

Research on online and offline hybrid interactive physical education teaching mechanism

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Abstract: The outbreak of the new coronavirus pneumonia has seriously affected the normal teaching process. The Ministry of Education urgently deployed epidemic prevention and control work and issued a series of response measures to guide online teaching. The development of education informatization has provided software and hardware support for online physical education, and online physical education has played an important role in the response to this crisis. However, in online physical education, there are problems such as weakened teacher-student interaction and hindered information feedback, obstacles to the creation of physical education situations and lack of empathy, limited application of physical education teaching methods, and lack of evaluation of physical education effectiveness. To address the issues associated with online physical education, an online and offline hybrid interactive physical education teaching mechanism is proposed. This mechanism aligns with the educational philosophy and guiding ideology of "health first" and is driven by the integration of educational information technology and practical subject knowledge. The design focuses on nurturing students' core competencies in physical education goals and aims to establish multi-dimensional sensory interaction and real-time feedback patterns. It employs a capability-based evaluation method that combines the expressiveness of the process with the finality of the outcome.

During the home isolation period and the normal stage of prevention and control, physical education courses played a vital role in guiding and strengthening students' physical exercise, improving immunity and improving the comprehensive ability and quality of the body, and antagonizing and coping with students' psychological stress. In the post-epidemic era, how to use education information technology to carry out online and offline mixed physical education teaching is of great significance to ensure and improve the quality of physical education, promote schools to strengthen health education and survival education through physical education courses, promote the deep integration of informatization and subject teaching practice, and cultivate students' independent and intelligent learning ability and mental health adjustment ability.

1. Problems in online physical education teaching

In 2012, 2016 and 2018, the Ministry of Education of China successively issued the Ten-Year Development Plan for Education Informatization (2011-2020), the 13th Five-Year Plan for Education Informatization, and the Education Informatization 2.0 Action Plan, which made remarkable

achievements in the construction of informatization teaching infrastructure and the training of teachers' informatization teaching ability, and provided hardware and technical support for schools to carry out online courses in response to public health and safety emergencies. The sudden and severe impact of the new crown pneumonia epidemic on school teaching has been huge, and the passivity of online courses has become the most important teaching response strategy. [1]

As the main means of physical education, online courses also have many limitations objectively. The development of sports online courses relies on electronic devices and multimedia to realize the teaching of teachers and the learning of students. Visually, it is the presentation of two-dimensional images, and the interaction between man and computer cuts the spatial consistency, alienates the distance between teachers and students, and lacks multi-mode communication and interaction, which limits the subjectivity of teachers and the creation of scenarios, restricts the application of teaching methods and teaching art, and affects the quality of teaching and learning effects.

There are the following problems in the practice of online physical education: First, teacher-student interaction is weakened and information feedback is hindered. Online courses create virtual space through multimedia and learn through visual and auditory two-dimensional, which is far less than the sense of scene of offline teaching to bring students all-round, multi-dimensional, three-dimensional, diverse, universal and personalized information acquisition and perception [2].

Second, physical education situations create barriers and lack of empathy. The creation of physical education situations consists of the two basic characteristics of "now" (time) and "presence" (space), which uses multiple senses to experience spatial perception and proprioception of body completion of skill movements, which is superior to online teaching language expression and visual reception.

Third, limitations on the application of physical education methods. Online physical education relies on multimedia transmission of sound and video, mainly using explanatory methods and model methods, and the video presents a two-dimensional picture, and students cannot accurately understand and master the accuracy of the teacher's demonstration actions in three-dimensional space. Due to the physical "absence", the teacher-guided error correction method, the student group practice method and the mutual error correction method cannot be effectively implemented. At the same time, the ideological and political education and ideological will cultivation reflected in the unity and cooperation process of team projects are missing.

Fourth, the lack of evaluation of the effectiveness of physical education. Physical education teachers can use process and outcome assessment to assess students' learning outcomes. However, the assessment of emotion, attitude and engagement in the learning process cannot be presented through small two-dimensional images, and teachers can maintain an effective distance from the display during the demonstration and explanation, and cannot focus on the learning status and performance of each student. In the evaluation of results, teachers mostly use theoretical answer sheets, training task shooting and analysis and other forms, and overemphasize theoretical aspects, weakening the practice, reinforcement and improvement of action accuracy [3].

2. Online and offline mixed interactive physical education teaching mechanism

The development of education informatization provides hardware and software support for online physical education teaching. Online physical education has played an important role in coping with the crisis, but there are also shortcomings and problems in the practice of physical education. In view of the problems existing in online physical education, it can be suggested to solve them by constructing a mixed online and offline interactive physical education teaching mechanism (Figure 1). In a more specific sense, this approach adheres to the "health first" educational philosophy and guiding ideology. It is propelled by the integration of educational information technology and practical discipline knowledge. The design is tailored to foster students' core literacy in physical

education goals. It establishes multi-dimensional sensory interaction and real-time feedback modes. Moreover, it employs an ability-based evaluation method that combines the performance throughout the process with the final outcome's effectiveness.

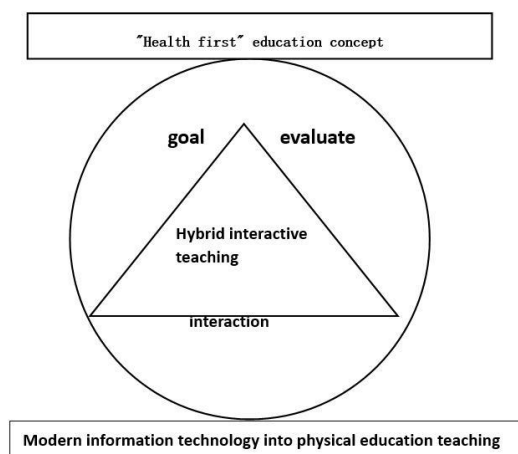


Figure 1: Online and offline hybrid interactive physical education teaching mechanism

2.1. Implement and follow the educational concept and guiding ideology of "health first"

The General Secretary's speech reflects the spirit of "people-oriented" and "people-oriented", which is reflected in the aspects of education as "student-centered" and "student-oriented" [4]. Emphasize and focus on students' subjectivity, pay attention to students' learning, physical and mental health promotion, growth and development, personality cultivation, resistance and survival education, innovative practice, employment preparation and social adaptability training. This requires a comprehensive understanding of students' learning basis and habits, attitudes and interests, ways and methods, overall planning of educational information resources, integration of student training programs and curriculum objectives, integration of information technology and teaching concepts, integration of online and offline teaching, attention to students' learning process and performance, and combination of various evaluation methods to cultivate students' comprehensive ability. [5]

2.2. Rely on the integration of educational information technology and discipline practice

The state has carried out top-level design and constantly updated and improved the policy on education informatization. Lei Zhaozi, director of the Science and Technology Department of the Ministry of Education, pointed out that the construction of "three links and two platforms" has been completed in the 1.0 era of education informatization. Three key elements include "access to broadband network in schools," "access to quality resource classes," and "universal access to online learning spaces." Supporting these are two platforms: the Education Resources Public Service Platform and the Education Management Public Service Platform. In 2018, the Ministry of Education issued the "Education Informatization 2.0 Action Plan", which proposed the development goals for the next stage. [6] Teaching application covers all teachers, learning application covers all students of appropriate age, digital campus construction covers all schools, informatization application level and teachers and students' information literacy are generally improved, and an "Internet + education" platform is built. [7]

Based on the practice of information technology in physical education teaching, Xiao Erdun (2017) pointed out that the blended learning of physical education in colleges and universities should focus on learning tasks, resource and platform design, and problem-solving oriented face-to-face teaching [8]. Zhao Haibo (2020) pointed out that the key to mixed PE teaching lies in the concept, attitude and

application ability of teachers' information-based teaching, as well as the support of high-quality teaching resources, and proposed to strengthen teachers' information-based training, and schools should introduce incentive policies and provide technical guidance [9].

The integration of information technology and physical education not only reflects the use of online and offline teaching resources, MOOC and SPOC and other online teaching resources, the construction of various platforms and resource libraries, and the use of flipped classroom teaching methods, but also integrates the concept of competitive sports big data thinking guidance training and the use of technology-assisted equipment technology. Wearable devices are used to collect and monitor students' physiological and biochemical indicators in real time through various microchips and photoelectric sensors, so as to ensure the safety and effectiveness in the exercise training process, which is an effective means to evaluate students' performance and comprehensive ability in the exercise process.

Taking fitness option course as an example, the teacher determines the major of the selected students, and analyzes the training plan for the students to be qualified for the professional position or content of the body posture support, the required muscle coordination force, aerobic endurance and strength and other physical bases. Through the network platform and other means, the physical activity data of students from high school to now, such as national physical fitness test results, physical education course selection content and evaluation methods, physical examination reports and health files, students' participation in morning exercise and extra-curricular sports activities, training and competition, were collected and analyzed (physical fitness assessment such as speed, strength, flexibility, coordination and balance). Set up individual exercise prescription or training plan for students' professional body posture and movement pattern.

Before class, the resource platform releases micro-lessons on theoretical knowledge points such as physiological anatomy of each muscle group, movement patterns and 3D video analysis, how to correct errors and use movements, efficacy or exercise value, relaxation and stretching, nutrition supply, health and survival education and other video materials, so that students can learn and practice through the platform. During the class, students wear a heart rate armband to collect real-time heart rate corresponding to blood flow rate per unit time through photoelectric sensors. Students can monitor heart rate change, calorie consumption, and ratio of heart rate to maximum heart rate under exercise conditions through display equipment or screen projection. The data report will be generated immediately after the exercise and pushed to students' mobile phones to verify the accuracy and rationality of the exercise plan setting. After class, students' self-exercise videos and sports data reports are uploaded to the platform, and teachers conduct objective evaluation by analyzing students' previous sports data reports [10].

2.3. Student-centered physical education aims to develop students' core literacy

The National Education Conference pointed out that education should focus on the fundamental issue of who to train, how to train people, and for whom to train people, and train socialist builders and successors with all-round development of morality, intelligence, physical fitness, the United States and labor. Establish the educational concept of health first, start physical education classes, and help students enjoy fun, enhance physical fitness, improve personality, and temper their will in physical exercise. The General Secretary's speech reflected the goal of education and the importance of physical education, through sports to promote the development of students' core qualities, improve physical and mental health, develop sound personality, cultivate moral character, enhance the quality of will and cultivate comprehensive ability.

With the help of professional teachers, physical education teachers analyze the requirements of professional knowledge and skills, body posture and movement ability, core quality or comprehensive

ability of students in the professional training program, and set physical education teaching objectives according to the professional training objectives. Further develop personalized objectives and course content based on the student's individual physical and athletic ability profile. It is an interactive and democratic "guide to learning", which truly reflects the student-oriented education concept. [11]

Through the combination of online and offline physical education, integrating information teaching concepts, platform resources and information technology and equipment, health and survival education is carried out, classroom content is enriched, teaching methods are innovated, and the physical education classroom atmosphere becomes lively, fully stimulates students' learning interest and exercise motivation, and more actively participates in classroom practice and interaction. Let students enjoy sports while promoting physical and mental health.

Improve the traditional physical education teaching, which suffers from a lack of variety in teaching content, monotonous teaching methods, a dull classroom atmosphere, and a deficiency in creating an engaging teaching environment.

2.4. Establish multi-dimensional sensory interaction and real-time feedback mode

The interaction between online and offline physical education teaching is reflected in the real-time interaction between teachers, students and carriers (online resource platform and information system equipment). Before class, students can use the educational information technology and network resource platform to learn the information teaching materials created by teachers online, and teachers can guide and evaluate online, and have real-time interaction through the carrier.

In the course, teachers form an active teaching atmosphere and participation through enriching teaching content and innovative teaching methods, as well as the help of educational information technology. After class, the training task or homework will be released through the platform, and the teacher will guide and correct the mistakes online.

The combination of advantages of online and offline physical education connects reality and virtual, three-dimensional and two-dimensional, time and space, audiovisual senses and psychological empathy, situation creation and thinking abstraction. Online teaching transcends time and space, carries out audio-visual material analysis and learning in the virtual network learning space, improves students' thinking imagination and perception ability, and promotes the cultivation of academic theory analysis and application ability. Jaqi believes that the on-site sense of physical education makes the information obtained by students omni-directional, multi-dimensional, three-dimensional, multi-dimensional, universal and personalized. Teachers and students are synchronized in time and space, and students empathize with the "same field" teaching situation created by teachers through teacher's action demonstration, language explanation, expression and body expression in three-dimensional space, so as to achieve multi-dimensional and full-sensory teaching interaction and feedback.

Take the design unit of exercise prescription for fitness course as an example. Before class, teachers publish courseware, efficacy analysis and audio-visual materials such as exercise movements of each muscle group with physiological exercise value, test questions, exercise prescriptions designed by students, and videos of exercise process through the vocational education cloud platform, and conduct group mutual evaluation and comprehensive comments and guidance of teachers. In class, teachers and students wear wearable heart rate armbands and exercise under the dynamic and powerful music rhythm arranged in advance. Real-time exercise data such as heart rate changes, exercise value corresponding to different heart rate ranges, and calorie consumption are displayed through mobile phones and tablet computers. With the help of information equipment and technology, teachers pay attention to the changes of students' internal physiological indicators and external athletic performance, have a more objective and comprehensive understanding of students' physical

and learning status, and carry out targeted and effective communication and interaction.

2.5. The evaluation method combining the performance of the process and the finality of the effect shall be adopted

The combination of the performance of the process and the final evaluation of the effect is an effective means to evaluate the teaching effect and learning outcome comprehensively and objectively. First of all, the process evaluation mainly focuses on the learning attitude, emotion and involvement of students in each lesson, teaching unit or stage. Uniform examination standards and implementation are extremely disadvantageous to students who are obese, overweight, physically frail, physically incapacitated or physically ill. At the beginning of the semester, students may begin to grasp the assessment standards and, considering their own abilities, might make predictions. If they believe that even with a semester of dedicated study they cannot meet these standards, it could lead to a loss of interest in learning, diminished confidence, and reduced participation in interactive activities. In a teaching cycle, students can master theoretical knowledge after careful study and hard training. However, physical fitness and skills are subject to their own athletic ability, can not be significantly improved in a short period of time, and can not meet the unified assessment requirements. This one-size-fits-all evaluation method lacks pertinence and effectiveness. Therefore, teaching evaluation should pay more attention to students' learning attitude, learning emotion and learning effort before class, during class, after class, online, offline and the whole semester learning cycle.

Secondly, the final evaluation emphasizes comprehensiveness and pertinence. Comprehensiveness is reflected in students' learning time and test on the network platform before class, interaction and practice in class, implementation degree of training tasks after class, application of knowledge and skills, health and survival education test, lifelong physical education assessment, etc. Pertinence refers to the changes in students' BMI index, body posture, skills, physical fitness, and special test indicators before and after the semester.

Take the fitness and fitness course as an example, the process evaluation combines each student's physical fitness, athletic ability and periodic training objectives, and objectively evaluates students' athletic performance and involvement through the data report of each class or training (exercise duration, calorie consumption, percentage of effective exercise heart rate to maximum heart rate and time interval). The final evaluation includes the uploading of pre-class platform learning and training videos, class participation, the sum of students' exercise data throughout the semester, and the comparison between the beginning and the end of the semester in terms of strength, flexibility, endurance, cardiopulmonary, coordination and balance, and body index.

3. Conclusion

In a certain period, to a certain extent, online physical education for teachers and students to complete the course at home, has played an important role. However, there are some problems in online physical education, such as focusing on teacher-led teaching, less participation and low efficiency of students, and lack of interaction between teachers and students. It has become more and more urgent to explore the teaching mode that takes students as the main body, develops students' quality development, realizes the whole process of all-round interaction, and focuses on students' ability based evaluation.

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