"Student-Centered Approach": Research on the Development and Application of Digital Course Resources in College Sports in the Context of Big Data

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Abstract: *Against the backdrop of the development requirements and current state of college physical education, this paper explores the development and application of digital course resources in the context of big data. The study highlights the significant expansion of big data's application scope in the education field through its deep integration with college physical education. Consequently, the development of digital course resources for college sports aligns with current teaching needs while promoting the education industry's transformation and upgrading in digital technology. Addressing the current resource shortage in college physical education courses, the development and application of digital course resources can effectively enhance teaching content, methods, and models. This approach not only fosters a conducive learning environment, enriches emotional experiences, and unlocks students' potential but also cultivates their innovation awareness.*

Keywords: College sports; digitalization; course resources

1. Research Purpose

With the advancement of digital transformation, China's higher education has entered the era of the "smart society." [1]Additionally, the nationwide implementation of the "stop classes, but not learning" method during the COVID-19 pandemic has accelerated the digital transformation of various courses from primary school to university in China. Internationally, UNESCO's "Education Digital Transformation: School Connectivity and Student Empowerment" emphasizes the significance of digitalization, while the EU's "Digital Education Action Plan (2021-2027)" identifies "digital technology" and "digital skills" as key terms for global education development[6]. The 20th National Congress of the Communist Party of China further promotes the digitalization of education, including physical education. Digital course resources for physical education refer to teaching resources that use digital technology and online tools to support physical education and training, including online courses, instructional videos, interactive simulations, virtual reality (VR) and augmented reality (AR), online testing and assessment, exercise prescriptions, data analysis tools, and virtual learning communities. [2]Physical education is undergoing a comprehensive transformation towards "digital" and "data intelligence." Therefore, this paper aims to explore the theoretical model, development strategy, and application path of digital course resources for college sports under the background of big data, providing positive reference for the transformation of physical education towards a direction that focuses on students, skill development, and optimized social learning.

2. Research Method

Using the literature review method, this paper collects content related to "digital course resources for college sports" from Chinese databases such as CNKI, Wan Fang, and conducts in-depth analysis and research. Using logical analysis, this paper summarizes and generalizes specific paths for the development and application of digital course resources for college sports.

3. Results and Analysis

3.1 Development Strategy for Digital Course Resources in College Sports in the Era of Big Data

3.1.1 Constructing a Model for Digital Course Resources in College Sports

In the age of digital teaching, physical education can transcend the limitations of time and space. Its key elements, such as teaching objectives, content, activities, evaluation, and environment, can be optimized, and combined in a blended space that integrates physical and online aspects. Therefore, this study aims to construct digital course resources for college sports based on Jerome Bruner's classification theory of educational objectives, Wang Huazhuo and Wang Hong's proposed educational objectives in the field of sports skills, and the SAMR technology model[3]. The model encompasses four scenarios: pre-class, in-class, post-class, and extracurricular, and covers both students and teachers as the main teaching subjects, as well as the teaching management department. This model embraces the Online-Merge-Offline (OMO) approach to digital course resources in physical education (Table 1).

This configuration takes into thorough consideration the specific characteristics of learning and teaching in higher education institutions: students exhibit a strong desire for active and interactive learning; it provides a platform that effectively breaks the constraints of time and space in physical education teaching; it simultaneously accommodates the offline mode in OMO teaching model; it offers precise technical support; it enables prompt categorization and feedback of data to various user groups (teachers, students, management), ensuring timeliness; the entire course process corresponds to the SAMR model (Substitution, Augmentation, Modification, Redefinition), which can be used to evaluate the extent of technological transformation in teaching. Teachers can apply suitable technologies to instruction based on their own understanding; throughout the teaching process, the emphasis is on empowering students and providing them with a rich experience of immersive learning.

Table 1: Digital Sports Curriculum Resources Architecture Model

Teaching Role	Teacher	Student	Administration Department	Technical Framework
Before Class	Distribute preview materials Collect questions interactive	Pre-lesson preparation Boosting interest in learning Developing the cognitive and motor skills foundation for sports learning	Technical framework	Perceptual imitation
In Class	Contributes to guiding precise and comprehensive teaching Various forms of mutual assistance in teaching Realizes interdisciplinary integration of teaching content	Project-Based Learning (PBL)Team-Based Instruction (TBI) Case-Based Learning (CBL) Experiential Learning Various student-centered learning/practice methods	Efficient connectivity Technology collection	Accurate practice
After Class	Distribute preview materials Collect questions Assign homework, tests Collect student learning data Improve curriculum plans Build high-quality curriculum	Post-lesson practice Personalized self-directed learning resources Collaborative learning through problem-solving	Post-class tracking Data feedback	Coherence
Extracurricular	Utilizing data to enhance sports instruction and training.	Virtual sports community Scientific physical fitness Exercise prescription	Collaborative education Data classification Safety assurance	Automation

3.1.2 Strengthening the Infrastructure Construction for Digital Sports Education Curriculum Resource Development

Infrastructure construction encompasses four aspects: the digital cognitive development of organizational members (teachers), the development of digital teaching resources based on school characteristics and business development, the development of student learning resources, and the maintenance and updating of these resources. Firstly, in terms of cognitive development: The transformation of individuals is the key to successful digital education transformation. Faced with the impact of new external factors and the uncertainty of change, each member may have different levels of understanding. Therefore, maximizing consensus is crucial.

While the traditional teacher and student, classroom-outside and classroom, learn-practice-exam model has been effective for a certain period, it can no longer adapt to the rapid digital development and internal learning needs of students. Hence, educational management and teachers should actively

participate in and advocate for the digital transformation of teaching. This involves staying updated on the latest research and practical directions of digital transformation in education [3], understanding the application scenarios of digital technology in sports teaching, innovating theories, and research, and engaging in case discussions to enhance technological innovation thinking. Secondly, in the construction of digital teaching based on school characteristics, schools serve as the fundamental implementation units for national digital education strategies. According to the Technology Acceptance Model, behavioral intention is determined by attitudes towards usage and perceived usefulness. Thus, promoting the development of digital sports teaching within the school's digital curriculum construction system requires considering the alignment of technological innovation with campus development needs and the school's value system. By leveraging the unique features of physical education within the school, analyzing the gap between the current level of physical education and the school's requirements, and creating digital educational resources that are truly "based on the school, used for the school, promote the school, and reflect the school's characteristics." Thirdly, inter-school cooperation can establish mechanisms for sharing and collaborating on digital educational resources, enabling the demonstration, exchange, and sharing of achievements in sports teaching on a broader scale [4]. Additionally, regarding the development of student learning resources, it is important to broaden the perspective on constructing digital resources in physical education. This involves strengthening connections with sports venues, gyms, sports teams at all levels, cultural tourism systems, and technology systems, and fully harnessing the significant social benefits that digital curriculum resources offer to achieve higher teaching effectiveness. Finally, in terms of maintenance and updating, the digital construction of sports teaching should possess sustainable development capabilities. This sustainability stems from evaluating the adaptability between entire course technical services and teaching practices, satisfaction evaluations from teachers and students regarding digital teaching, and feedback data on teaching effectiveness and goals from students. This feedback enables timely warnings and interventions, facilitating quick adjustments by administrators and teachers, ultimately improving the long-term effectiveness of applying digital technology in sports teaching.

3.1.3 Strengthening the Construction of Learning Platforms for Developing Digital Sports Education Curriculum Resources

The key to building a digital curriculum platform for physical education in universities is to establish an online learning platform for physical education courses. In this process, physical education teachers should consider the actual learning needs of students to provide them with a variety of digital curriculum resources. Teachers should develop differentiated and practical physical education resources based on the specific needs of different students, enabling fragmented learning based on different knowledge points. By using an online learning platform for physical education courses, students can engage in independent learning. Before class, they can preview the content and objectives assigned by the teacher and access relevant course resources. During class, they can learn and practice under the guidance of the teacher. After class, they can participate in virtual community-based extracurricular exercise tasks related to the classroom content. The digital process runs through the entire teaching process. According to the SAMR theory, students can make improvements or breakthroughs in various aspects based on their own physical conditions [5].

The online learning platform for physical education courses enables real-time interaction and communication between teachers and students. Based on real-time feedback on movement patterns and data, teachers can promptly understand students' learning progress, identify challenges during learning, and provide optimized teaching guidance. Teachers can also use WeChat public accounts to recommend high-quality physical education teaching resources to students, including exciting sports competitions and major sports news. By learning from these digital resources, students can acquire more sports knowledge and understand the spirit of sports, thereby enhancing their physical and mental well-being comprehensively.

3.1.4 Developing Diverse and Rich Multimedia Teaching Resources

Multimedia teaching resources can present course content in the form of images, sounds, videos, etc., providing students with a more intuitive and interactive learning experience. Firstly, universities should develop high-quality teaching videos that include introductions and demonstrations of different sports disciplines and skills, showcasing sports techniques, tactical applications, and practical exercises to help students gain a deeper understanding of sports theory. In addition, videos can be produced as event replays or special reports to broaden students' horizons.

Secondly, universities should provide a wide range of image resources, including pictures and charts, to present course content in a visually engaging manner. Images can vividly and effectively explain sports

knowledge, making it easier for students to learn.

Thirdly, the development of audio resources, such as language and audio introductions, can be used to explain event replays, clarify competition rules, and provide supplementary learning materials for students.

Furthermore, interactive teaching tools and simulation tools can be developed to allow students to simulate experiments and engage in practical activities in a simulated environment. This enables students to participate in physical education practices.

Lastly, the development of sports-related learning games and various apps can be utilized to enhance students' learning interest through gamification. These games can cover different learning contents, such as rule memorization and body coordination, and utilize interactivity and competition to improve students' physical abilities.

3.2 Applying Digital Course Resources for Physical Education in the Context of Big Data

3.2.1 Analysing Student Data

The academic performance of college students in physical education is influenced by multiple factors. To achieve good teaching results and help students learn effectively, college physical education teachers should utilize big data technology to analyze students' learning situations and individual characteristics. As independent individuals, students may have significant differences in their physical learning. Some students have strong jumping ability and are good at high jump, while others have strong endurance and excel at long-distance running. By using data analysis methods, teachers can accurately identify teaching levels and adjust teaching content and methods to improve teaching efficiency. This approach can also help students achieve comprehensive development goals and fully respect individual differences. For example, when teaching the process of running 800 meters, teachers can analyze data to understand students' specific situations. Through data analysis, teachers can identify difficulties that some students may face and arrange more reasonable training plans for them, including various forms of exercise such as preparatory running, mid-run running, and sprinting. Each student's speed and strength differ at each stage, and these exercise forms can help students gradually complete the full distance. Teachers should record each student's performance at each stage in detail on a computer. By analyzing and comparing the results, teachers can understand each student's physical exercise situation at each stage and support the adjustment of training content and optimization of training methods to achieve good teaching results. Using digital course resources as carriers, college physical education teaching can become more targeted, and data comparison and analysis can help teachers optimize teaching methods and content.

3.2.2 Implementation of Health Management

Currently, the intelligent sports information platform in China is running relatively stable, but there is still a need to improve certain sections and innovate the platform's operational mode. By utilizing network methods to integrate various resources and establish a sports prescription resource library, multiple modules such as sports activities and physical health can be fully developed and utilized. Through detailed analysis of students' physical fitness test data, students can find suitable fitness methods for themselves. By comprehensively analyzing students' exercise situations, the level of guidance for student movement can be improved. Additionally, exploring the integration of students' physical fitness test data into electronic medical records can lay a foundation for the integration of sports and medicine. This can help build personal health records for students, including health data in various aspects such as exercise intensity, heart rate, and stress.

3.2.3 Ensuring Teaching Support

Firstly, various digital teaching resources should be integrated into one platform, making it easier for teachers to access and utilize them quickly. This includes textbooks, lesson plans, teaching materials, etc. Using this platform, teachers can easily obtain the necessary teaching resources and flexibly apply them in the classroom teaching process. Secondly, big data technology and analysis tools can be used to provide more personalized teaching support to teachers. By collecting and analyzing students' learning data, interests, and other information, systematic and targeted teaching strategies can be provided to meet students' individual learning needs. Furthermore, by using the digital course resources platform, teachers can implement learning management and real-time tracking of students, recording their actual learning progress, grades, and other data to understand their learning situation. This helps teachers optimize teaching strategies in a timely manner and provide effective feedback. Moreover, relying on digital tools, remote teaching support can be provided to teachers to achieve online tutoring goals. Teachers can engage

in interactive communication with students through video conferences and online discussion platforms, enabling distance teaching. This method is not constrained by geographical limitations and is more flexible, facilitating teacher-student communication. Finally, digital teaching training support should be provided to teachers. By utilizing online training courses and resource sharing, the teaching ability of teachers can be continuously improved, fostering higher professional literacy among teachers.

4. Conclusion and Recommendations

In conclusion, the development and utilization of digital course resources in physical education teaching in universities have become an inevitable trend in educational reform in the era of big data. The new generation of information technologies, such as the Internet of Things, cloud computing, big data, and ubiquitous networks, are breaking through the bottleneck period of digital education development and providing important resources to enhance the overall intelligence of physical education in universities. However, it is important to be aware of the learning risks that come with digital dependence. For instance: (1) Will "interpersonal emotions" disappear when we break time and space limitations? (2) Could students' demands for "personalization" and "centrality" lead to a narrowing of their learning space due to the implications of the data they receive? (3) Might over-reliance on information devices lead to "pseudo-learning" instead of genuine learning? (4) How can we establish a connection between objective data feedback and human thoughts and emotions to inspire students' intrinsic motivation for physical education learning?[4]

These are the questions that need to be considered in the comprehensive construction of digital course resources and platforms for physical education in universities. Therefore, the focus should not only be on digital accumulation and innovation but also on research and construction in digital management and governance. This will ensure that we maximize the advantages of digital course resources, enhance the vividness of physical education teaching, stimulate students' enthusiasm for participation in sports, and promote their comprehensive development.

Author Contributions

Conceptualization: Jing Yao; Methodology: Du Yun; Formal Analysis: Jing Yao; Resources: Zhang Xing; Writing – original draft preparation: Jing Yao.; Writing – review and editing: Du Yun

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