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Research on the Effects of Information Technology Empowerment in Physical Education Teaching in Chinese Ordinary High Schools

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Abstract: This paper discusses the influence of information technology on the teaching effect of physical education in ordinary high schools in China. The application and development status of information technology in middle school physical education in China were collected by literature method. The teaching effect of teachers using lesson preparation and preview software before class, using smart devices and micro-classes during class, and using DingTalk and other software after class in physical education classes of five classes of third-year students in Wujiang Fudan School, Xifeng County was statistically analyzed from the perspectives of learning interest, problem solving, collaboration ability, innovation ability, autonomous learning ability, and satisfaction with teacher-student interaction. The results showed that there was a significant difference in the improvement of physical education classroom teaching effect before and after the use of information technology. The effects of students' learning interest, satisfaction with teacher-student interaction, and problem-solving ability were obvious. Enriching teaching methods, changing traditional teaching thinking, and using teaching information technology are helpful to improve teaching effects. Using the advantages and characteristics of information technology to promote the professional improvement of physical education teachers, expand students' knowledge and collaborative learning ability, is conducive to the development of students, the penetration of core literacy of physical education subjects, and the cultivation of lifelong sports awareness.

Keywords: Information Technology, Physical Education, Teaching Effect.

1. Introduction

With the advent of the digital age, China's education is also undergoing continuous reform. With the empowerment of information technology, high school physical education teaching is also constantly innovating.

During the period of the epidemic, the application of information technology in various disciplines has increased, stimulating the updating of technology and the emergence of teaching platforms.With the development of AI technology, software such as deepseek, Doubao, and Wenxinyiyan have emerged in China.These tools have significantly enhanced the efficiency of online education,enabling personalized learning experiences and real-time feedbook.Teachers and students alike benetil from the seamless integration of AI into educational processes,fostering a more interactive and engaging learning environment.The continuous evolution of these technologies promises to further revolutionize the way knowledge is imparted and acquired.

During the school physical education teaching period, a new teaching mode with mobile learning or offline + online learning as the main method and shorter teaching videos as the carrier(Su Zijun and Li Wei,et.al.,2024)[1], the new auxiliary teaching mode is helpful for the display and analysis of difficult movements and movement details in physical education teaching(Xu Jian,et.al.,2020)[2]. For example, in the long jump action of track and field events, it is difficult for teachers to stay in the air during the demonstration. The movement is fast and it is difficult for students to see the movement process clearly. The video freeze-frame and slow-motion presentation transforms the abstract into an image, allowing students to form an impression of the movement in their brains. Auxiliary carriers are conducive to students' pre-class preparation, in-class understanding, and post-class review. Information technology integrates teaching resources, expands learning time and space, supports indoor and outdoor, in-class and out-of-class learning, is easy to use, and designs specific content according to the needs of physical education teaching, and provides teaching resources repeatedly.

1.1. The Current Status of the Application and Development of Information Technology in Physical Education in China

With the development of science and technology, education is constantly reforming and promoting quality education in an all-round way. The most important thing is the spirit of innovation and the ability of innovation. The implementation of quality education must be innovative in educational concepts, educational ideas, educational systems, educational content, and educational methods (General Office of the CPC Central Committee,et.al.,2020)[3]; establish the concept of innovative development, further provide teachers with extensive resources for lesson preparation, enrich teaching methods and means, improve teaching models, and guide students to correctly use teaching auxiliary software (Lu Xiaobing,et.al.,2024)[4]. Combine the results of information technology transformation to serve the skills-oriented and physical-oriented sports technology, promote the construction of physical education curriculum mechanism, promote the improvement of teachers' professional knowledge, and enhance the physical health and all-round development of high school students (General Office of the CPC Central Committee,et.al.,2020)[5].

1.1.1. Classification of the Application of Information Technology in Physical Education

Table 1. Classification of the application of information technology in physical education

Presentation form	teaching software	Purpose
Production tools	Poser, Flash, Dreamweaver, Camtasia	Video production
Presentation tools	AI,PPT, Seewo, ZoomIt, MindLine	Display teaching content
Communication tools	DingTalk, AI, WeChat,cloud platform, etc.	Knowledge,communication
Resources tools	Subject Network, Deepseek, etc.	Lesson preparation database
Exploration tools	Matlab, 3Ds-Max, etc.	Dynamic change analysis and research
Practice tools	Keep, WeChat Sports, Fitness APP, etc.	After-school physical exercise
Analysis tools	Excel spreadsheets,Spss	Data collection and analysis

As shown in Table 1, based on the role and function of information-assisted teaching software, targeted selection is made throughout the pre-teaching preparation, teaching, and post-teaching assistance. According to the needs of physical education teaching, there are eight types of auxiliary forms: using Poser, Flash and other picture and video software to create teaching content courseware tools; using AI,PPT, MindLine and other software to make text vivid and abstract movements concrete to present teaching content tools in the classroom; integrating micro-courses, MOOCs and other teaching and sports skills objectives and theoretical teaching and tutoring software in physical education classrooms; using platforms and other communication tools such as review and preview, and expanding knowledge after class; using subject network, teaching network and other teaching sharing resource platforms to find information when preparing for class; using Matlab, 3Ds-Max and other software to study students' skill learning, discover problems and explore solutions; using physical exercise Keep, sports bracelets and other software after class to understand exercise time, heart rate, and intensity; analyzing and statistically analyzing students' physical fitness test results. In different situations, choose appropriate teaching auxiliary software to achieve teaching goals and promote the comprehensive development of students' sports skills and theoretical knowledge (Gao Hanzhong, Gao Sheng,et.al.,2021)[6].

1.1.2. Characteristics of the Application of Information Technology in Skill-oriented Projects

As shown in Table 2, in the skill-dominated sports, the characteristics of sports events are different, and they are divided into difficulty and beauty group, performance accuracy group, fighting and confrontation group, net confrontation group, and same-field confrontation group. In view of the characteristics of the difficulty and beauty and performance accuracy group (Tian Maijiu,et.al.,2000)[7] ,the high-difficulty movements, the display of movement beauty, and the reflection of human beauty, teachers cannot let students feel it directly in class and language expression. The use of animation videos, audio, micro-classes, micro-videos, etc. can highlight the details of the movements, the standard of demonstration, and the clear movement route. Students can also give timely feedback and analyze the deficiencies in their learning during practice. The fighting, net separation, and same-field confrontation groups have complex technical movements and high coordination requirements. Under the condition of standardized technical movements, students are required to show their speed, reaction, endurance, flexibility and other qualities to the maximum extent. Matlab, Camtasia, 3Ds-Max, Kinect for Windows SDK, flipped classroom and other software can be used to intuitively feel the application of technical movements, the performance of students during the competition, improve students' observation ability, and analyze the characteristics of technical and tactical application in the competition.

Table 2. Characteristics of the application of information technology transformation results in skill-oriented projects

	Projects	Assisted teaching software	Features
Difficulty and beauty items	Diving, gymnastics, rhythmic gymnastics, figure skating, synchronized swimming and skills, martial arts routines	Flash,Camtasia, Macromedia Authorware, micro-class,micro-video, 3Ds-Max	Highlight action details, demonstration standards, clear movement routes, timely feedback and analysis
Performance accuracy items	Archery, shooting and crossbows	PPT, Poser, Matlab, Camtasia, micro-class, micro-video, MOOC, flipped classroom, 3Ds-Max, Kinect for Windows SDK	Integrity, intuitiveness, drills, improving observation skills, familiarity with opponents
Fighting confrontation items	Wrestling, boxing, fencing, judo,Taekwondo		
Net confrontation item	Table tennis, badminton, tennis, volleyball, shuttlecock		
Same-field confrontation items	Football,basketball,handball, hockey,ice hockey		

1.1.3. Characteristics of the Application of Information Technology in Physical Fitness-Oriented Projects

Table 3 shows that physical fitness-dominated sports are divided into fast power, speed, and endurance. Fast power and speed require students to combine strength and speed. Teachers demonstrate continuous and fast movements in class. Students are inaccurate about the position and posture of the

movements. Using video slow motion, freeze frame, and repeated playback software can help students quickly form an impression of the movements and grasp their body postures. Endurance requires students to develop endurance while paying attention to the development of speed. During the practice, students can monitor their step count, pace, and heart rate to understand their running speed, classroom exercise load, and exercise intensity. The classroom exercise situation can be monitored through relevant software, which is conducive to achieving teaching goals and monitoring students' physical conditions.

Table 3. Characteristics of the application of information technology in physical fitness-oriented projects

	Projects	Assisted teaching software	Features
Fast power items	Jumping,throwing and weightlifting.	Flash, Camtasia, micro-video, flipped classroom.	Pedometer, heart rate pulse monitor
Speed items	Sprinting, hurdles, short-distance swimming, short-distance (speed skating, speed skiing, cycling, rowing).	Micro-class,micro-video	Movement details, movement analysis. Calculate speed, record load emphasis
Endurance items	Race walking, middle and long distance (running, swimming, cycling, etc.)		

According to the above information technology application in physical education classes, combined with the students and hardware facilities of our school, appropriate methods are used to enter the physical education theory and practical classes.

2. Research Objects and Methods

2.1. Research Objects

The effect of information technology in physical education classroom teaching was taken as the research object. The physical education classes of five classes of senior high school students were selected as the experimental subjects, using lesson preparation and preview software before class, mobile phone shooting and micro-class during class, and DingTalk and other software after class.

2.2. Research Methods

2.2.1. Literature Method

The search for "information technology" and "middle school physical education" was conducted through the China National Knowledge Infrastructure database. The search period was from 2004 to 2025, with a total of 155 articles, including 3 master's and doctoral dissertations.

2.2.2. Questionnaire Survey Method

According to the needs of this study, a questionnaire on the impact and effect of information technology on physical education was made in a short period of time. Six factors of the effect of integrating information technology into high school physical education classroom teaching were established (Li Xiaowen,et.al.,2015)[8]: learning interest, independent learning ability, problem solving, collaboration ability, innovation ability, and satisfaction with teacher-student interaction. The questions in the questionnaire were scored using the Likert five-point system, and each question was assigned a value from low to high, from completely incompatible, incompatible, unclear, relatively compatible, and completely compatible.

Table 4. Distribution and collection of questionnaires

Questionnaires issued	Questionnaires collected	Response rate	Valid questionnaires	Valid response rate
Questionnaire 426	426	100%	400	93.9%

As shown in Table 4, the questionnaires were distributed twice, with 213 copies each time, for a total of 426 copies, a recovery rate of 100%, and an effective recovery rate of 93.9%.

2.2.3. Mathematical Statistics Method

The questionnaire data were collected and sorted using Excel, and the independent sample T test and paired sample T test in SPSS23.0 software were used to obtain the mean, standard deviation and P value to determine whether there is a significant difference in the teaching effect of information technology in high school physical education classes.

3. Results and Analysis

3.1. Data Analysis

3.1.1. Statistical Analysis of Teaching Effects before the Use of Information Technology

Table 5. Statistics of teaching effects before the use of information technology n=213

Variable	Sample	Mean	Standard Deviation
Study interests	213	3.32	0.42
problem-solving ability	213	2.63	0.37
Collaboration ability			
Innovation ability	213	2.93	0.52
Self-learning ability	213	2.66	0.38
Satisfaction with teacher-student interaction	213	2.89	0.50
	213	2.77	0.47

As shown in Table 5, students think that the overall teaching effect of physical practice and theory classes is average, with the highest score in learning interest, followed by students' collaboration ability and independent learning ability, and then satisfaction with teacher-student interaction, innovation ability, and problem solving. The development of students' abilities in all aspects needs to be improved.

3.1.2. Analysis of Teaching Effects after Using Information Technology

Table 6. Statistics of teaching effects after using information technology n=213

Variable	Sample	Mean	Standard Deviation
Study interests	213	3.92	0.43
problem-solving ability	213	3.23	0.38
Collaboration ability			
Innovation ability	213	3.51	0.54
Self-learning ability	213	3.23	0.35
Satisfaction with teacher-student interaction	213	3.45	0.50
	213	3.45	0.45

As shown in Table 6, the overall average values are on an upward trend. Students believe that the overall physical

education teaching effect is good, among which the learning interest score is the highest, indicating that the use of technical support in physical education classes can better stimulate students' interest and enthusiasm in learning; the second is the ability to collaborate. The use of technology in practical and theoretical classes can improve students' ability to collaborate, and can also improve students' expression and communication skills; the second is the students' independent learning ability and satisfaction with teacher-student interaction. In theoretical classes, multimedia is used to increase students' knowledge, and interactive APPs can be used to interact with students to increase the interest of theoretical classes; the third is innovation ability and problem solving. Students can use the Internet to expand their horizons and solve doubts and difficulties. This shows that the use of information technology to assist classroom teaching can help solve some aspects of students' ability problems and promote students' development in all aspects.

3.1.3. Comparative Analysis before and after the Use of Information Technology

Table 7. Comparative analysis before and after the use of information technology n=213

Variable	Before the experiment($\bar{X}\pm S$)	After the experiment($\bar{X}\pm S$)	P
Study interests	3.32±0.42	3.92±0.41	0.00
problem-solving ability	2.63±0.37	3.23±0.38	0.00
Collaboration ability	2.93±0.52	3.51±0.54	0.01
I nnovation ability	2.66±0.38	3.23±0.35	0.01
Self-learning ability	2.89±0.50	3.45±0.50	0.01
Satisfaction with teacher-student interaction	2.77±0.47	3.45±0.45	0.00

As shown in Table 7, by conducting a paired sample T test on the data before and after the application of technology, it is found that after comparing six factors such as learning interest, it can be seen that information technology has a positive impact on the teaching effect of physical education classroom. The results of the T test show that after the application of technology in physical education classroom, students' learning interest is improved, their learning autonomy is enhanced, and their problem-solving ability is strengthened. Among them, the satisfaction of teacher-student interaction, students' learning interest, and problem-solving $P<0.01$ are significantly improved; followed by students' collaborative learning, innovation ability, and autonomous learning ability $P<0.05$. There are significant differences. This fully shows that the use of information technology can have a positive impact on the teaching effect of physical education classroom.

3.2. The Influence of Information Technology on the Teaching Effect of High school Physical Education

3.2.1. The Role of Information Technology in Promoting High School Physical Education

Traditional physical education teaching mainly focuses on text narration and classroom demonstration movements. There are deficiencies in theory and skill teaching. The use of information technology to assist teaching software is conducive to the design of different, diverse, multi-faceted, dynamic and intuitive displays in the classroom for specific teaching content. Combined with the advantages of online teaching, it realizes resource integration, resource sharing, interconnection, personalized settings, repetitive learning, etc. In physical education teaching, the combination of online and offline is conducive to highlighting teaching key points, breaking through teaching difficulties, expanding knowledge, combining movement and stillness to create a positive atmosphere, and reducing the occurrence of learning aversion.

3.2.2. Information Technology Promotes the Improvement of High School Physical Education Teaching Mode

Integrating information technology into educational disciplines breaks the traditional teaching methods. Under the new concept of "Internet + Education", physical education teaching resources are integrated to form an innovative teaching model integrating technology, forming valuable physical education teaching content, and scientific course teaching arrangements. In teaching design, we use deepseek, teaching network, electronic textbook network, lesson preparation network, subject network, 101 education, China knowledge network and other software to prepare physical education content, broaden teachers' professional knowledge and make the classroom richer; in teaching implementation, information technology provides situational guidance for physical education, supports indoor and outdoor teaching, enriches teaching methods and means, timely evaluation and feedback, and accurately analyzes the learning and mastery of sports skills in class; in teaching evaluation, we use software to analyze and evaluate teaching design and teaching implementation process. The integration of information technology into high school physical education has important value and significance for the improvement of teachers, the development of students, the core literacy of sports and the future.

3.2.3. Information Technology Promotes the Classification, Stratification and Division of Labor Of High School Physical Education Teaching Mode

Use statistical analysis software to classify students with certain differences in physical fitness in physical education teaching, determine different levels of goals according to actual conditions, carry out physical education teaching and counseling at different levels, organize students of different levels to take physical fitness tests within a certain period of time, understand the differences in students' athletic ability and physical fitness, classify and build groups, and adjust the exercise load; set different sports skill goals for the

differences between strong and weak students; focus on individual differences for all students, and teach students in accordance with their aptitude; set stage goals, conduct stage testing and assessment; formulate the next development goals according to the stage assessment, and continuously improve the improvement process for developmental evaluation, so that all students can develop comprehensively.

3.2.4. Information Technology Enhances the Management of Students' Physical Education Homework in High School Physical Education Teaching

In traditional teaching, after-school homework for physical education classes, teachers cannot clearly grasp the completion degree, completion amount, completion process, whether they understand the homework content, whether they forget the movements, etc. of students after assigning them. When checking in class, they are limited by time and the number of students, which is not conducive to a comprehensive understanding of students' learning and mastery and further teaching arrangements. Through the cloud platform and sports APP, after-school homework management is carried out for students in multiple classes online; physical education homework is assigned on the platform with one click, and visual data is exported with one click to analyze the completion status of students; during the holidays, teachers share the platform through mobile phones or computers to understand the content, time, and intensity of students' exercise, and provide scientific guidance to students in a timely manner, so that students can develop exercise habits and form a health awareness.

3.2.5. Information Technology Promotes the Generation of a Second Classroom for Students' Physical Exercise

High school students are under pressure from study and have tight time. During class, they participate in physical exercise through physical education classes and large breaks. During the holidays, students lack a sports environment atmosphere, have personal inertia, and have a single method of physical exercise, which is not conducive to students' persistence in physical exercise. Relying on the results of information technology transformation, teachers organize students to participate in cloud sports games, fun AR sports, cloud physical tests and other activities to break the monotony of physical exercise, improve students' enthusiasm for participating in physical exercise, and promote students to combine work and rest.

4. Conclusion

Information technology promotes the improvement and innovation of physical education teaching mode, combining static and dynamic, exploring learning methods, situational guidance, diversified teaching methods, and accurate analysis of sports skills learning in class; information technology is integrated into high school physical education classrooms, breaking traditional physical education teaching, using information technology to break through the teaching bottleneck in physical education, improving students' interest in physical education, improving students' ability to unite and cooperate in class, mobilizing classroom enthusiasm, and promoting students' personal abilities. It has a significant effect. It promotes the generation of students' second classroom, improves the homework management system, divides the teaching into different levels and categories, completes the teaching goals, and improves the teaching effect so that students can develop comprehensively.

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