Research on Restructuring University Basketball Curriculum System under the "AI-Enabled Empowerment" Background

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Abstract: This study focuses on the reconstruction of the university basketball curriculum system under the background of "AI-enabled empowerment." It aims to analyze the problems existing in current university basketball teaching and explore how to leverage artificial intelligence (AI) technology to innovate and upgrade curriculum content, teaching methods, and evaluation systems. Through literature analysis and empirical research, this paper points out the limitations of traditional basketball courses, such as monotonous content, insufficient personalization, and limited technical means. The introduction of AI technology can enable various innovative applications, including data-driven personalized teaching, virtual simulation training, and movement behavior analysis. Based on this, this paper proposes paths for constructing a systematic, diversified, and intelligent curriculum system, including strengthening infrastructure construction, enhancing faculty competence, optimizing curriculum design, and improving the evaluation mechanism. The research results indicate that AI-enabled empowerment can significantly improve the teaching effectiveness and student engagement of university basketball courses, help promote the modernization transformation of university physical education, and provide theoretical support and practical guidance for cultivating high-quality sports talents.

1. Introduction

With the rapid development and widespread application of Artificial Intelligence (AI) technology, the field of education is undergoing profound changes. University physical education, as a crucial component in cultivating students' physical and mental health and teamwork spirit, also faces opportunities and challenges in digital transformation. Basketball, as a significant part of university physical education courses, involves not only students' physical exercise but also skill enhancement and tactical understanding. However, the traditional basketball curriculum system suffers from issues such as monotonous content, insufficient personalization, and limited teaching methods, making it difficult to meet the diverse and individualized development needs of students in the new era. Against the backdrop of "AI-enabled empowerment," leveraging advanced technologies such as big data, virtual simulation, and motion recognition can achieve innovation in curriculum content, transformation in teaching methods, and improvement of the evaluation system. This paper focuses on the current situation and problems of the "AI-enabled" university basketball curriculum system, explores its reconstruction paths and strategies, provides a theoretical foundation and practical guidance for promoting the intelligent and personalized development of university physical education, and assists universities in cultivating new-era sports talents with innovative and practical abilities.

2. Analysis Status of AI-Enabled University Basketball Curriculum System

2.1 Slow Start and Insufficient Penetration of AI Technology in University Basketball Courses

Although the potential of Artificial Intelligence (AI) technology in sports and teaching is widely recognized, its practical application in university basketball courses remains in the preliminary exploratory stage, with extremely low penetration. Most universities have not yet established a systematic and large-scale AI application platform, the introduction of related technologies is

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mostly pilot projects or scattered attempts, lacking continuity and depth. Many universities have only introduced a small number of motion sensing devices, video analysis tools, or virtual simulation software, but these applications are often isolated and lack integrated solutions, making it difficult to form a complete teaching system. Due to the absence of mature technical standards and industry norms, there is an uneven level of application between different universities, leading to overall limitations in promotion. Furthermore, teachers and administrators generally lack sufficient understanding and acceptance of AI technology, coupled with a lack of professional training and technical support, which restricts the effective implementation of the technology. Universities lack dedicated technical teams or partners, making it difficult to independently develop or introduce AI teaching tools suitable for their own context. Cost is also a constraining factor, high-end hardware equipment such as motion sensors and Virtual Reality (VR) devices is expensive, making procurement and maintenance difficult to afford, especially noticeable in universities with limited budgets.[1] These factors collectively result in the application of AI technology in university basketball courses still being in a "trial" phase, making widespread penetration difficult to achieve. On the other hand, the integration of course content with AI technology lacks systematic planning. Many universities merely add AI as an auxiliary tool to traditional teaching, without forming a core AI-centric curriculum design philosophy. The lack of standardized, modular teaching content makes teaching effectiveness difficult to quantify and dampens the enthusiasm of both students and teachers.

2.2 Insufficient Curriculum Resources and Information Infrastructure Constrain Deep Integration of AI

The weak digital foundation of university basketball courses severely limits the deep integration of AI technology. Firstly, the scarcity of hardware facilities is the biggest problem. The penetration rate of advanced hardware such as high-performance sensors, motion capture equipment, and virtual simulation platforms is low. Many universities only use ordinary cameras or low-end motion monitoring equipment, which cannot meet the needs for precise data collection and analysis. The performance limitations of this hardware lead to insufficiently nuanced detection and evaluation of athletic performance, prevent high-precision analysis of student movements, and struggle to support the formulation of personalized training plans. Secondly, the absence or immaturity of software platforms makes it difficult for AI technology to take root in teaching. The market lacks mature software products specifically developed for university basketball courses that integrate exercise data collection, analysis, and feedback. Even if some universities adopt third-party software, it is mostly single-function tools, resulting in fragmented functionality and a lack of holistic solutions. Universities cannot develop customized solutions based on their specific course needs, hindering the deep integration of technology into all aspects of daily teaching. Regarding information infrastructure, network environments and data storage capacity are limiting factors. [2]Universities' limited network bandwidth cannot guarantee the real-time transmission and processing of big data. Limited data storage capacity makes it difficult to accumulate large amounts of movement behavior data, affecting model training and optimization.

2.3 Professional Expertise of Teaching Staff and Training System Urgently Need Improvement, Affecting AI Application Effectiveness

University basketball teachers generally lack sufficient professional expertise in applying AI technology, which has become a significant factor constraining AI-enabled empowerment of basketball courses. Firstly, the professional background of most university physical education teachers leans heavily towards traditional sports theory and skills training, with very limited understanding of emerging technologies such as artificial intelligence, big data, and virtual reality. Many teachers have not received systematic technology training and lack opportunities for independent learning and practice, making it difficult for them to master basic AI-related knowledge and operational skills. Secondly, teachers lack a full understanding of the role of AI technology in teaching, harboring some resistance and concerns. Some teachers believe technological means might weaken their professional authority or affect the traditional classroom atmosphere, lacking

the recognition that AI technology can enhance teaching efficiency and improve learning experiences. This psychological barrier discourages teachers from actively trying and promoting AI-enabled teaching methods, limiting the practical application of the technology. Thirdly, the lack of a systematic and continuous training system is another prominent issue.

2.4 Insufficient Student Learning Experience and Engagement, Affecting the Actual Effect of AI Empowerment

In university basketball courses, students' learning experience and engagement level directly impact the effectiveness of AI-enabled empowerment. Currently, students' learning motivation in basketball courses is low, primarily due to a lack of innovation in course content, monotonous teaching forms, and insufficient personalized learning support. Traditional courses often focus on mechanical skill drills and games, lacking fun and interactivity, making it difficult to spark students' enthusiasm for learning. Furthermore, students face cognitive barriers to the novel experiences brought by AI technology. Technologies like virtual simulation, motion analysis, and intelligent tutoring hold immense potential, but many students hold a wait-and-see or even resistant attitude towards these new technologies.[3] The lack of necessary technical understanding and operational skills makes them feel unfamiliar, inconvenient, or apprehensive about using AI-assisted tools, thereby affecting their active participation. Course design lacks personalization, making it difficult to meet the diverse needs of different students. Each student has a different foundation, interests, and developmental goals, yet existing courses often adopt a "one-size-fits-all" model, unable to provide differentiated learning paths based on students' actual levels. This causes some students to feel bored or frustrated, lacking sustained motivation for learning. Additionally, the absence of real-time feedback and intelligent guidance impacts students' learning experience. In traditional teaching, it is difficult for teachers to provide timely, personalized guidance on each student's movements and performance, students struggle to obtain immediate skill improvement suggestions. [4]The lack of personalized learning data analysis also makes it difficult for students to understand their own strengths and weaknesses, thereby reducing learning initiative and sense of accomplishment. Students' generally low level of awareness and acceptance of AI technology also becomes a constraining factor.

2.5 Disconnection between Curriculum System Design and Practical Application, Affecting Effective Implementation of AI Empowerment

The design of the university basketball curriculum system exhibits a significant disconnect, making it difficult to effectively integrate AI technology and impacting its practical application effectiveness. Firstly, course objectives and content settings lack innovation and fail to fully reflect the potential of AI-enabled empowerment. Traditional courses focus predominantly on skill training and games, lacking cutting-edge elements integrated with AI, resulting in courses that lack modern, technological characteristics. Secondly, the course structure lacks systematicity and hierarchy, making it difficult to cover all aspects of AI-enabled empowerment. Many universities adopt fragmented teaching arrangements without forming a complete curriculum system architecture or integrating AI technology throughout all teaching links. From basic skill cultivation to data analysis, virtual simulation, and personalized tutoring, course content fails to achieve effective cohesion, affecting the continuity of teaching effectiveness. [5]Thirdly, teaching methods are singular, lacking diversification and personalization. Traditional teaching relies heavily on teacher lectures and student imitation, lacking interactive, immersive, and personalized learning experiences enabled by AI technology. Without scientifically sound teaching process design or AI-integrated intelligent tutoring tools, teaching struggles to meet the differentiated needs of diverse students. Finally, the implementation of practical application links is inadequate, presenting a "pie in the sky" phenomenon.

3. Paths for Restructuring the University Basketball Curriculum System Based on AI

3.1 Promote Deep Integration of AI Technology in University Basketball Courses and Build a Systematic Application Platform

To achieve the intelligent transformation of university basketball courses, it is first necessary to accelerate the pace of deep integration of AI technology and establish a systematic, standardized application platform. Universities should introduce advanced motion sensors, virtual simulations, and big data analysis tools to form a complete technological ecosystem. This includes not only the procurement and updating of hardware equipment but also the deployment of professional software platforms that integrate functions such as exercise data collection, analysis, feedback, and teaching management, enabling real-time data acquisition and intelligent analysis. By establishing unified data interfaces and application standards, compatibility issues between different devices and software can be resolved, enhancing the efficiency and effectiveness of technology application. Simultaneously, cooperation with AI technology enterprises and research institutions should be strengthened to introduce mature solutions and promote joint university-enterprise research and development, forming an intelligent basketball teaching ecosystem with distinctly university characteristics. Furthermore, to improve the technological application capabilities of teachers and administrators, specialized training programs should be established to cultivate a group of interdisciplinary talents who understand technology and know how to teach. Through continuous technical training and practical operation, teachers' understanding and mastery of AI technology can be enhanced, enabling them to independently design and implement intelligent teaching plans. [6] Universities should also actively promote the application of AI technology in teaching management, such as dynamic monitoring of student athletic performance, automatic recording and analysis of learning processes, and the formulation of personalized training plans, forming a new teaching model of "data-driven, intelligent assistance." The ultimate goal is to create an AI-centric digital platform for university basketball courses, achieving scientific upgrades in course content, teaching methods, and the evaluation system, thereby solving the problems of fragmented traditional applications and limited effectiveness. On this basis, universities should formulate clear application specifications and technical standards to ensure the safe, stable, and sustainable development of AI technology. Additionally, efforts to strengthen infrastructure construction must be increased, optimizing the network environment and cloud computing resources to guarantee big data storage and high-speed processing, providing hardware support for the deep application of AI technology. Only by relying on mature technological platforms and establishing a systematic application framework can the intelligent transformation of university basketball courses be truly realized, promoting the comprehensive upgrading of the curriculum system.[7]

3.2 Enrich Course Resources, Improve Information Infrastructure, and Create an Efficient Digital Teaching Environment

To address the scarcity of course resources and deficiencies in infrastructure, universities should invest heavily to enrich digital resources and create an efficient teaching environment. On one hand, develop or introduce diversified course resources integrated with AI technology, including Virtual Reality (VR), Augmented Reality (AR) scenarios, motion capture analysis, and intelligent tutoring systems, to meet the learning needs of students at different levels and with different interests. For example, using virtual simulation technology to construct realistic basketball scenarios allows students to practice skills in a virtual environment, enhancing learning interest while reducing training costs. Generating personalized learning paths through AI helps students progressively improve according to their own level. On the other hand, information infrastructure construction must be strengthened, including a high-speed and stable network environment, cloud storage platforms, and data management systems. Universities should introduce cloud computing services to achieve centralized storage and management of sports data, facilitating data access and analysis. Concurrently, establish a unified data platform to break down data silos, enable data sharing between different colleges and teachers, and improve information circulation efficiency. Improve data security and privacy protection measures to ensure the safety of students' personal information

and sports data, alleviating concerns among teachers and students, and providing security safeguards for AI applications. Simultaneously, by establishing an open digital resource library and teaching platform, encourage joint participation of teachers and students in resource construction and utilization. Universities can establish special funds or incentive mechanisms to support teachers in developing high-quality teaching content, encourage students to upload learning outcomes and innovative works, and foster a positive atmosphere of knowledge sharing. Building on this, utilize AI technology for content recommendation and personalized push notifications, realizing a "student-centered" intelligent teaching environment. Furthermore, the software and hardware upgrades of infrastructure should be strengthened, improving the campus network environment to ensure high-speed, stable data transmission to support real-time motion monitoring and virtual simulation. Big data analytics should also be leveraged to optimize course design and timely adjust teaching strategies, enhancing teaching efficiency. Through resource enrichment and infrastructure enhancement, provide a solid technical foundation for AI-enabled university basketball courses, achieving comprehensive upgrading from hardware to software, and from content to environment.

3.3 Establish a Professional Teaching Faculty and Improve the Training System to Promote Continuous Enhancement of Teachers' Technical Capabilities

Teachers are the key drivers of AI-enabled empowerment in university basketball courses. Only by enhancing teachers' professional expertise and technical abilities can teaching innovation and quality improvement be achieved. Universities should prioritize faculty development and establish a systematic, multi-level training system. Firstly, introduce specialized talents in disciplines such as artificial intelligence, data analysis, and virtual simulation to form interdisciplinary teams comprising technical experts, physical education teachers, and curriculum developers. These teams should collaboratively design teaching plans and develop course content. Secondly, conduct regular professional training sessions and practical exchange activities. Invite industry experts, research institutions, and corporate representatives to deliver lectures, seminars, or workshops, helping teachers stay abreast of the latest AI technologies and application cases. Establish hybrid online-offline training platforms to provide continuous learning resources and hands-on opportunities, enabling teachers to constantly update their knowledge structures and improve their technical application skills. Thirdly, promote a tripartite "teacher-student-technology" collaboration model. Encourage teachers to collaborate with IT and AI professionals in course development, conduct pilot programs in real-world scenarios, and accumulate practical experience. Universities should also establish incentive mechanisms by incorporating AI application outcomes into teachers' performance evaluation systems to stimulate their enthusiasm and innovation drive. Additionally, cultivate interdisciplinary talents proficient in both "AI technology and physical education pedagogy." Encourage teachers to pursue relevant master's or doctoral degrees or participate in specialized training programs to elevate their theoretical understanding and practical skills. Provide teachers with sufficient learning time and financial support to ensure they can continuously track technological frontiers and master the latest teaching tools and methods. Finally, establish an industry-academia integrated training mechanism through university-enterprise cooperation. Leverage corporate resources to provide teachers with internship and practical training platforms, helping them gain in-depth understanding of industry demands and cutting-edge technology applications. Through multi-channel, multi-level training systems, continuously solidify the technical foundation of the teaching faculty, providing robust talent support for AI-enabled empowerment in university basketball courses.

3.4 Design a Scientific and Rational Curriculum System to Promote Diversified and Personalized Teaching Models

To achieve innovative development of university basketball courses, it is essential to break away from traditional monolithic curriculum structures. By integrating AI technology, construct a scientific, rational, hierarchical, and flexible curricular framework. Firstly, adopt a student development-oriented approach to design a curriculum system integrating multiple modules such as skill training, tactical strategy, data analysis, virtual simulation, and innovative practice. Each

module should incorporate AI technology to form multi-tiered course content progressing from foundational to advanced and theoretical to practical. Secondly, advance personalized and differentiated teaching schemes. Utilize AI technology to analyze students' athletic performance, learning habits, and interest preferences, providing customized learning paths and training plans for each student. Through intelligent tutoring systems, tailor instruction to individual needs to enhance learning efficiency and interest—achieving true personalized education. Concurrently, design diversified teaching methods such as virtual simulation experiences, interactive competitions, and data-driven skill assessments to enrich learning formats and stimulate student engagement. Moreover, strengthen practical applications and promote intra- and extra-campus collaboration. Establish virtual training bases and sports laboratories, introducing hybrid real-virtual practice scenarios that allow students to repeatedly practice in simulated environments and elevate their skill levels. Combined with AI-powered analysis, provide students with immediate improvement suggestions, forming a closed-loop cycle of "learning-practice-feedback." Simultaneously, refine the course evaluation system by establishing a scientific, multi-dimensional assessment framework. Leverage big data to analyze students' learning trajectories and athletic performance, combining formative and summative evaluations to comprehensively measure learning outcomes. Introduce dynamic adjustment mechanisms to modify teaching strategies in real time based on students' learning states, enabling continuous curricular optimization. Finally, establish incentives for course innovation and continuous improvement. Encourage teachers to continually explore new AI-integrated courses, collect student feedback, and optimize course content and structure. Through persistent refinement, propel the university basketball curriculum system toward intelligent, personalized, and diversified development to meet the diverse growth needs of students in the new era.

3.5 Improve the Evaluation System to Promote Data-Driven Teaching Management and Continuous Optimization

A scientific and rational evaluation system is crucial for ensuring the effectiveness of AI-enabled empowerment in university basketball courses. Universities should establish a multi-dimensional, data-based evaluation framework that combines process and outcome assessments to comprehensively reflect students' skill levels, learning engagement, and innovation capabilities. Utilize AI technology to collect diverse data from virtual simulations, movement analysis, and intelligent tutoring sessions, creating individual student growth profiles for dynamic tracking and personalized assessment. Specifically, implement intelligent scoring models that quantify performance indicators such as athletic execution, tactical comprehension, and collaborative abilities to form a scientific evaluation system. Leverage big data analytics to provide students with immediate feedback, helping them identify strengths and weaknesses to motivate self-directed learning. Simultaneously, integrate evaluation results into course adjustments to achieve data-driven teaching optimization, ensuring course content and methodologies continuously adapt to students' actual needs. Furthermore, construct a multi-tiered incentive mechanism that integrates evaluation and motivation. Offer honors, scholarships, or practical opportunities to high-achieving students to stimulate engagement, concurrently, provide personalized tutoring and support for struggling students to help them address deficiencies and achieve continuous progress. Establish a transparent evaluation system to enhance students' sense of recognition and belonging. At the management level, employ AI-assisted decision-making systems to scientifically assess course implementation effectiveness. Provide administrators with intuitive and accurate analytical reports to support ongoing course improvement. By continuously refining the evaluation system, we aim to establish a student-centered teaching management model, thereby promoting the sustainable development of AI-enabled university basketball courses.

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