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Research Article

Deep Integration of Physical Education and Multimedia Technology Using Internet of Things Technology

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With the in-depth development of the new curriculum reform, school PE is facing new challenges. How to implement the innovative development of school PE teaching and improve the teaching efficiency and quality of school PE has become one of the key research objects of the state and schools. This paper is aimed at exploring the development prospect of IoT in PE and actively promoting the deep integration of animal Internet technology and PE, so as to improve the teaching quality and efficiency of PE teachers. Based on the deep integration of IoT, multimedia technology, and PE, this paper puts forward the potential value of IoT based on physical exercise. This paper discusses the benefits of IoT on college students' volleyball and table tennis skill learning. At the same time, the teaching mode is applied to the teaching of volleyball spiking and table tennis technology, and the teaching effect of the teaching mode is analyzed and evaluated. By using SPSS17.0 after sorting out the data and conducting independent sample t-test, the confidence interval is 95%. The experimental results show that the technical evaluation scores of the experimental class before the experiment are lower than those of the control class. After the table tennis teaching experiment, there are significant differences in physical learning interest, learning ability, and sports performance compared with those before the experiment.

1. Introduction

Nowadays, with the rapid development of science and technology, education plays a more and more important role in economic development and social progress. The strategy of rejuvenating the country through science and education implemented by the party and the government provides a good opportunity for the development of China's education. According to the report, the physical health of Chinese teenagers has been declining for more than 20 years. It is mainly reflected in teenagers' muscle endurance, cardiopulmonary function, and so on. The rate of poor vision and obesity in adolescents is high, and they are getting younger and younger.

The emergence of the epidemic in 2020 makes the integration of Internet of Things technology and sports more necessary. And with the advent of 5G era and the improvement of network speed, it provides a condition guarantee for the integrated development of Internet of Things technology and sports. It makes the integration of Internet of Things technology and physical education possible. "Smart sports platform," as a specific form of "Internet of Things technology (IoT) + sports," has actively promoted the deep integration of IoT and physical education (PE). In order to ensure the sharing of high-quality PE teaching resources, improve the speed of teachers' lesson preparation before class, and help teachers monitor students' sports, especially heart rate in class, this paper makes an intelligent analysis of students' physical data. It is possible to guide teaching, realize targeted teaching, evaluate students' exercise through intelligent means after class, and improve PE teachers' teaching quality and efficiency.

The innovation of this paper is as follows: (1) based on the Internet plus modern information technology, this article boldly builds the teaching mode of IoT + volleyball spiking technology. It also applies the teaching mode to the teaching of volleyball spiking technology. It also analyzes and evaluates the teaching effect of applying this teaching

mode. (2) This paper combines the two teaching modes of IoT and multimedia technology with table tennis teaching and discusses the teaching effect achieved and universities and the effectiveness of table tennis skill learning. (3) This paper applies sports interactive virtual reality equipment and video resources and designs the teaching link scheme combined with the knowledge system of PE.

2. Related Work

The integration of physical education and artificial intelligence is important. Guo and Sun constructed a real-time monitoring system for university physical education classrooms to provide a theoretical and technical basis for the application of automatic identity location in large scenarios [1]. This study explored the optimisation of an intelligent optimised remote multimedia physical education system by combining regional scenarios with field real-world data to verify accuracy and trends. Gong et al. found that the optimised intelligent multimedia physical education system has better functionality [2]. Ji-Yun and Zhang proposed the construction of a physical education research support environment based on the emerging information technology. The experimental results show that their proposed solution for the construction of a support environment for physical education and research is feasible [3]. The Internet of Things (IoT) brings new dimensions to physical education. Ding et al.'s integration of IoT into physical education facilitated teachers' centralised management of students and improved the quality of physical education classes [4]. While improving student fitness and allowing students to experience advanced teaching methods, there are gaps in facilitating interaction with students. To aid the adoption of software and information technology in the SM process, Reneta examined the breadth of incorporating information technology into sport management (SM) programmes [5]. Traditional approaches to physical education lack new ideas and fail to meet the goals of physical education. Ba and Qi proposed the construction of a WeChat mobile teaching platform in a deep neural network-based reform of physical education teaching strategies [6]. Although they built a WeChat mobile physical education strategic reform teaching platform based on deep neural network, they did not conduct in-depth research on the application, characteristics, deficiencies, and improvement of deep neural network in physical education. Modern technology has a huge role in promoting physical education. Yang analyzed the application of new network interconnection technology in the development of basic physical education, and the experiment showed that modern education technology, as an innovation point for deepening education reform, is closely related to the informatization of physical education, the training of innovative talents, and the construction of lifelong learning system [7]. Multimedia technology has become necessary for physical education and Chen has improved the physical education instruction paradigm. His approach focused on multimedia tools and their application in physical education, and the results of the simulation subpart of the test proved the effectiveness of the approach [8]. Although improving its pedagogical effectiveness, the use of various tools to stimulate students' interest in learning is lacking.

However, the current research on PE teaching in the context of IoT still does not get rid of the definition and thinking of traditional PE teaching. It also lacks in-depth analysis and discussion on the functionality of the IoT, which also hinders the high combination and advantages of the IoT and PE [9, 10]. For tapping the potential of the IoT, improving teaching ecology, and improving education level, it still needs to be further discussed.

3. PE Teaching Method of IoT

3.1. Key Technologies of IoT. The three-layer architecture of the IoT and the specific applications of each layer are shown in Figure 1.

As shown in Figure 1, the line communication technology transmits the information collected by the perception layer [11]. The highest level of the IoT system is the application layer. The application layer has two understandings. According to the field of the collected information, the application layer can be divided into different production and living categories, such as agriculture, industry, and home. The meaning of application layer can be understood as "user terminal" level. Through computer technology, automatic control technology, and intelligent technology, users can use computers, pads, mobile phones, and other terminal devices to operate the IoT. It includes collecting and analyzing the information collected by the perception layer and controlling the equipment in the Internet of Things system through remote control technology to meet the required production and living requirements.

3.2. Integration of IoT and PE. It provides a wider range of learning functions for the IoT. IoT is a new system that integrates sensor networks on the basis of Internet technology and mobile Internet technology. Therefore, the impact of IoT on education not only has the impact of traditional Internet technology on educational technology but also is different from or better than Internet technology [12, 13]. The IoT not only maintains the interconnection characteristics of the Internet and mobile Internet but also extends the interconnection to a broader field. It realizes the communication between things and between people and things. The information flow of inquiry learning in traditional situations is shown in Figure 2.

As shown in Figure 2 above, the arrows in the figure above reflect the information of various attributes of the inquiry object, such as shape, color, and smell, and the flow of information after the processing of the inquiry object (the cognitive processing of students and teachers for the inquiry object). Under the traditional situation, this paper forms a closed inquiry learning ring with inquiry objects, students, and teachers, in which the information flow about inquiry objects flows. For the same inquiry object, different inquiry participants (teachers and students) can only form their own learning ring [14]. Because in the traditional situation, the information collection of the inquiry object needs to be

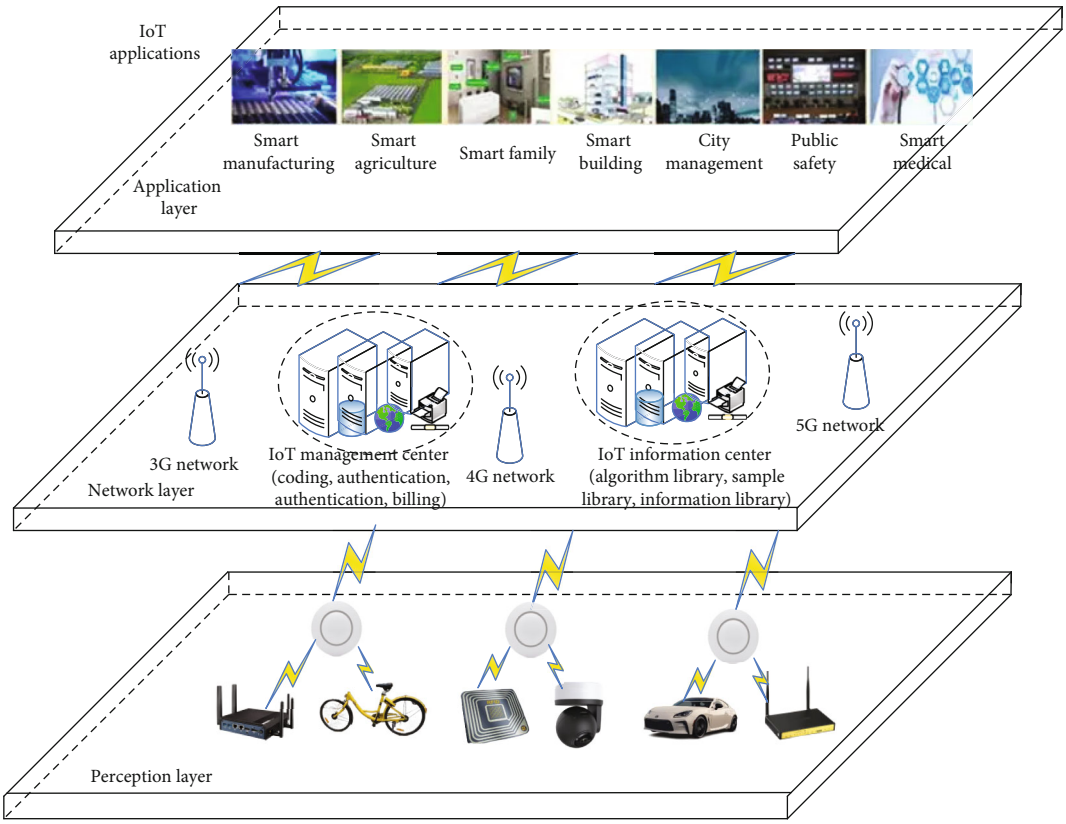


Figure 1: Three-tier architecture of IoT.

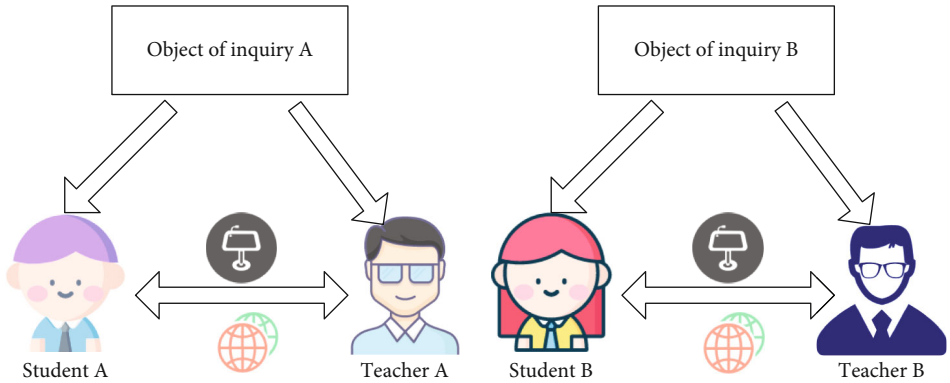


Figure 2: Information flow of inquiry learning in traditional context.

carried out by students and teachers, including the use of senses or instruments [15]. The "material flow" of inquiry learning in the context of IoT is shown in Figure 3.

As shown in Figure 3, it applies IoT to inquiry learning. The "information flow of inquiry and Internet" increases its reliance on traditional information flow. The so-called material flow here does not refer to the dynamic process of material movement and transformation in ecology. It refers to that the IoT can connect real things to the communication network and realize a system dynamic process based on real things. The traditional education system relying on the Internet and mobile Internet itself cannot collect information for a specific and realistic thing but can only transmit digital information. These digital information are all kinds of information that have been processed by people's cognition. Based on the IoT, students and teachers can collect attribute information for a specific thing through the IoT, so that the "material flow" can be realized in the learning environment based on the IoT [16, 17]. On this basis, students and teachers who originally belong to different learning rings can carry out inquiry learning on the inquiry object through the IoT.

3.3. Motion Interference Removal Design of Adaptive Algorithm. Adaptive filtering is a filtering technology that automatically adjusts the filtering parameters from time to

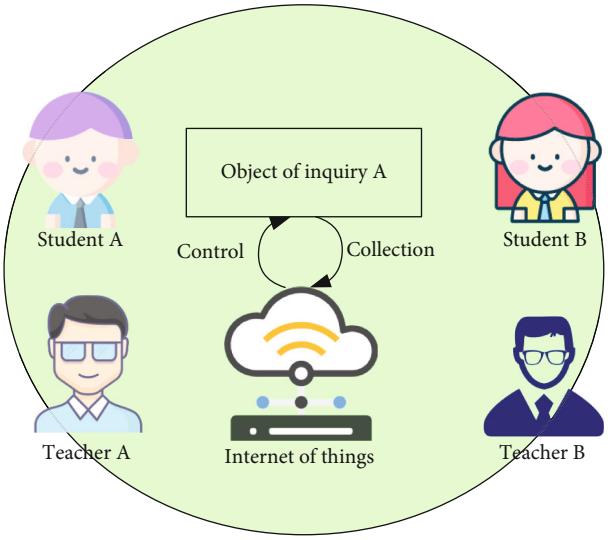


FIGURE 3: "Material flow" of inquiry learning in the context of IoT.

time through the feedback of the results, so as to change the filtering parameters according to the changes of signal or noise [18, 19].

$$v(n) = \sum_{l=0}^{M} w(l) r(n-l) = W^T(n) R(n). \tag{1}$$

$W(n)$ represents the filter weight coefficient $W(n)$ of N moments, and $r(n-l)$ represents the adjacent vectors from the N time to the $M+1$ noise sources in the past.

$$R(n) = [r(n), r(n-1), \cdots, r(n-m)]^T. \tag{2}$$

The output signal $e(n)$ is represented as

$$e(n) = d(n) - v(n) = s(n) + k(n) - v(n). \tag{3}$$

The mean squared expectation of $e(n)$ is

$$\begin{aligned} Q\{e^2(n)\} = Q\{d^2(n)\} + Q\{(k(n) - v(n))^2\} \\ + 2Q\{d(n)(k(n) - v(n))\}. \end{aligned} \tag{4}$$

Since the original signal s_n has no correlation with the background noise k_n and the estimated noise v_n, there are

$$2Q\{s_n(k_n - v_n)\} = 0. \tag{5}$$

Therefore, formula (6) can be transformed into

$$Q\{e^2(n)\} = Q\{d^2(n)\} + Q\{(k(n) - v(n))^2\}. \tag{6}$$

In order to make $Q\{e^2(n)\}$ the minimum value, $Q\{(k(n) - v(n))^2\}$ needs to be the minimum value. For the RLS, there are

$$\begin{aligned} Q\{d^2(n)\} + Q\{(k(n) - v(n))^2\} = Q\{d^2(n)\} \\ + Q\left\{\left(k_n - W^T(n) R(n)\right)^2\right\}. \end{aligned} \tag{7}$$

Moreover, in order to speed up the response speed of the filter to interference changes, the forgetting factor γ can be introduced to reduce its error weight according to the exponential law as follows:

$$Q\{e^2(n)\} = Q\{d^2(n)\gamma^{M-n}\} + Q\left\{\gamma^{M-n}\left(k_n - W^T(n) R(n)\right)^2\right\}. \tag{8}$$

The error of n time based on $n-1$ time is

$$x(n) = d(n) - R^T(n) W(n-1) - d(n) - \sum_{l=0}^{M} w_{n-1}(l) r(n-l), \tag{9}$$

$$W(n) = W(n-1) + N(n) x(n). \tag{10}$$

Formula (9) and (10) can be obtained simultaneously:

$$N(n) = \frac{W(n) - W(n-1)}{d(n) - \sum_{l=0}^{M} w_{n-1}(l) r(n-l)}. \tag{11}$$

Another filter achieves the best effect, making

$$Q\{(k(n) - v(n))^2\} = 0. \tag{12}$$

It can acquire

$$N(n) = \frac{\sum r(n-l) W(n)}{\gamma^n + W^T(n) \sum r(n-l) W(n)}. \tag{13}$$

δ is between 0 and 1, usually near 1, such as 0.99.

3.4. Bandwidth Allocation Model for Multiuser QoE Fairness. The goal of this paper is to maximize the utility value of the QoE fairness [20]. Therefore, the bandwidth allocation model for multiuser QoE fairness is as follows:

$$\max \sum_{s=0}^{\infty} \text{Fairness}(s). \tag{14}$$

Constraints are

$$\sum_{i \in [K]} y w_i(s) \le Y(s), s = \{0, 1, 2 \cdots \infty\}, \tag{15}$$

$$l r_i(s) = g(y w_i(s)), i \in [K], s = \{0, 1, 2 \cdots \infty\}. \tag{16}$$

The decision variable is the available bandwidth $yw_i(s)$ allocated to each user, and the function $g(\bullet)$ in formula (16) is the bit rate level that the user client will apply for after allocating the corresponding bandwidth [21].

$$k(n) = \sum_{l=0}^{M} w_l r_{n-l}. \tag{17}$$

This requires adjusting the weight coefficient w_n of the adaptive filter to adjust v_n to k_n and make $Q\{e_n^2\}$ the minimum value.

$$\begin{aligned} a(n) = Q\{e^2(n)\} = Q\{d^2(n)\} - 2Q\{d(n)R^T(n)\}W(n) \\ + W^T(n)Q\{R(n)R^T(n)\}W(n). \end{aligned} \tag{18}$$

Then the gradient vector of $a(n)$ relative to $W(n)$ can be obtained as

$$\nabla(n) = -2Q\{d(n)R(n)\} + R(n)R^T(n)W(n). \tag{19}$$

Let $\nabla(n) = 0$; then

$$W(n) = \left(R(\mathrm{n})R^T(n)\right)^{-1} Q\{d(n)R(n)\}. \tag{20}$$

3.5. IoT Transforming Traditional Sports. Through the intellectualization of fitness equipment, we can constantly create humanized intelligent sports. It makes the traditional sports get rid of the limitation of sports venues, enrich the types of sports, and improve the entertainment of sports. In recent years, air pollution caused by smog has led more and more people to choose indoor fitness. However, due to the limitations of indoor venues, some projects such as golf, tennis, and football cannot be carried out effectively, which has reduced the fitness enthusiasm of some people to a certain extent. With the emergence of new technologies such as VR, 5G communication and holographic projection, if we use the support of VR technology and 5G network, we can build virtual sports environment for golf, tennis, and canoeing. Participants can experience a close to real sports experience in a small indoor space. They feel the happiness brought by these sports. Traditional sports events make it more convenient for people to participate through intelligent transformation, which is also conducive to participants' understanding of their own sports ability. For example, the gradual popularization of 5G network has made it possible for space training confrontation, and two people separated by thousands of miles can also experience real combat confrontation at any time, so that sports are no longer lonely. The application field of IoT + sports is shown in Figure 4.

As shown in Figure 4, with the help of modern information technology, traditional sports add more elements of leisure and entertainment. It radiates new vitality and can attract more teenagers to participate in it. It achieves the purpose of fitness and entertainment at the same time, so as to reduce teenagers' dependence on online games. For example, virtual reality sports can effectively make up for the insufficient conditions of fitness venues and effectively avoid the accidental injury caused by difficult technical movements to participants.

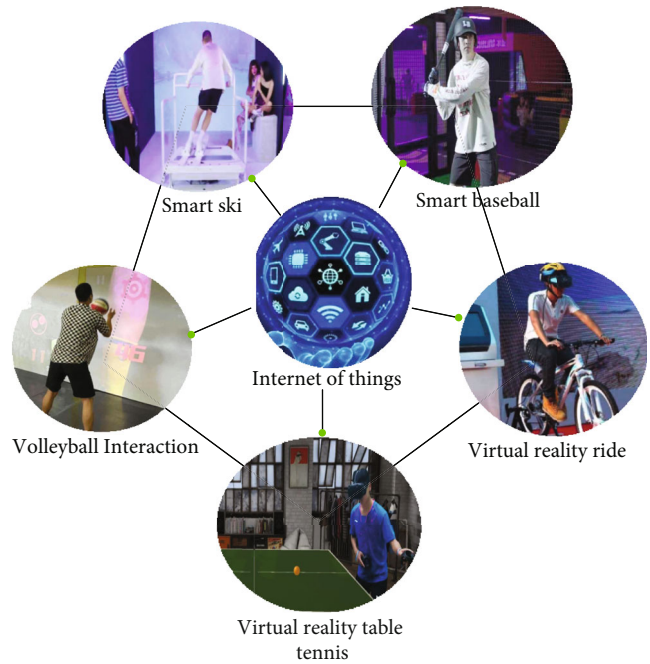


Figure 4: IoT + sports application field.

4. Experiment on Deep Integration of IoT, PE, and Multimedia Technology

4.1. Construction Path of Intelligent PE Classroom in Colleges and Universities. It adheres to the guiding ideology of "health first" and implements the teaching concept of "student-centered." The ecological circle of intelligent PE classroom in colleges and universities is shown in Figure 5.

As shown in Figure 5, innovative physical education models are used to improve teaching efficiency with the help of science and technology, visualise sports data, organically integrate inside and outside the classroom, focus on process evaluation, promote communication between students, teachers, parents, and schools, and also build a smart sports classroom ecosystem in the context of a smart campus.

4.2. IoT + Volleyball Smash Teaching Experimental Method

4.2.1. Experimental Purpose. The purpose of this experiment is to apply the teaching mode of IoT + spiking technology in volleyball general course and verify the effectiveness of this teaching mode through experiments. Through experimental intervention, it applies the teaching mode of IoT + spiking technology in volleyball spiking teaching. It compares the teaching effects of the IoT + spiking technology teaching mode and the traditional teaching mode for students' theoretical knowledge, skills, and interest in volleyball spiking, as well as the analysis of students' learning and satisfaction with the IoT + spiking technology teaching mode in the experimental class.

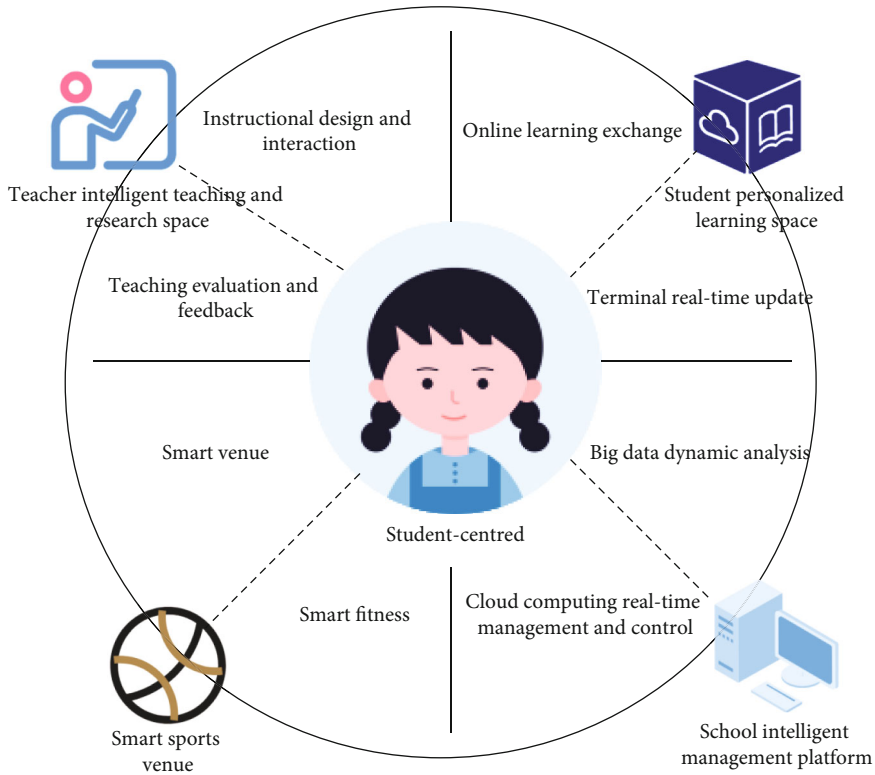


Figure 5: College intelligent PE classroom ecosystem.

Table 1: List of test results of students' height, run-up touch height, and throwing solid ball before the experiment.

	Height (cm), $x \pm s$	Approach height (m), $x \pm s$	Medicine ball long throw (m), $x \pm s$
Control class ($n = 18$)	180.35 ± 4.23	3.14 ± 0.14	13.97 ± 3.03
Experimental class ($n = 18$)	179.42 ± 6.02	3.16 ± 0.19	14.97 ± 3.85
t value	0.578	-0.280	-0.934
p	0.567	0.781	0.356

Note: There is significant difference at $p < 0.05$, and there is no significant difference at $p > 0.05$.

Table 2: Test results of spiking skill level of the original position 4.

Content	Group	Achieving the standard (units)	Technical evaluation (points) 1	Technical evaluation (points) 2
4 smash	Experimental class ($n = 18$)	1.57 ± 1.02	2.14 ± 0.28	1.50 ± 0.54
	Control class ($n = 18$)	1.76 ± 1.37	2.17 ± 0.37	1.69 ± 0.59
	t value	0.508	-0.306	-1.022
	p value	0.614	0.762	0.314

Note: There is significant difference at $p < 0.05$, and there is no significant difference at $p > 0.05$.

4.2.2. Test results and Analysis before Experiment. The experimental and control subjects were tested on specific quality indicators. The data in the table are the final data after excluding invalid data, which are data of students who failed to take the pretest. The confidence interval of the test was 95% by using SPSS 17.0, and the data results and analysis are shown in Table 1.

As shown in Table 1, the run-up touch height is related to the students' jumping explosive quality, which is the physical quality required for volleyball learning.

Before the experiment, in order to prove spiking skill level before learning, this paper tests the original spiking skill level of the two classes. This paper also uses SPSS17.0 after sorting out the data and conducting independent sample t-test, and the confidence interval is 95%. Before the experiment, the test results of spiking skill level of the original position 4 in the control class and the experimental class are shown in Table 2.

It can be seen from the analysis of the spiking skill evaluation results of the two experts, from the mean value, the

Table 3: Comparison results of spiking skill test.

Content		Before experiment ($n = 18$)	After the experiment ($n = 18$)	x after − x before	t value	p
Spike skills review 1	Experimental class	2.14 ± 0.28	4.72 ± 0.13	2.58	-15.620	0.000
Spike skills review 1	Control class	2.17 ± 0.37	4.28 ± 0.37	2.11	-17.650	0.000
Spike skills review 2	Experimental class	1.50 ± 0.54	4.19 ± 0.30	2.69	-16.592	0.000
Spike skills review 2	Control class	1.69 ± 0.59	3.33 soil 0.45	1.64	-10.537	0.000
Up to standard	Experimental class	1.57 ± 1.02	4.27 ± 0.66	2.70	-7.466	0.000

mean values of skill evaluation 1 and skill evaluation 2 show that the mean value of the control class is greater than that of the experimental class, but the p values of skill evaluation 1 and skill evaluation 2 are greater than 0.05. It shows that there is no significant difference in the technical action evaluation of spiking technology between the two classes. Therefore, we can think that the spiking skills of the experimental class and the control class are at the same level, which is not the influencing factor of the experiment. Through grouping, it can well control irrelevant variables such as students' special projects, teaching teachers, teaching environment, and teaching progress. In this paper, the main effect independent variables are IoT + volleyball spike technology teaching mode and traditional teaching mode, which belong to operational variables.

4.3. IoT Integration Table Tennis Teaching Experiment

4.3.1. Experimental Object. Three parallel classes of table tennis elective course for nonsports majors in a university were selected as the experimental objects, a total of 97 students (traditional teaching class, $n = 34$, virtual reality class, $n = 32$, and video teaching class, $n = 31$). Sample conditions are as follows: the subjects are similar in age, are in good health, and have no table tennis training experience.

4.3.2. Teaching Content and Grouping Design. Teaching content is as follows: follow the requirements of the syllabus of table tennis elective courses in colleges and universities, and add IoT games and video resources for auxiliary teaching.

Grouping design is as follows: randomly select one of the three parallel classes of table tennis elective course as the control class ($n = 34$) and the other two classes as the experimental class, which are divided into virtual reality class ($n = 32$) and video teaching class ($n = 31$). In the teaching process, the control class carries out table tennis teaching normally according to the teaching plan formulated by the teacher. The virtual reality class is based on HTC vive virtual reality equipment, which uses VR games for auxiliary teaching. The video teaching class carries out auxiliary teaching by watching relevant table tennis teaching videos.

4.3.3. Experimental Design. After the basic teaching, the students in the control class complete the teaching tasks according to the teaching requirements. The experimental operation part of the experimental class is in charge. The experimental class is divided into two groups: virtual reality class and video teaching class. The dependent variables are autonomous learning ability, interest in sports situation, skill evaluation results, and physical quality. The experimental class and the control class were taught table tennis for 18 weeks, once a week, 1.5 hours per class. In the teaching process, the same table tennis teacher teaches table tennis according to the syllabus. The teaching contents, teaching progress, class hours, and venues of the three parallel classes are consistent. This paper carries out experimental intervention of virtual reality game and video-assisted teaching, respectively. After the experiment, the teacher will continue to review the classroom teaching content and assign the tasks after class.

5. Experimental Results of Integrating IoT into PE Teaching

5.1. Impact of IoT + Volleyball Smash Technology Teaching Mode on Smash Teaching Effect

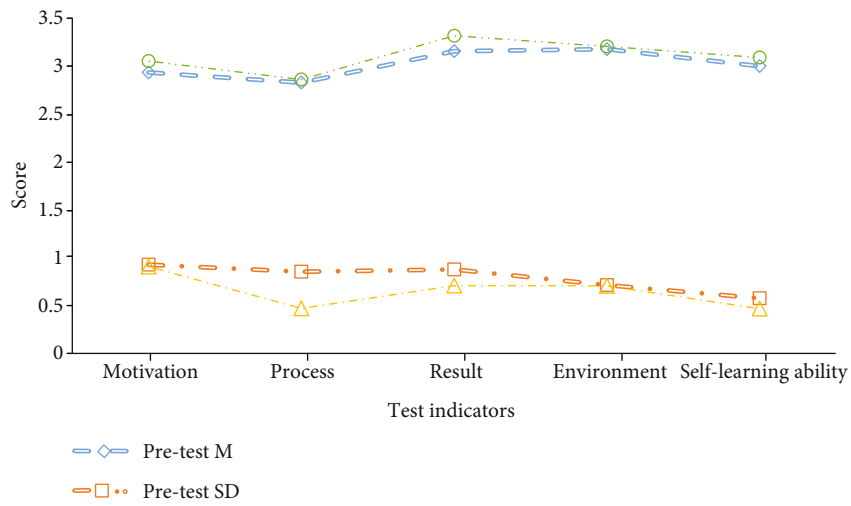
5.1.1. Analysis of Pretest and Posttest Results of Experimental Class and Control Class. The advantage of volleyball teaching mode is that volleyball teaching mode based on the IoT is different from that based on the practice. Teachers can give the most objective response to the quality of their teaching and students' learning. High-quality assessment can actively promote teachers' teaching and students' learning. Therefore, it is of great significance to measure and assess students' learning effect. This paper adopts qualitative and quantitative evaluation methods to evaluate the spiking technical achievements of the experimental class and the control class. The assessment of qualitative results is mainly scored and evaluated by the two volleyball experts invited. The quantitative assessment is to clarify the number of spikes and count the number of effective balls. The analysis results are shown in Table 3.

As shown in Table 3, from the analysis of the technical assessment results, both the assessment results of Expert 1 and Expert 2 showed significant differences. From the analysis of the test results, it can be seen that the technical assessment scores of the experimental class before the experiment were lower than those of the control class, so we can conclude that applying the teaching mode of IoT technology + volleyball dunking technique to the teaching of dunking technique in the general course can improve the standardization and correctness of students' dunking technique.

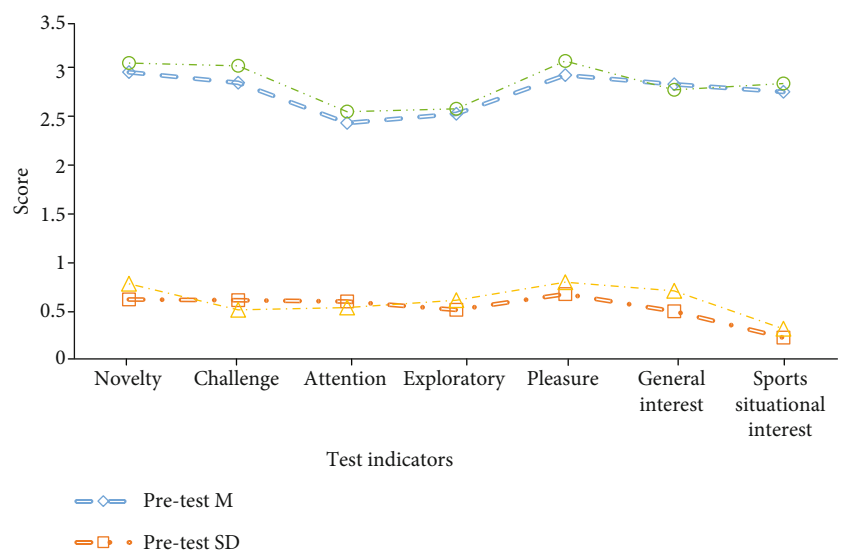
5.1.2. Analysis of Posttest Results of Spike Technique in Experimental Class and Control Class. Before the experiment, the body shape, physical quality, and original smashing skill level of the students in the control class of the

Table 4: Analysis of test results after spiking technology experiment.

Content	Group	Achieving the standard (units)	Technical evaluation (points) 1	Technical evaluation (points) 2
	Experimental class	4.27 ± 0.66	4.72 ± 0.13	4.19 ± 0.30
	Control class	3.33 ± 1.02	4.28 ± 0.37	3.33 ± 0.45
4 smash	x real − x pair	0.94	0.43	0.86
	t value	3.265	4.606	6.690
	p	0.003	0.000	0.000



(a)



(b)

Figure 6: Analysis of learning effect of traditional teaching class. (a) Consistency analysis of autonomous learning ability. (b) Consistency analysis of sports situational interest.

experimental class were tested. This paper adopts SPSS17.0 using independent sample t-test, and the p values of the analysis results are greater than 0.05. The control class is taught in the traditional teaching time, and the analysis results are shown in Table 4.

According to Table 4, the test results of Expert 1 or technical evaluation 2 and the test results of spiking technical evaluation do not matter. Therefore, it can be considered that the experimental intervention played a role. The teaching mode of IoT + volleyball spiking technology can

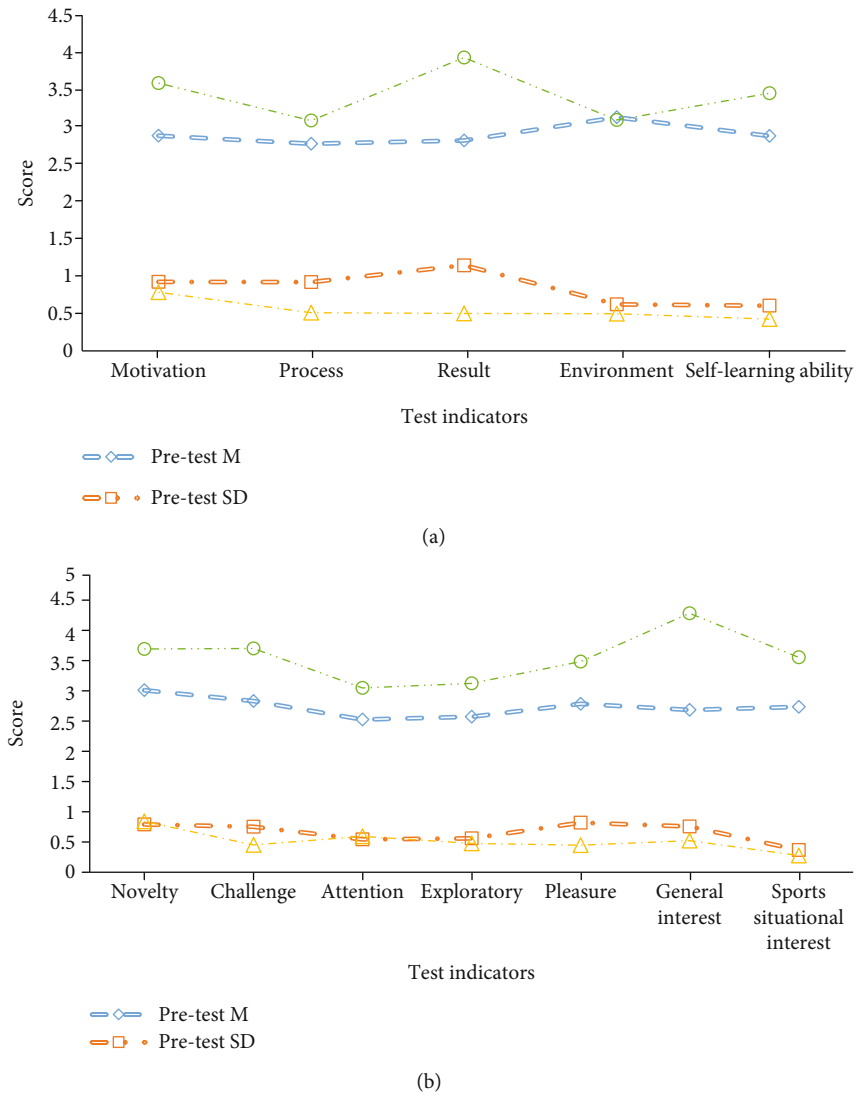


Figure 7: Analysis of learning effect of virtual reality teaching class. (a) Consistency analysis of autonomous learning ability. (b) Consistency analysis of sports situational interest.

effectively improve the standardization, correctness, and accuracy of students' learning spiking technology and promote the improvement of students' learning effect. In the traditional table tennis teaching, the whole process guidance of teachers in the learning environment limits the learners' ability of independent thinking to a certain extent, which is not conducive to the deep-seated implicit change of learning ability and emotional experience. The traditional teaching method cannot effectively promote the improvement of learners' autonomous learning ability.

5.2. Table Tennis Teaching Experiment Results of IoT Integration

5.2.1. Analysis on the Learning Effect of Traditional Table Tennis Teaching. In this paper, in the traditional table tennis teaching, learners gradually form action images through the observation of demonstration actions, which can be used as a reference for practical practice. On the basis of repeatedly improving the wrong actions, it establishes the connection of each part and finally realizes the automation of motor skills. In order to explore the impact of traditional table tennis teaching on learners' learning effect, this paper uses paired sample t-test to make a longitudinal comparison of the test contents of 34 experimental subjects in the traditional teaching class, as shown in Figure 6.

As shown in Figure 6, there is no significant difference in learning motivation, learning process, learning results, and learning environment compared with those before the experiment. It can be seen that the emotional attitude of middle school students in the learning process is easily affected by the difficulty of the content of the teaching materials, resulting in psychological experiences such as reduced learning motivation, boredom, and frustration. It cannot

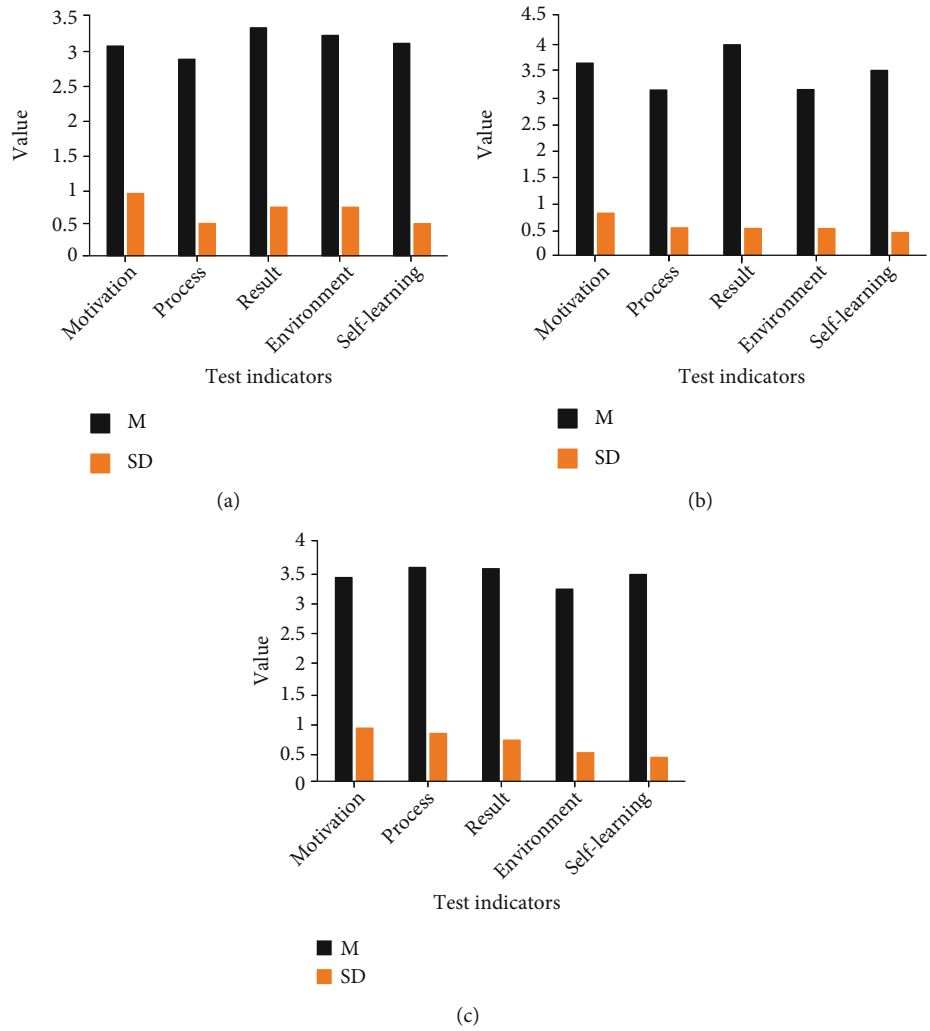


Figure 8: Difference analysis of autonomous learning ability. (a) Traditional class. (b) IOT technology class. (c) Video teaching class.

make students deeply understand the formation law of table tennis skills, the coordination between different technologies, and the ability to adapt to changes.

5.2.2. Analysis of Learning Effect of Table Tennis Virtual Reality Teaching. With the deep integration of virtual simulation technology and education, it creates a teaching scene for learners. Students enhance their learning experience by using a variety of hardware devices for human-computer interaction and feedback from the first person perspective. However, whether virtual reality teaching can promote the improvement of table tennis teaching effect has not yet formed a definite answer. In order to explore the potential value of VR in teaching, this paper uses paired sample t -test to vertically compare the test contents of 32 learners in the virtual reality teaching class, as shown in Figure 7.

As shown in Figure 7, through the analysis of the learning effect of virtual reality table tennis teaching, after the intervention of virtual reality sports games in a natural semester, the subjects have significant differences in learning motivation, learning process, and learning outcome indicators in terms of autonomous learning ability. It shows that HTC vive virtual reality equipment, as an auxiliary teaching tool for college table tennis elective courses, creates a high-immersion table tennis learning environment with human-computer interaction freedom, practice process feedback, and virtual scene authenticity for participants. Learners stimulate the internal motivation of exercise in the virtual situation of independent exploration and give students space for independent thinking. After the intervention of teaching experiment, students' learning ability has been significantly improved.

5.3. Differences in Learning Effectiveness of Different Teaching Methods

5.3.1. Analysis on the Differences of Autonomous Learning Ability. In the PE class, the teacher explains and demonstrates a series of technical actions, which allows learners to choose their own practice objectives and methods in the learning process. It also timely monitors and evaluates the learning process at each stage and finally achieves the

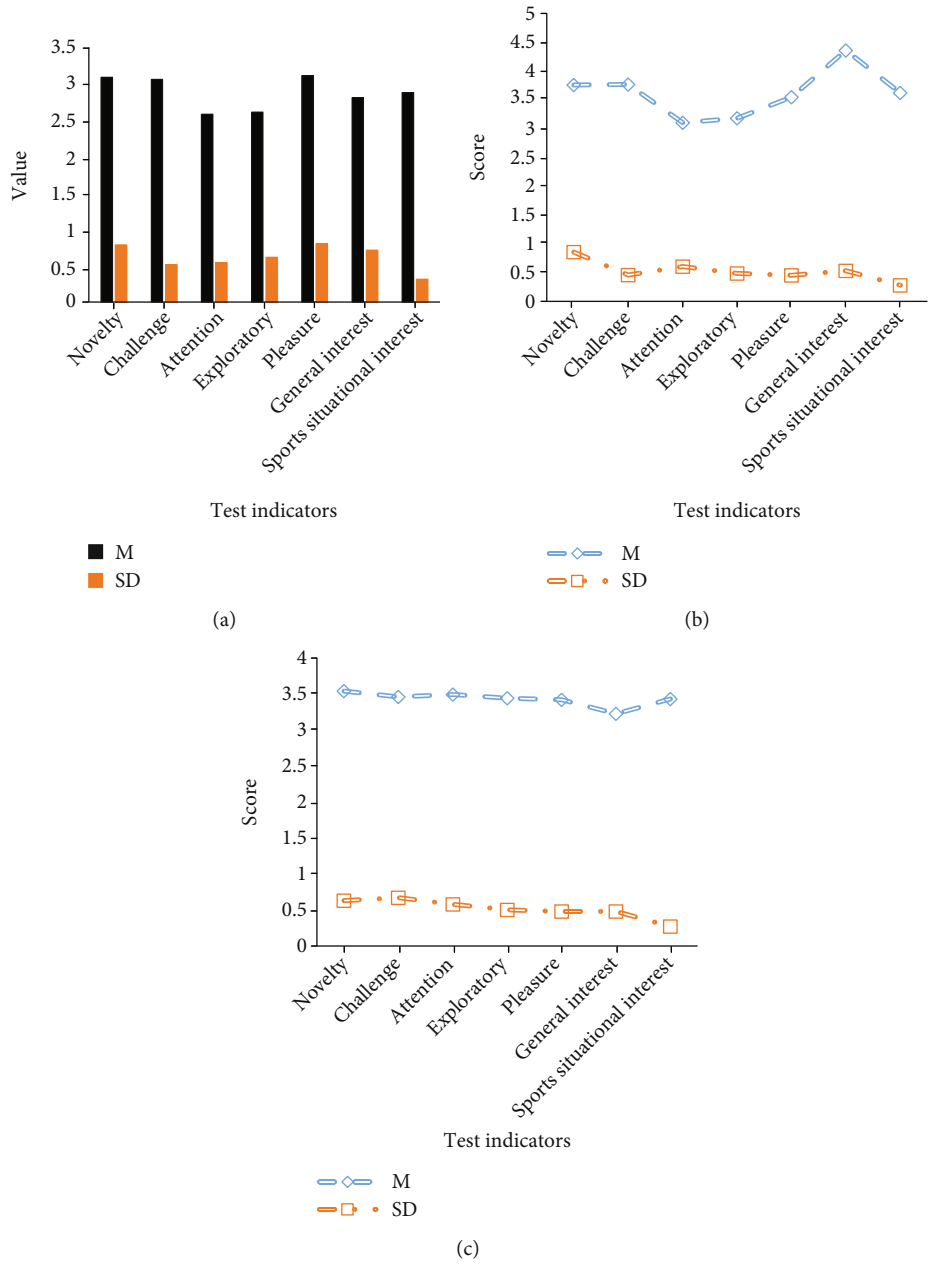


Figure 9: Difference analysis of sports situational interest. (a) Traditional class. (b) IOT technology class. (c) Video teaching class.

purpose of learning objectives. In table tennis teaching, there may be some differences in learners' autonomous learning ability due to the different intervention methods between the experimental class and the control class for the purpose to verify the differences between different groups; this paper uses one-way ANOVA combined with the LSD pairwise test for statistical processing, as shown in Figure 8.

As shown in Figure 8, a cross-sectional comparison of different groups of learners' self-directed learning ability shows that the teaching format that integrates IoT + Teaching and video learning resources is more effective in improving learners' self-directed learning ability. Metacognitive awareness emphasises that learners not only know and understand themselves but also acquire knowledge and strengthen their learning skills. The contextualised table tennis exercises help learners to actively participate in the construction of knowledge and to plan, monitor, and evaluate their own learning process.

5.3.2. Analysis on the Differences of Sports Situational Interest. In order to verify the differences between different groups, this paper uses one-way ANOVA combined with the LSD pairwise test for statistical processing, as shown in Figure 9.

As shown in Figure 9, compared with the traditional teaching and the teaching mode integrating video learning resources, the situational learning form guided by immersive

virtual reality system can better improve learners' interest in sports. In terms of challenge and overall interest, virtual reality class > video teaching class > traditional teaching class. It shows that teachers choose relevant game plots based on the content of table tennis teaching materials. It allows students to complete the construction of table tennis knowledge and skills in the process of playing game roles and human-computer interaction. It makes the situational cognition transfer from the traditional teaching situation to the vivid VR learning situation. It not only stimulates the interest in exercise but also deepens the understanding, memory, and operation of the abstract technical actions of table tennis, so as to reduce the difficulty of learning. In terms of novelty and pleasure, this paper reveals the integration of virtual reality technology and video resources into table tennis teaching. On the basis of active explicit interaction and implicit interaction, this paper effectively stimulates students' psychological characteristics such as curiosity, novelty, and pleasure of new things through observation, comparison, and touch.

6. Conclusion

IoT will be a very effective and cost-effective teaching method to promote college students' sports skill learning and improve teaching quality. It can stimulate students' sports motivation and learning interest and promote the diversified development of sports skill learning to a certain extent. This study applies the IoT and multimedia technology to the teaching of volleyball and table tennis in colleges and universities. It compares and analyzes the changes of emotional attitude, academic performance, and physical quality data of different groups of learners before and after the experiment. The experimental results show that it can arouse the interest in sports situation and improve the performance of sports skills, while the traditional teaching class learners have no positive effect on emotional attitude. It shows better effectiveness in promoting learners' learning interest and sports performance than video teaching class and traditional teaching class. In terms of the improvement effect of autonomous learning ability, there are significant differences between the experimental class and the traditional teaching class, which verifies the scientific hypothesis of virtual reality technology to improve the teaching effect of table tennis. This paper has good practical significance for the improvement of college students' table tennis skill learning, autonomous learning ability and learning interest, the development of curriculum resources, and the transformation to PE informatization. In the future, we should reduce the negative effects caused by high cost investment, dizziness, insufficient interaction, and unreasonable experimental cycle, so as to write a new chapter for the application of Internet of things technology in physical education.

Data Availability

Data will be available on request.

Conflicts of Interest

The author declares no conflicts of interest.

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