Path Mechanism and Empirical Research of Artificial Intelligence Empowering Physical Education Classroom Teaching Reform

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Abstract: This article focuses on the integration of artificial intelligence (AI) and physical education (PE) classroom teaching, and explores the way of empowering teaching reform. Through literature research, the theoretical basis is clarified, and the PE classes in schools of different regions and levels are selected as the objects by using the experimental method. Futhermore, the experimental group and the control group were set up, adopting AI empowerment teaching and traditional teaching mode respectively, and collecting data with the help of questionnaires and test scales, which were processed by descriptive statistics, difference test and correlation analysis. The results show that the improvement of sports skills in the experimental group, such as basketball shooting percentage and football ball control skills, is far greater than that in the control group. The development of physical quality, such as endurance and explosive power, is more significant; The average score of learning interest in the experimental group was also higher than that in the control group. This shows that the reform of AI-enabled PE classroom teaching has achieved remarkable results, and all the reform paths are practical and effective, which provides strong support and feasible direction for the modernization of PE teaching.

1. Introduction

With the acceleration of educational modernization and the rapid development of science and technology, the reform and innovation of PE has become an important issue in the field of education. As the main position to achieve the goal of PE, PE classroom shoulders the heavy responsibility of promoting students' physical and mental health and cultivating sports literacy [1]. However, the traditional PE classroom teaching has gradually exposed the limitations that it is difficult to meet the diversified development needs of students in terms of pertinence of teaching content, flexibility of teaching methods and comprehensiveness of teaching assessment [2]. Furthermore, AI is profoundly changing various fields with its powerful data processing, intelligent analysis and accurate decision-making ability, and the education field is no exception [3]. AI technologies, such as machine learning and computer vision, have brought new opportunities and possibilities for the reform of PE classroom teaching [4]. It can provide personalized teaching content according to individual differences of students, innovate teaching methods with the help of intelligent equipment and software, and realize comprehensive and dynamic teaching assessment through multi-dimensional data collection.

At present, scholars have carried out a lot of research on the application of AI in the field of education, and some of the achievements involve the field of PE [5]. However, there is still a lack of systematic and in-depth discussion on how AI can accurately empower PE classroom teaching reform, especially its specific path and mechanism, and the empirical research is relatively insufficient [6]. Based on this, this study focuses on the theme of AI-empowered PE classroom teaching reform, which has important theoretical and practical significance. Theoretically, this is expected to enrich the theoretical system of the integration of PE and AI, and clarify the internal logic of change. Practically, the research aims to provide practical teaching reform strategies and methods for front-line PE teachers, promote the improvement of PE classroom teaching quality, and

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help students achieve better PE learning and physical and mental development under the background of intelligent age.

2. Core concepts and theoretical basis

AI is a technical science that simulates, extends and expands human intelligence, and realizes intelligent behaviors such as learning, reasoning and problem solving through computer programs. In the PE classroom teaching scene, it is embodied in the application of analyzing students' sports data with the help of machine learning algorithm to provide targeted guidance, or using computer vision technology to correct students' actions [7]. The reform of PE classroom teaching refers to the systematic and innovative changes in teaching concepts, contents, methods, assessment and other aspects in the process of PE classroom teaching to adapt to the development of the times and the needs of students.

The theory of educational informatization emphasizes the deep integration and application of information technology in the field of education, and promotes the reform of educational mode, method and content through technological innovation. As a cutting-edge information technology, the integration of AI with PE classroom teaching is an important embodiment of educational informatization, which is helpful to break the limitations of traditional teaching and realize the optimal allocation of educational resources and the reengineering of teaching process [8]. Personalized learning theory pays attention to the individual differences of students, and holds that each student's learning style, speed and needs are different. With the ability of data analysis, AI can accurately understand the characteristics of students, customize their own learning paths and contents, meet the individualized learning requirements of different students in PE classes, and stimulate their learning interest and potential. Constructivist learning theory advocates students to actively construct knowledge and skills system, and emphasizes the importance of learning situation, cooperative communication and meaning construction. In PE teaching, AI can create realistic learning situations, promote the cooperation between teachers and students and students with the help of intelligent equipment, and help students better understand and master PE knowledge and skills, and realize the meaning construction.

3. Theoretical analysis on the path mechanism of AI-empowered PE classroom teaching reform

AI has brought new opportunities for the reform of PE classroom teaching. By optimizing teaching content, improving teaching methods and innovating teaching assessment, it builds a mechanism of motivation, operation and guarantee, and promotes the modern transformation of PE classroom teaching.

In terms of the optimization path of teaching content, AI has realized personalized teaching content push. Big data analysis technology can integrate multidimensional information such as students' physical fitness, interests, and learning progress, thereby generating personalized sports learning plans for each student. Artificial intelligence technology has promoted the innovative integration of emerging sports projects and intelligent technology. The application of virtual reality (VR) and augmented reality (AR) technologies has developed new sports teaching projects such as virtual rock climbing and AR football, significantly enhancing the diversity of sports teaching content.

The improvement path of teaching methods is mainly reflected in the application of intelligent auxiliary teaching tools and the creation of situational and experiential teaching. Smart wearable devices can monitor students' heart rate, trajectory and other data in real time, and teachers can adjust teaching intensity and strategies in time accordingly. Using intelligent equipment to create realistic situations, such as simulating the Olympic Games scene for track and field teaching, can make students feel the competitive atmosphere and enhance their learning enthusiasm and participation.

The innovation path of teaching assessment covers the construction of diversified assessment

indicators and real-time dynamic assessment feedback. This assessment system constructs a multidimensional indicator system that includes sports skills, physical fitness, learning attitude, and teamwork, which can comprehensively and objectively evaluate students' physical education learning effectiveness. As shown in Figure 1 below. Furthermore, the data of students' learning process is collected in real time through AI technology, and the learning problems and progress are fed back in time, so that students and teachers can adjust their learning and teaching strategies in time.

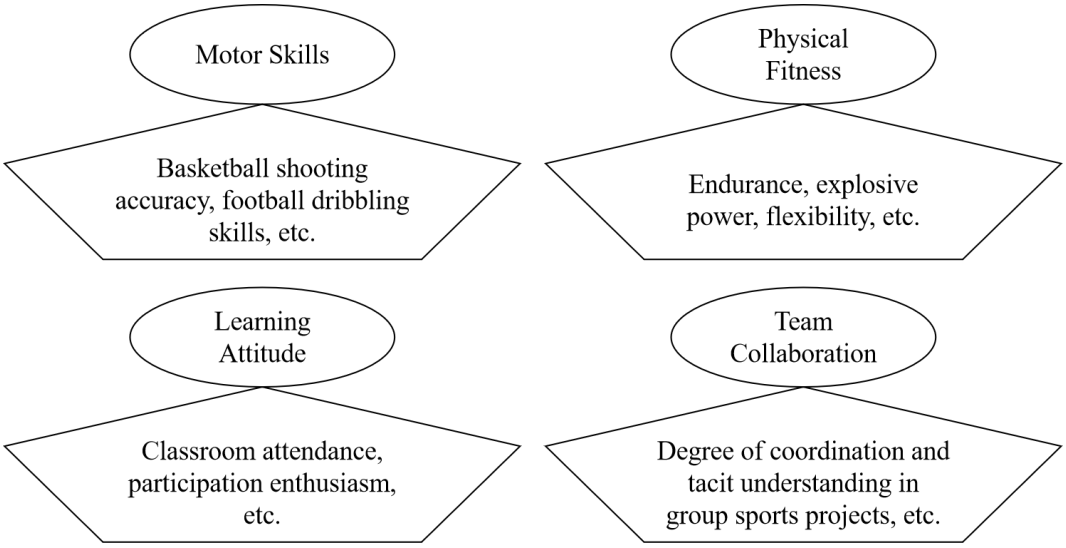

Figure 1 Diversified assessment index table of PE classroom teaching

From the perspective of mechanism construction, the dynamic mechanism consists of policy drive, technological development pull and educational demand push. The state's policy support for educational informatization promotes the application of AI in PE teaching; The continuous progress of technology provides the feasibility for the reform of PE teaching; The demand of students and teachers for improving teaching quality is the internal driving force of change. The operation mechanism pays attention to the deep integration mode of technology and teaching and the data-driven teaching decision-making process. By constructing an intelligent teaching platform, AI technology is closely combined with PE, and teaching objectives are set and teaching contents and methods are selected according to data analysis. The guarantee mechanism includes teacher training system and technical facilities guarantee. Teachers' artificial intelligence technology application training should be strengthened to improve teaching ability; At the same time, schools need to ensure that they have perfect intelligent equipment and network facilities to provide a solid foundation for teaching reform.

4. Research design and empirical analysis

4.1. Research design

(1) Experimental design

This study selects schools in different regions and at different levels as samples, covering urban key schools, urban ordinary schools and rural schools to ensure that the research results are widely representative. Several PE classes were randomly selected from these schools as the research objects and divided into experimental group and control group. In the experimental group, the AI-enabled teaching reform scheme was fully introduced into the PE classroom teaching, while in the control group, the traditional PE teaching mode was adopted.

The independent variable in the experiment is whether AI is used to empower the reform of PE classroom teaching, and the dependent variables include the improvement level of students' physical skills, the change of learning interest and the development of physical quality. Futhermore, the control variables are set as teaching time, teachers' teaching level, students' initial physical fitness, etc., to ensure that the experimental results are not interfered by other irrelevant factors.

(2) Research tools

In order to collect data comprehensively, two key research tools were designed. The first is "Questionnaire on Students' Learning Experience and Attitude in PE", which understands students' subjective feelings about PE classroom from the dimensions of learning interest, acceptance of teaching methods and learning motivation. For example, the question "How interested are you in the content of this semester's physical education classroom teaching?" should be scored using the Likert5 scale, where 1 point indicates "very not interested" and 5 points indicate "very interested". The second is the "PE Classroom Teaching Effect Test Scale", which objectively evaluates the teaching effect from the aspects of sports skills and physical fitness. Among them, the sports skill test sets specific indicators according to different sports, such as the shooting percentage of basketball, the time of passing obstacles with the ball in football, etc. Physical fitness tests include endurance (such as 800-meter /1000-meter running performance) and explosive power (such as standing long jump performance). (See Table 1: Some topics of the questionnaire on students' PE learning experience and attitude)

Table 1: Some topics of the questionnaire on students' PE learning experience and attitude

Question	Option
How interested are you in the teaching content of PE class this semester?	1. Very uninterested 2. Not interested 3. Generally 4. Interested 5. Very interested
Do you think AI-assisted teaching is helpful for you to master sports skills?	1. Completely unhelpful 2. Very little help 3. It is somewhat helpful 4. Greatly helpful 5. Very helpful

4.2. Empirical analysis

(1) Data collection

Before the start of the experiment, all the students who participated in the experiment were pre-tested, and initial data such as their physical fitness, sports skill level and learning attitude were collected. During the experiment, the students' movement data in the experimental group, such as movement trajectory and heart rate changes, were recorded in real time with the help of intelligent equipment, and the corresponding performance of the students in the control group under the traditional teaching mode was observed and recorded. After the experiment, the two groups of students were post-tested again to collect data on sports skills, physical fitness and students' learning experience and attitude through questionnaire survey.

(2) Data analysis methods

By using descriptive statistical analysis, the data of the two groups of students before and after the experiment were sorted out, and statistics such as mean value and standard deviation were calculated to preliminarily understand the data distribution characteristics. The difference test is used to judge whether AI empowerment teaching has a significant impact on students' performance in all aspects. Through correlation analysis, this article explores the relationship between different variables, such as the relationship between students' interest in learning and the improvement of sports skills.

(3) Analysis of empirical results

After data analysis, the results show that in terms of improving sports skills, the progress of students in the experimental group in basketball shooting percentage, football ball control skills and other items is significantly higher than that in the control group (see Table 2: Comparison table of sports skills improvement between the experimental group and the control group).

Table 2: Comparison table of sports skills improvement between the experimental group and the control group

Analytical dimension	Performance of experimental group	Performance of control group
Increasing range of basketball shooting percentage	25%	12%
The improvement range of football ball control skills	22%	10%
Endurance improvement effect (measured by the progress of 800m/1000m running, seconds)	Average progress of 15	Average progress 8
Effect of explosive power improvement (measured by the progress of standing long jump, cm)	Average progress 12	Average progress 6
Average score of learning interest (Likert5 scale)	4.2	3.5

In the development of physical quality, the effect of improving the endurance and explosive power of the students in the experimental group is more significant. In terms of learning interest, the average score of students' interest in PE class in the experimental group is 4.2, which is significantly higher than that in the control group (3.5), indicating that AI empowerment teaching can effectively stimulate students' interest in learning.

On the whole, the empirical results verify that the reform of AI-empowered PE classroom teaching plays a positive role in improving the teaching effect, and each reform path shows certain effectiveness in practice, which provides a strong basis for the popularization and application of AI in PE teaching.

5. Conclusions

This study focuses on the reform of AI-enabled PE classroom teaching, and conducts in-depth exploration on the path mechanism and empirical level. In the aspect of path mechanism, the path of teaching content optimization, teaching method improvement and teaching assessment innovation is clarified. The teaching content should achieve an organic integration of personalized promotion and innovation; The teaching method requires the use of intelligent auxiliary tools to create a situational experiential teaching mode; Teaching assessment constructs diversified indicators and realizes real-time feedback. Power, operation and guarantee mechanism work together to promote the process of change. Empirical analysis verifies the positive role of AI empowerment teaching reform in improving teaching effect. The experimental group is superior to the control group in sports skills, physical fitness and learning interest, which highlights the effectiveness of the reform path. However, there are some limitations in the study. Although the sample selection takes into account schools in different regions, it may not cover all PE teaching situations. The experimental period is limited, and the long-term impact needs further observation. Future research can expand the sample range, extend the research cycle, deeply tap the potential of AI in PE, promote the deeper integration of PE and AI, and help PE classroom teaching achieve comprehensive and sustainable modernization.

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