teaching quality monitoring module	Value added evaluation throughout the entire process, analysis of overall physical fitness trends, monitoring of teaching effectiveness, providing support for management decision-making	Student sports comprehensive score, physical fitness analysis report, and teaching optimization suggestions

Among them, the data collection layer is the underlying foundation of the entire smart sports system. Schools can use tools such as wearable devices, AI vision, automatic physical testing instruments, and mobile mini programs to collect students' static physical fitness data and daily dynamic exercise behavior information[2]. The intelligent processing layer will organize and purify the collected raw data, and the system will automatically remove invalid abnormal data and human cheating data. Based on this, a complete student sports portrait will be established, which can

accurately identify students' sports safety hazards and personal physical weakness. The teaching application layer mainly serves teachers and students on campus. It can not only help students correct sports movements and customize exclusive training plans, but also provide rich physical education micro lesson learning resources. At the same time, it supports online reservation and use of campus sports venues. The evaluation and governance layer is aimed at the teaching management departments at all levels of the school, automatically generating the comprehensive evaluation results of each student's physical education, and organizing the overall physical health analysis report of the whole school, which can provide real data support for the optimization of the school's physical education curriculum and the overall planning of campus sports activities[3]. In addition, after feedback, the evaluation results can further optimize and adjust the physical education teaching plan, thus forming a continuously updated and improved closed-loop operation mode.

4. Implementation Path of Digitalization Transformation in University Physical Education

4.1. Strengthen top-level design

Colleges and universities need to incorporate the construction of sports digitalization into the overall development plan of school education digitization, and specifically formulate a special implementation plan for smart sports construction. It is necessary to clarify specific construction goals, phased promotion tasks, and special funding guarantee mechanisms, and standardize the procurement of equipment and system construction work [4]. Colleges and universities should always adhere to the core principle of "putting education first and technology as a supplement", clarify the application value of digital intelligence technology, make technology truly serve daily physical education teaching, promote the improvement of students' physical fitness, and resolutely abandon the utilitarian construction thinking of only equipment and only data. In addition, schools can regularly organize special exchanges and discussions with physical education teachers and teaching management personnel to ensure that all faculty and staff have a deep understanding of the core content of digital sports.

4.2. Coordinate platform construction

Schools need to establish a unified standard for campus sports data, actively promote the integration and interoperability of smart sports platforms with internal systems such as academic affairs, student affairs, and campus hospitals, and completely break the problem of isolated operation and data barriers between various systems. Each school can promote the construction work in steps and stages based on its own funding situation: first, focus on building and improving the student physical health database and extracurricular exercise management platform, then gradually complete the AI visual upgrade and transformation of sports venues, and promote the construction of a smart venue reservation system. We can choose more lightweight online applications, actively introduce mobile mini programs and mature teaching platforms on the market, effectively reduce construction costs, and avoid blindly investing in high priced equipment, resulting in resource waste [5]. The school also needs to establish a long-term stable software and hardware operation and maintenance management mechanism, regularly inspect and maintain various data sensing devices, in order to ensure the safety and stability of data collection work and the authenticity and reliability of data content.

4.3. Building a layered training system

To establish a regular training mechanism for physical education teachers, the overall training

content can be refined into two major learning modules, namely the basic application module and the deep integration module. The basic application section mainly focuses on practical skills for daily teaching, including daily operation methods of smart platforms, analysis and interpretation of student sports data, editing and production of teaching short videos, and other basic content; The deep integration section focuses more on teaching innovation, with a focus on explaining AI action analysis technology, the overall design ideas of digital physical education courses, and how to use real teaching data to complete layered teaching design and other core content. Schools can take the lead in establishing interdisciplinary teaching and research communities, organize physical education teachers, information center staff, and computer science teachers to jointly discuss and develop smart physical education teaching cases that are suitable for their own schools. Through normalized collective lesson preparation, open class demonstrations, and discussions, a replicable smart physical education classroom teaching model can be formed. At the same time, specialized assessment and incentive content related to digital physical education teaching can be included in teacher performance evaluation and various teaching competitions, thereby fully mobilizing the subjective initiative of all physical education teachers to participate in digital teaching reform.

4.4. Establish a sound data governance mechanism

Schools should develop specific rules for managing campus sports data and strictly adhere to the principle of minimum necessity in data collection. They will never excessively collect private data such as students' location information and physical health status. For the platform data, hierarchical access permissions are set up, and ordinary teachers can only view the desensitized learning data of their own classes. At the same time, it is strictly prohibited for anyone to share or leak students' raw data to the outside world. By using intelligent algorithms to identify various abnormal sports check-in behaviors, it can effectively avoid the negative phenomena of students running on behalf of others, maliciously brushing sports data, and other fraudulent activities [6]. In addition, it is necessary to establish basic security mechanisms such as data backup and network security protection, and to strengthen data security management responsibilities layer by layer, effectively protecting the personal health privacy of every student and safeguarding the security bottom line of campus sports digitalization construction.

5. Conclusion

In the current context of digital education, the digital transformation of physical education in universities has become an inevitable trend in the reform of physical education teaching. Universities must strictly implement the fundamental task of cultivating morality and talents, eliminate the one-sided thinking of blindly pursuing technology, establish a multi-level and closed-loop intelligent sports operation system, and make synchronized efforts from multiple aspects such as top-level system design, software and hardware platform construction, teacher capacity cultivation, data security governance, etc., promote the deep integration of digital technology with physical education classroom teaching and students' extracurricular exercise, effectively improve the physical health level of contemporary college students, establish the concept of lifelong exercise, cultivate the ability of independent exercise, and further provide strong support for the construction of a healthy China and a sports power.

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