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Research on the practice of "four-dimensional integration" physical education in colleges and universities driven by digitalization—Taking Chongqing University of Technology as an example

Yanlin Xu*

Physical Education Department, Chongqing University of Technology, Banan District, Chongqing, China

**Corresponding author*

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Abstract: The digital transformation of education is the core engine driving the high-quality development of school physical education in the new era. Taking Chongqing University of Technology as an example, this paper uses the methods of literature, questionnaire and interview to deeply analyze the development dilemma of digital sports education, and builds a four-dimensional integrated sports education mode of digital ' teaching, training, competition and physical management '. The implementation system is constructed from five aspects : platform data exchange, digital literacy cultivation of teachers and students, personalized health intervention, four-dimensional collaborative integration and long-term operation and maintenance assessment, so as to realize the precision of teaching, scientific training, standardization of events and normalization of physical intervention, and provide theoretical basis and practical paradigm for the construction of intelligent sports integrated education in colleges and universities.

1. Introduction

The "15th Five-Year Plan" for the construction of a "sports power" emphasizes the promotion of high-level sports science and technology self-reliance and self-improvement, accelerating the construction of digital sports, supporting the application of new technologies such as big data, artificial intelligence, and cloud computing in the field of sports, and improving the digital level of sports products and services[1]. With the development of digital new productivity such as big data and artificial intelligence, the reform of digital sports based on digital and intelligent conditions has global strategic significance below[2]. At present, big data, Internet of things and artificial intelligence are widely used in campus sports work, which improves the effectiveness of physical education. At the same time, there are still problems such as mutual separation, data islands, and idle smart devices in classroom teaching and extracurricular training. Moreover, the existing research focuses more on single digital teaching or physical fitness monitoring optimization, and lacks research on the construction of a collaborative education system covering the whole business

chain of sports. Based on this, taking the campus intelligent sports platform of Chongqing University of Technology as a sample, this paper constructs a four-dimensional linkage education model of digital ' teaching-training-competition-physical management ', analyzes the existing practical difficulties and puts forward a complete implementation path, in order to provide practical reference for improving the quality and efficiency of intelligent sports education in colleges and universities.

2. Research objects and research methods

2.1 Research object

This study takes the four-dimensional linkage education model of physical education teaching, extracurricular training, campus competition, physical health management and the practical path of school landing under digital empowerment as the research object.

2.2 Research methods

(1) Literature method

Through CNKI, with ' education digitization ', ' smart sports ', ' physical education ', and ' students ' physical health ' as keywords, relevant literature is retrieved, and existing theoretical results are sorted out to lay a theoretical foundation for model construction.

(2) Questionnaire survey method

The digital questionnaires of teachers and students were compiled to collect the opinions of teachers and students on platform construction, existing problems and optimization paths, and to quantitatively analyze the shortcomings of traditional education and the actual needs of digital construction.

(3) Interview method

This study developed a standardized interview outline, interviewed teachers of the sports department, technical personnel of the information center, school team coaches and student representatives respectively, and explored practical problems and optimization ideas in the operation of smart sports platforms and digital teaching.

3. The current situation and problems of digital physical education in schools

3.1 The current situation of digital sports education

Under the background of continuous promotion of education digitization and healthy China strategy, our school actively carries out campus digitization construction. At present, the school has built a campus smart sports platform (hereinafter referred to as the platform). The platform is equipped with teaching, training, competition, and physical health management ports, mainly focusing on the realization of teaching precision, training personalization, event popularization, and physical management. The four major goals of the whole process are running. The teaching terminal basically realizes the basic functions of pre-class preview, classroom check-in, after-class review and so on. At the training end, students can comprehensively improve their physical fitness by completing sit-ups, push-ups, rope skipping and other projects ; the competition side realizes the registration of the event, the live broadcast of the event, the presentation of the event results, etc., and simplifies the event process ; the physical health management terminal realizes the functions of intelligent test, test data acquisition and analysis. Combined with the field research of the school, it is found that there are still some deficiencies in the operation of the campus intelligent sports

platform.

3.2 Problems in digital physical education

3.2.1 Insufficient platform coordination and equipment stability

(1) Data islands are common, and cross-system data cannot be shared. The campus smart sports platform integrates full-chain modules such as teaching, training, competition, physical health testing, and extracurricular exercise, but data fragmentation and algorithm limitations also hinder deep application to a certain extent, forming a closed-loop within the module and isolated data islands between modules below[3]. There are phenomena such as the disconnection between physical health test data and classroom teaching data, and the two-way separation of event data and training and teaching. Such as physical health data failed to communicate with teaching, training and other ports, to achieve data sharing and sharing.

(2) The basic data standards are different, and the labor cost of teaching management is high. There is no automatic synchronization mechanism between the student database of the campus intelligent sports platform and the campus unified identity, academic performance and student status system, which increases the workload of attendance and performance accounting. Intelligent physical health test equipment has frequent failures and lack of data acquisition accuracy.

3.2.2 Equipment utilization and low digital literacy of teachers and students

(1) Equipment normalization management is not enough. The school has built a campus intelligent sports platform, and students can make online appointments independently to complete the tests of physical health test items such as vital capacity and standing long jump. However, there are still some deficiencies in students ' self-appointment, unsatisfactory test results, pre-class video browsing, and participation in extracurricular exercises ; the digital literacy of teachers and students is not balanced below[4]. As the designer of learning activities, the interpreter of data, the instructor of personalized guidance and the guide of technology application, teachers ' lack of digital thinking is an important factor restricting the digital development of higher education.

(2) Teachers have not updated their educational concepts and changed their thinking in time. Some old teachers are still mainly based on traditional teaching methods and means, and do not realize the analysis of learning situation and the formulation of strategies through digitization.

3.2.3 Physical management intervention is not enough, students ' enthusiasm is not high

(1) Homogenization of health intervention programs and lack of personalized guidance. The school completes the physical health test and data reporting of the whole school students through the campus intelligent sports platform every year, and does not deepen the research on the students ' physical health test data, and puts forward targeted intervention strategies.

(2) Extracurricular exercise incentives are single, and the phenomenon of illegal running is prominent. Extracurricular exercise relies on the rigid assessment of the running and punching platform, with only mileage and punching times as the evaluation criteria, and lacks multiple incentives such as hierarchical points and credit deduction. Students generally passively cope with assessments, breed illegal behaviors such as virtual positioning, finding people to run on behalf of others, and weaken the effect of exercise and education ; lack of classes, dormitory fitness competition, fun small events and other activities carrier, it is difficult to form a full sports atmosphere ;

(3) The data privacy protection mechanism is not perfect, and the students ' cooperation is insufficient. The platform collects sensitive information on students ' physique, movement and

identity, but the data is desensitized and the authority control is loose. Students perfunctory to complete the physical health test out of privacy concerns, resulting in data distortion, missing, affecting the accuracy of big data analysis.

3.2.4 Operation and maintenance support Heavy construction light long-term, support system is not perfect

(1) There is no exclusive operation and maintenance team, and the normalized operation and maintenance system is absent. After the completion of the platform and physical health test equipment, a joint operation and maintenance team composed of the sports department, information center and other departments has not been formed, and there is a lack of equipment inspection, fault repair and system iterative standardization system.

(2) The problem feedback has no closed-loop rectification mechanism. The algorithm vulnerabilities, hardware failures, and process defects found by teachers and students only rely on oral feedback, wirelessly reporting ports, problem accounts, and supervising the sales process. Similar problems have not been cured for a long time ; the school does not regularly carry out teacher-student satisfaction surveys, so it is difficult to accurately grasp the pain points of use, and the platform service cannot be continuously optimized.

(3) Lack of digital education assessment constraints. The indicators such as the effectiveness of digital teaching, the application of the platform, and the improvement rate of students ' physical fitness have not been included in the annual assessment of teachers, the evaluation system of the Ministry of Sports and the secondary colleges.

4. School four-dimensional integration of sports education mode construction

Improve the four-dimensional integration linkage mechanism and build an integrated global education system.

(1) Physical education and physical health integration, to achieve the determination of teaching. Teachers use artificial intelligence technology to fully understand the physical condition of students, clarify their sports strengths and weaknesses, so as to achieve differentiated teaching in the classroom, provide students with personalized training programs and improvement suggestions, and improve students ' exercise effect[5] below . Based on the students ' full-cycle physical fitness big data, the common shortcomings of the class and the individual physical weakness are judged, and the classroom special teaching unit is set up to make up for the shortcomings of the students ' physical quality.

(2) the integration of sports training and campus competition, to prepare for the competition. To lead the daily training of sports teams with the competitive standards of campus events at all levels, integrate the competition technology and evaluation standards into the normal training, consolidate the competitive foundation with systematic training, and test the training effect by relying on the events, so as to form a virtuous cycle of ' training and competition integration, training and preparation, and competition and training ' ;

(3) The integration of campus competition and extracurricular exercise to achieve competition to promote practice. With the goal of students ' sports needs, we will hold popular campus sports events, and incorporate the competition records into the extracurricular exercise assessment, so as to stimulate students ' sports participation in the internal drive, and form an interoperability pattern in which events drive daily exercise and continuous exercise support competition.

(4) The integration of physical health management and lifelong sports to achieve long-term empowerment. By giving full play to the platform 's normal monitoring and intervention functions, the students ' physical health management runs through the whole process of the university, realizes

the synchronous promotion of health control and physical education, and empowers the formation of lifelong exercise habits.

5. School four-dimensional integration of physical education model to build the implementation path

5.1 Upgrade the smart sports platform to open up global data

(1) Open up the cross-system data interface to achieve multi-terminal collaborative linkage.

The school set up a leading group of campus intelligent sports work composed of a student management group to coordinate and promote the construction of campus intelligent sports. Through the platform, students ' basic information such as majors and grades can be queried, and personalized exercise programs can be automatically pushed.

(2) Unified basic data standards, optimize the digital teaching management module

The system should update the basic information of students regularly to facilitate teachers ' query. Further optimize the attendance, classroom management, extracurricular exercise, health care and other module functions, and the linkage of the final results, to achieve the accuracy of teaching management.

(3) Iterative physical health test equipment algorithm to ensure stable and accurate testing

In view of the identification loopholes in the standing long jump and the pull-up, the school should timely cooperate with the manufacturer to upgrade the algorithm, optimize the standing long jump induction point position, the pull-up posture recognition logic, the sit-up area induction, block all kinds of identification loopholes, and truly realize the accurate test ; enable face recognition, student number password login, etc., to improve test efficiency.

5.2 Two-way support of hardware operation and digital capabilities to enhance the effectiveness of digital applications

(1) Standardize equipment application scenarios and revitalize hardware resources

The school revised the physical education syllabus, incorporated digital application into the physical education syllabus, clarified its application requirements in curriculum construction, classroom teaching and after-school training, improved the efficiency of platform utilization, and actively promoted teachers to try to use digital to empower physical education links and improve the effectiveness of education.

(2) Carry out digital training at different levels to consolidate the digital literacy of teachers and students.

The school has established a normalized digital teaching and research training for teachers. The training content covers platform operation and maintenance, big data learning situation analysis, AI training scheme design, intelligent equipment operation ; select digital outstanding young teachers to help middle-aged and elderly teachers one-on-one, and improve the overall digital teaching ability. At the same time, through a variety of online and offline ways, students ' digital application ability is improved.

5.3 Improve the closed-loop physical health management system and stimulate students ' endogenous motivation for independent exercise

(1) Build students ' dynamic digital sports archives, and implement the " one policy for a lifetime " precision education.

Based on the data of students ' physical health test scores, course attendance, extracurricular

exercise, competition awards and so on, the platform accurately constructs the digital portrait of students ' sports. Students according to the portrait, clear their own physical quality short board, according to the personalized exercise program, independent scientific exercise.

(2) Build ladder multivariate incentive system, put an end to exercise violations

Optimize the running card assessment mechanism and implement gradient points reward. Monthly standard convertible sports points, three consecutive months of standard deduction of sports usual performance. The platform normalizes the online class PK, dormitory physical fitness challenge, and the school 's sports rankings. Regularly carry out skipping, squatting, and sit-up fun events, and mobilize students ' exercise initiative through process, honor, and material multiple incentives. Eliminate violations such as running and brushing from the root.

(3) Build a strong data security line to protect students ' privacy rights.

Sports data governance and security research mainly focuses on data life cycle management, privacy protection and technical risks[6]. The home page of the platform shows ' sports data use and privacy protection notice ', which makes it clear that physical health test data is only used for teaching research, and third-party commercial disclosure is strictly prohibited. The whole process uses data desensitization technology to anonymize student names and student numbers, and carries out statistical analysis with numbers.

5.4 Improve the operation and maintenance assessment guarantee mechanism and consolidate the long-term landing foundation of the model

(1) Establish a multi-party collaborative operation and maintenance team to clarify job responsibilities.

Integrate the Ministry of Sports, the Information Center and other departments to set up a special operation and maintenance working group to clarify the responsibilities of each department. The sports department coordinates digital teaching and collects the needs of teachers and students ; the information center is responsible for data interface, network and background system support ; the manufacturer undertakes hardware maintenance, algorithm and platform function iteration ; teaching management personnel supervise daily operation and coordinate process optimization.

(2) Build a closed-loop rectification system for the problem and continuously optimize the platform service.

The online feedback channel is unimpeded. Teachers and students establish a management system of ' building account sales number ' according to the real-time reflection of faults such as stalling and inaccurate positioning in the operation of the platform. The school regularly carries out research on the satisfaction of teachers and students on the campus smart sports platform, continuously optimizes and improves the platform function, and improves the satisfaction of teachers and students.

(3) Incorporate formal assessment and evaluation, establish a rigid long-term forced mechanism

The application of digital platform and students ' participation are included in the evaluation system of college sports work. The school improves the supporting reward and punishment system, and commends the individuals and departments with outstanding achievements in digital education ; fulfill the rectification and landing of ineffective work promotion.

6. Conclusion

Digital technology can reconstruct the full-process operation system of physical education in colleges and universities, specifically manifested as follows:

(1) By leveraging big data, the Internet of Things, and artificial intelligence, the data barriers throughout the entire chain of physical education can be broken down, forming a closed loop of

"data collection - intelligent analysis - hierarchical intervention - dynamic feedback".

(2) Digitalization promotes the precision of teaching, the scientific nature of training, the standardization of competitions, and the normalization of physical fitness intervention, achieving the four-dimensional goals.

(3) By establishing a digital closed-loop education model for physical education in colleges and universities covering four dimensions: physical education teaching, sports training, campus competitions, and physical health management, the comprehensive quality of physical education in colleges and universities will be comprehensively enhanced.

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