Curriculum and Teaching Methodology (2025)
Clausius Scientific Press, Canada

DOI: 10.23977/curtm.2025.080218
ISSN 2616-2261 Vol. 8 Num. 2

Research on the Innovation and Practice of University Physical Education Teaching Models Empowered by Digital Intelligence Technologies

Yang Jie, Dong Jiukui, Yang Shuijin, Liu Juanni

School of Sports Science and Engineering, Hunan Institute of Engineering, 411104, Xiangtan, Hunan, China

Keywords: Digital Intelligence Technologies; University Physical Education; Virtual Reality; Data Security; Teaching Innovation

Abstract: With the rapid development of digital intelligence technologies, their application in university physical education has gradually become a trend in educational innovation. Technologies such as Virtual Reality (VR), Augmented Reality (AR), big data, and smart devices are bringing profound changes to traditional physical education models. By analyzing case studies of domestic universities applying digital intelligence technologies, this paper explores the transformation brought by technological innovation to physical education and discusses the main challenges faced, including the cost of technology implementation, insufficient digital literacy of teachers, and data security risks. Finally, it proposes specific strategies to optimize technological investment, strengthen teacher training, and improve data protection mechanisms to promote the continuous innovation and development of physical education in universities.

In the context of the growing development of information technologies, digital intelligence technologies provide new opportunities for innovation in university physical education. Compared to traditional teaching methods, digital intelligence technologies show significant advantages in improving teaching efficiency, personalized learning, and student engagement. By introducing tools such as Virtual Reality (VR), Augmented Reality (AR), and big data analytics, teachers can provide more precise training guidance based on students' actual conditions. However, the application of digital intelligence technologies in university physical education still faces many challenges, especially regarding cost investment, teacher competency, and data security. Therefore, conducting in-depth research on these issues and countermeasures is key to advancing physical education reforms.

1. The Application of Digital Intelligence Technologies in the Innovation of Physical Education Teaching Models in Universities

(1) Building Intelligent Teaching Platforms

The core of an intelligent teaching platform lies in the construction of a resource integration and sharing platform. Through cloud computing and big data technologies, the platform can efficiently

integrate various resources such as physical education course videos, training manuals, and teaching cases, and support real-time updates and sharing[1]. Both teachers and students can quickly access these resources as needed, which breaks the limitations of time and space, enhancing teaching flexibility and autonomy. The platform also provides space for teaching interaction for teachers from different universities and regions, promoting the sharing and collaboration of educational resources, thus improving the overall education level.

The personalized learning recommendation system analyzes students' learning progress, interests, and sports skills through intelligent algorithms, providing each student with a tailored learning plan. Based on students' physical fitness test results, historical learning data, etc., the system automatically recommends suitable training content and learning paths. This personalized recommendation mechanism not only enhances students' motivation but also makes the teaching more targeted, helping students quickly improve their sports skills. Through this precise learning recommendation, students can find the best learning pace and methods within their own interests and abilities, effectively improving the efficiency and quality of teaching.

(2) Innovation in Teaching Methods

The application of Virtual Reality (VR) and Augmented Reality (AR) technologies in physical education teaching has opened up new possibilities for teaching methods[2]. VR creates an immersive virtual environment, where students can simulate competition scenes and complex movements without needing an actual venue, achieving safe and effective training outcomes. For example, in basketball or skiing training, students can repeatedly practice technical movements through VR technology, overcoming the space and risk limitations of traditional sports. AR technology, on the other hand, overlays virtual data onto the real environment via smart devices, providing real-time feedback on students' posture, movement accuracy, and technical details. This immediate feedback allows students to adjust themselves during training, improving the precision and efficiency of the exercises.

Data-driven precision teaching collects and analyzes students' physical and movement data in real time, providing scientific training plans. By monitoring students' physiological data (such as heart rate, steps, exercise intensity) through smart devices, big data technology can accurately assess students' athletic abilities and health status, creating personalized training plans. Compared to the traditional "one-size-fits-all" teaching model, big data analysis can offer more precise instructional guidance based on each student’s specific needs. This data-driven approach optimizes the arrangement of teaching content and enhances students' exercise outcomes, ensuring that they train at appropriate intensities, avoiding overtraining and injury.

(3) Transformation in Teaching Evaluation

The construction of a diversified evaluation index system is key to driving the reform of physical education assessment. Traditional evaluation methods overly focus on physical fitness and performance, neglecting important aspects such as students' mental qualities, sports intentions, and teamwork. By introducing more comprehensive evaluation standards, teachers can assess not only students' athletic skills and physical conditions but also their participation and performance in team collaboration. For example, by combining psychological testing with physiological data analysis, teachers can better understand students' emotional state and recovery, allowing for the development of personalized training plans. A multidimensional evaluation system ensures that students are assessed not only in terms of their competitive level but also in terms of their mental qualities, sports interests, and overall capabilities.

The application of intelligent evaluation tools and technologies makes teaching evaluation more precise and efficient. With the use of smart devices such as wearable devices and motion sensors, teachers can collect students' sports data in real time, including exercise intensity, heart rate variations, and movement posture[3]. The intelligent system automatically analyzes these data,

helping teachers identify students' deficiencies in movement and provide targeted improvement suggestions. At the same time, the system can provide personalized scores for students based on the data, ensuring fairness and accuracy in the evaluation. Intelligent evaluation tools significantly improve the timeliness of feedback, helping students correct technical movements in a short period and ultimately enhancing the overall teaching effectiveness.

2. Case Analysis of Digital Intelligence Technology Empowering the Innovation of Physical Education Teaching Models in Universities

(1) Case Selection and Introduction

In order to explore the application of digital intelligence technologies in university physical education, this paper selects innovative case studies from three domestic universities. Peking University extensively uses Virtual Reality (VR) technology, especially in high-risk sports such as skiing and rock climbing. Through VR simulation training, it effectively reduces accident risks and improves learning efficiency. Shanghai Jiao Tong University has introduced a personalized training system based on big data analysis, which monitors students' sports data in real time and develops personalized training plans to help students improve their athletic abilities accurately. Zhejiang University has established a sports health management platform through intelligent wearable devices that automatically collect sports data and provide health analysis, achieving refined management of students' physical fitness. These practices demonstrate that digital intelligence technologies not only improve teaching effectiveness but also drive the upgrading of physical education teaching models.

(2) Practical Process and Methods

To implement digital intelligence technology innovation in university physical education, it is necessary to design a scientifically sound practical plan. Taking Peking University's VR skiing teaching as an example, the plan begins with needs analysis, with the goal of reducing safety hazards in high-risk sports and improving students' skill mastery. The team selects hardware devices and builds virtual environments, ensuring compatibility of VR devices and the richness of teaching content. Meanwhile, both teachers and students undergo relevant technical training to ensure smooth application of the technology in teaching. During implementation, teachers monitor students' performance in the virtual environment and adjust the teaching plan in real time, ensuring that each student gets adequate practice in the simulated environment. The practical results show that through VR technology, students' mastery of technical movements became more precise, and the accident rate significantly decreased, leading to a marked improvement in teaching effectiveness.

The specific application strategies of digital intelligence technologies in different universities are distinctive. Shanghai Jiao Tong University uses a big data analysis system that analyzes students' physical fitness data, sports performance, and health conditions to develop personalized training plans. The system monitors students' sports data in real time and adjusts training plans based on their learning progress and physical fitness improvements. This strategy ensures that each student trains at the most appropriate intensity, avoiding both overtraining and insufficient training. At Zhejiang University, students wear intelligent devices such as smart wristbands, which automatically collect their sports data. The system analyzes the data through a cloud platform and provides personalized exercise recommendations and health management plans. Through these technologies, students' sports health is comprehensively tracked, and teachers can better understand students' physical conditions and training progress, optimizing sports teaching management.

(3) Evaluation of Practical Effectiveness

The evaluation of the practical effectiveness of digital intelligence technologies in different

universities shows significant improvements in students' learning outcomes. For example, in Peking University's VR skiing teaching, students' skill mastery rate increased by about 30%, and the injury rate decreased by 50%. Through big data analysis, Shanghai Jiao Tong University's personalized training system helped students' physical fitness levels improve by an average of 15% in one semester. Satisfaction surveys indicated that over 90% of students were satisfied with the application of digital intelligence technologies in physical education, believing that it enhanced their learning interest and engagement. Teacher feedback also shows that the introduction of technology optimized the teaching process, making it more precise and personalized, significantly improving teaching efficiency. The application of digital intelligence technologies has promoted the deep development of physical education reforms. Through refined data management and personalized teaching, traditional physical education models have been effectively broken, and the interactivity between teachers and students has been significantly enhanced. Overall teaching quality and management levels have been improved, providing strong support for future innovation in university physical education.

3. Challenges and Strategies for Empowering Innovation in University Physical Education Teaching Models through Digital Intelligence Technologies

(1) Challenges Faced

The application of digital intelligence technologies in university physical education faces several challenges[4]. One of the most prominent issues is the high cost of technology application and the problem of technological updates. Technologies such as virtual reality (VR), augmented reality (AR), and big data analysis require significant hardware investments and ongoing technical maintenance, which can place a heavy financial burden on many universities, especially those with limited funding. As technology continues to advance, new innovations quickly render existing equipment and software obsolete, and frequent updates result in a continuous investment challenge. This undoubtedly increases both the complexity and cost of implementing these technologies.

Another issue is the lack of digital literacy and capabilities among teachers. While digital intelligence technologies offer numerous innovative opportunities for physical education, many teachers lack the necessary professional knowledge and practical experience in using digital tools and teaching platforms. Teachers need to continuously undergo training in new technologies to enhance their ability to effectively incorporate these technologies into their teaching. In practice, many universities are insufficiently investing in faculty training, which results in teachers struggling to effectively integrate emerging technologies into their daily lessons.

Data security and privacy protection are also major concerns. In intelligent teaching systems, a vast amount of personal data, exercise data, and health information about students need to be collected, stored, and analyzed. The leakage or misuse of these sensitive data could pose significant risks to students' privacy[5]. Universities must take effective data security measures to ensure the confidentiality and security of students' data. Currently, there are still gaps in data security regulations and technical protections, and how to establish a robust security defense system is a crucial challenge that must be addressed in the application of digital intelligence technologies.

(2) Strategies

To address the issue of technology application costs in university physical education, flexible investment models, such as equipment sharing and technology leasing, should be adopted to reduce initial large-scale investments. Universities can collaborate with technology suppliers and other institutions to share or exchange equipment, thereby distributing costs. At the same time, a technology update mechanism should be established to ensure timely upgrades of the equipment and platforms used, preventing resource waste due to outdated devices. Regular evaluations of

existing equipment and software, along with flexible adjustments based on teaching needs and technological advancements, will help improve the cost-effectiveness of technology applications. Universities should also seek multi-channel funding support, such as government project funds or corporate partnerships, to ensure the sustainability of technology updates and maintenance.

Strengthening teacher training and professional development support is key to improving the effectiveness of digital intelligence technology applications. Universities should regularly organize training sessions focused on digital intelligence technologies to help teachers enhance their digital literacy and master the usage of emerging technologies. Teachers need not only to learn how to use relevant hardware and software, but also innovate in teaching design and methods to better integrate the characteristics of physical education. In addition to traditional technical training, interdisciplinary collaboration among teachers should be encouraged to promote deeper integration between information technology and physical education. For example, physical education teachers working with information technology teachers can explore technology application solutions that better meet teaching needs. Through systematic training and support, teachers' overall competency can be enhanced, ensuring that digital intelligence technologies are better integrated into the teaching process.

Data security and privacy protection are critical challenges that cannot be ignored in the application of digital intelligence technologies. With the widespread use of smart devices and big data, student personal exercise data and health information are at significant security risk. Universities should improve data management and privacy protection systems to ensure the safety of student information. Data encryption and multi-layer security measures should be implemented to prevent data leakage during storage and transmission. A strict permission management mechanism should be established to ensure that only authorized personnel can access relevant data. Additionally, universities should develop comprehensive data security policies in accordance with national laws and industry standards, and regularly conduct audits and risk assessments to prevent potential security vulnerabilities. By enhancing data protection awareness among both faculty and students, universities can ensure the implementation of privacy protection measures, providing a secure foundation for the application of digital intelligence technologies.

4. Conclusion

Digital intelligence technologies have brought new opportunities and challenges to university physical education. Through the application of technologies such as virtual reality, augmented reality, and big data, physical education can not only achieve more personalized and precise guidance but also make significant breakthroughs in teaching management, student interaction, and other areas. Universities face issues such as technology update costs, insufficient digital literacy of teachers, and data security during the application of these technologies. By optimizing technology investments, strengthening teacher training, and improving data security management, the in-depth application of digital intelligence technologies in university physical education can be effectively promoted, providing strong support for the transformation and upgrading of future educational models.

Acknowledgement

A 2024 Ministry of Education Industry-University Collaboration and Cooperative Education Project, with the project approval number 2410270342, titled "Research on the Reconstruction and Optimization of Blended Physical Education Courses in Universities from the Perspective of 'Proactive Health'."

References

[1] Xiao Y, Chen Y, Tang Y. Research on the Teaching Reform of Capital Operation Course: Digitally-enabled Innovation[J].Journal of Educational Research and Policies,2024,6(12):100-104.
[2] Zhu H, Zhou S. Mathematics and Intelligence Education: The Path of Folk Art Teaching for College Preschool Education Major[J]. Education Journal,2024,7(5)
[3] Zhu J. Discussion on the Reform Path of Accounting Wisdom Teaching in Applied Undergraduate Colleges in the Age of Number Intelligence[J].New Explorations in Education and Teaching,2024,2(4)
[4] Li J. Exploring the New Model of Digital Intelligence Education—Boosting the Research and Practice of Provincial First-class Curriculum Construction with the Course of "Micro Film Creation"[J]. The Educational Review, USA, 2024, 8(2)
[5] Wei L. A Strategic Study on Quality Improvement of Physical Education Teaching Empowered by Digital Intelligence Technology[J].Applied Mathematics and Nonlinear Sciences, 2024, 9(1)