



Realization of Intelligent Computer Aided System in Physical Education and Training

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Abstract. With the introduction of artificial intelligence technology, computer-aided instruction (CAI) has developed into intelligent computer-aided instruction (ICAI). ICAI not only overcomes many weaknesses of traditional CAI, but also greatly improves and improves the teaching effect and efficiency. This article first analyzes and studies the characteristics and functions of the intelligent computer-aided instruction system, and gives a corresponding implementation framework on this basis. Then, using mathematical statistics, logical analysis and other methods, randomly select two ordinary class undergraduate students as the investigation experiment object, using the content of the current badminton syllabus as the teaching experiment content, try to construct the teaching of "using intelligent computer-assisted badminton teaching" Model flow chart, this experiment draws the use of intelligent computer-assisted teaching methods in badminton teaching. Teachers create effective teaching programs according to the teaching goals, give full play to the student's dominant position, and carry out targeted teaching, which can effectively improve badminton lessons. The use of intelligent computer-assisted badminton teaching enhances the communication and exchanges among students, and cultivates the spirit of mutual cooperation, mutual help and mutual progress among students. The use of intelligent computer-assisted badminton teaching has fundamentally achieved the principles of student's subjectivity and comprehensive development of body and mind, which has further stimulated students' initiative and enthusiasm in learning badminton and cultivated students' lifelong sports awareness.

Keywords: Intelligent Computer Aided System; Badminton Teaching; Auxiliary Teaching; Experimental Research

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1 INTRODUCTION

Computer-aided instruction (CAI) is the use of a computer to simulate the behavior of physical education teachers, through the interactive activities between students and computers to achieve the purpose of physical education [1]. Since the development of the world's first computer-aided

teaching system by IBM in the United States in 1959, CAI has received the attention of various countries, many commodities have appeared, and the CAI industry has formed. However, due to the limitations of traditional CAI systems on teaching methods and answers, it is difficult to adopt corresponding teaching methods for students of different levels and abilities [2]. With the continuous development and maturity of computer science and artificial intelligence (AI) technology, AI is introduced into CAI, so that the CAI system can understand what to teach, who to teach, and how to teach, so that it can rationally arrange physical education content and change physical education teaching to meet the needs of individual physical education, this is an intelligent computer-aided physical education system (ICAI) based on AI technology and cognitive science theory. Abele [3] developed a new field of computer application technology, which represents a new physical education thinking and physical education teaching method, which greatly improves and improves the quality and efficiency of physical education. According to Brawner[4], CAI is to analyze the objectives of the curriculum to form a hierarchical structure of learning goals; then expand the design of the learning tasks for each goal (frame), each screen can contain technical explanations of sports events and explanations, questions, and corresponding questions The ideal student response and feedback information, etc.; the picture of physical education is connected according to a certain physical education logic to form courseware. This courseware formed by the designer fixing the structure in advance is called CAI system. Due to the lack of sufficient resilience in this courseware, adaptive courseware design techniques have emerged later, and the physical education teaching content and physical education logic are separated in a certain procedure [5]. According to the learning situation of students, there is a physical education decision-making body to provide students with a certain The learning content of the screen, but it is still a learning method where students are completely controlled by the computer. Burkhardt[5] separated physical education content from physical education strategies, Intelligent Computer Assisted Physical Education (ICAI) provided by the student's cognitive model, through intelligent system search and reasoning, dynamically generate content and strategies suitable for individualized teaching; judge the student's learning level through intelligent diagnosis mechanism, analyze the reasons for the students' wrong actions, and propose changes to students and further study the content suggestions. By distributing statistics of errors occurred by all students, the intelligent diagnosis mechanism will provide physical education teachers with recommendations on the focus, methods, test priorities, and question types of physical education; provide physical education teachers with friendly physical education content and test content maintenance interface. Cabestrero [6] developed the physical education teaching strategy, which can be adjusted without changing the students' cognitive models, teaching content, and test results, the teaching supervisors are provided with reference opinions on the evaluation of the teaching performance of the instructors.

This article first analyzes and studies the characteristics and functions of the intelligent computer-aided instruction system, and gives a corresponding implementation framework on this basis. Then, using mathematical statistics, logical analysis and other methods, randomly select two ordinary class undergraduate students as the investigation experiment object, using the content of the current badminton syllabus as the teaching experiment content, try to construct the teaching of "using intelligent computer-assisted badminton teaching". Model flow chart, this experiment draws the use of intelligent computer-assisted teaching methods in badminton teaching. The use of intelligent computer-assisted badminton teaching enhances the communication and exchanges among students, and cultivates the spirit of mutual cooperation, mutual help and mutual progress among students. The use of intelligent computer-assisted badminton teaching has fundamentally achieved the principles of student's subjectivity and comprehensive development of body and mind, which has further stimulated students' initiative and enthusiasm in learning badminton and cultivated students' lifelong sports awareness.

2 IMPLEMENTATION OF ICAI SYSTEM

2.1 Module Framework

The ICAI system module framework we implemented is described as follows:

1) Domain model: Depositing the professional knowledge of the course imparted to students can also generate problems, provide correct answers to the problems and the process of solving the problems. Chih-Yueh [7] said the domain model generally contains two aspects of knowledge: one is about the content of the course; the other is the knowledge about the knowledge to solve the problem, namely the process knowledge. Knowledge representation methods have semantic networks (mainly propositional semantic networks or data semantic networks), rules and other forms.

2) Diagnostic model: Use the diagnostic rules to analyze the student's response, determine the knowledge that the student already knows or the wrong idea generated by the student, and pass it to the current state of the student model.

3) Student model: Accurately reflect the students' knowledge level, learning ability, etc., provide a basis for the system to achieve individualized teaching. This ICAI system combines cognitive theory to establish a cognitive student model, which is the core technology implemented by the entire ICAI system.

4) Teacher model: Combining knowledge of physical education teaching strategies and curriculum structure, students can choose questions for them to answer, supervise and evaluate their behavior. Choose appropriate tutoring materials for students when they need them. The block diagram of the ICAI system is shown in Figure 1.

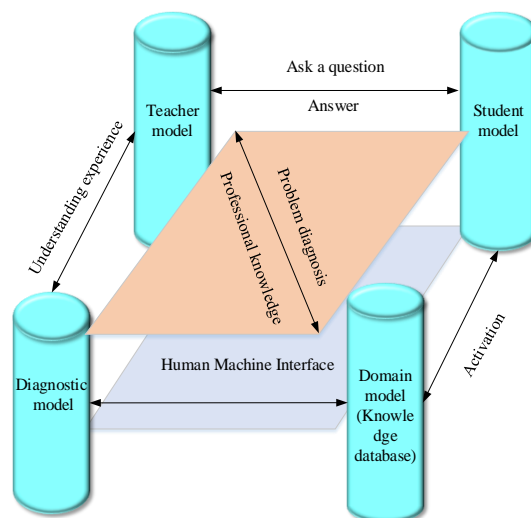


Figure 1: Block diagram of the module implemented by the ICAI system.

2.2 Core Technology

Cognitive student model, two common methods of establishing student model:

1) Overlay Mode: It describes the students' knowledge as a subset of the professional knowledge in the domain knowledge module, and can tell the students what is wrong and how to correct it. The cognitive student model is shown in Figure 2.

2) Buggy Model: A student model that represents the correct and wrong knowledge of the student. It does not regard students' knowledge as a subset of professional knowledge in domain knowledge, but regards it as a deviation from professional knowledge, so it can also find incorrect knowledge that causes students to make mistakes.

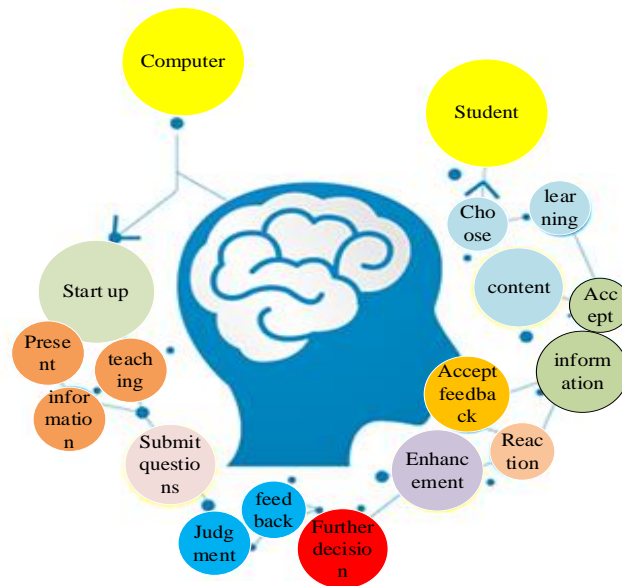


Figure 2: Cognitive student model.

3) In the ICAI system model, according to Gulshan [8], the main role of the student model is to register the learner's personal information, such as student number, name, gender, etc.; on the other hand, it is also the most important, which is to accurately reflect the student's knowledge level, learning ability, etc., provide a basis for intelligent physical education. Cognitive ability is a person's ability to control his learning, memory, and thinking. To a large extent, he expresses a person's ability to analyze problems. Based on cognitive theory, we use the back propagation model (BP model) in the artificial neural network (ANN) to build a cognitive student model that can reflect the learning level and cognitive ability of students. Our input to the BP model includes the selection of six levels of cognitive activity proposed by Bloom, namely the evaluation test scores of six aspects of memory, understanding, application, analysis, synthesis, evaluation, and name, gender, age, etc. Kermayn [9] used twelve quantities of personal information and academic qualifications, physiological conditions, learning environment, etc. are used as input nodes, and the students' mastery of ideas, skills and applications are selected as output nodes.

In fact, it is to complete a nonlinear mapping from multi-dimensional space to three-dimensional space: Use x_i to denote the input signal, and y_i to denote the output signal. The number of nodes in each layer is n , and the connection weight of each layer is w_{ij} . The input of node i is:

$$x_i = \sum_{j=1}^{m-1} w_{ij} y_j \quad (1)$$

The output of node i is:

$$y_i = f(x_i) = \frac{1}{1 + e^{-x_i}} \quad (2)$$

Where $f(x): X \rightarrow Y$, $X = \{X_1, X_2, X_3, \dots, X_{10}\}$ and $Y = \{Y_1, Y_2, Y_3\}$. Among them, X_1, X_2, \dots, X_5 respectively represent the 5 grades of cognitive activity judgment test results, X_6, X_7, \dots, X_{10} respectively represent name, gender, age, education, physiological conditions, learning

environment; Y_1, Y_2, Y_3 respectively indicate the students' mastery of concepts, skills and applications, where $Y_i \in \{Poor (0-59), Medium (60-80), Good (81-90), Excellent (91-100)\}$.

The design and application idea of the cognitive student model is to give the conceptual nodes in each test unit of the teaching content the cognitive type and difficulty level, and at the same time estimate the initial value of the students' cognitive ability. After the student tests the concept or question type of a test unit, the ICAI system corrects the student's cognitive ability, according to the difficulty, plus points for correct answers, minus points for correct answers, and six points after one study by the learner according to the BP algorithm. Abele [3] developed the correction value of the cognitive type, and then select the appropriate concept points according to the students' cognitive ability by reasoning rules, and continue to teach the learner. The corresponding process of physical education content and strategic reasoning machine is: We use a production system to intelligently reason and generate different physical education content and strategies. Its form is expressed as:

If <student level expression>

Then <generate new teaching content and strategy>.

Examples are as follows:

IF (representation concept of knowledge) = (difference)

THEN (review introductory course, explaining concepts)

IF (representation concept of knowledge) > = (pass) AND (application of knowledge representation) = (difference)

THEN (review concept, explain the auxiliary knowledge and typical applications of the example).

The entire physical education teaching content and strategy generation process is an inference process of an inference engine, which uses the student-level representation values (Y_1, Y_2, Y_3) according to the corresponding inference in the above production system rules are used for reasoning to generate the next teaching content and strategies. In the teaching process, because this process is repeated continuously, and the students' cognitive abilities are revised, in this way, every time a student learns, the cognitive ability evaluation value is modified once, and finally the student's cognitive ability is gradually approached through the BP algorithm standard value.

2.3 The Salient Features of the System

The ICAI system used in physical education has the following significant characteristics: 1) designed based on cognitive theory, so that the courseware has a certain adaptive ability; 2) improves students' interest in learning, and guides students to enter an active and efficient learning environment; 3) it is particularly conducive to individualized education and teaching according to aptitude; 4) it not only improves the teaching effect of teachers, but also improves the learning efficiency of students.

3 REALIZATION OF INTELLIGENT COMPUTER-AIDED SYSTEM IN PHYSICAL EDUCATION

In the course of badminton teaching, if you only pay attention to the consequences of temporary effects, it is extremely unfavorable for students to master the correct technique. Without paying attention to the long-term effects, the results over time can be imagined [4]. The formality and perfection of the badminton teaching procedure will directly affect the overall grasp of the badminton teacher's teaching process, and directly affect the badminton teaching effect. Then, before the class, the badminton teacher needs to read through the university badminton syllabus and formulate a large semester teaching goal. Burkhardt [5] created a standardized, complete and perfect badminton teaching program plays a certain role in improving the quality of badminton teaching and the comprehensive conditions of students. The badminton teaching program includes various preparations before class and classroom teaching. The arrangement of homework after class, after-school guidance, assessment during the teaching process and teaching evaluation, the

perfect badminton teaching method plays a systematic and standardized role in the badminton teaching program. Therefore, the use of good teaching methods by badminton teachers plays a crucial role in the improvement of badminton teaching procedures. The following are the teaching procedures of traditional badminton teaching methods and intelligent computer technology applied in the teaching process of college badminton. The intelligent computer technology applied in the teaching process of college badminton is shown in Figure 3.

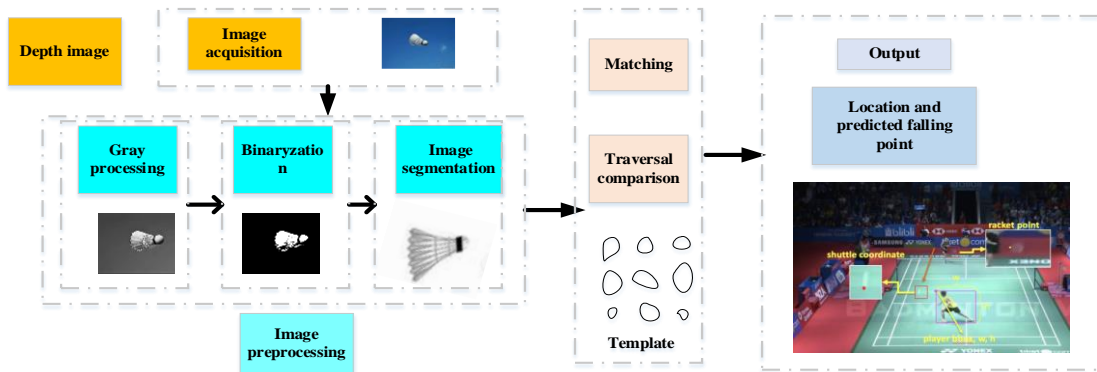


Figure 3: The intelligent computer technology of college badminton.

3.1 Intelligent Computer-aided System Badminton Teaching Program

The program in intelligent computer-assisted badminton teaching is composed of two parts: pre-class preparation and in class practice. Before the class, teachers need to read the syllabus, check the literature to understand the prospects, current situation and good teaching methods of badminton, and understand the teaching situation of badminton. During the class, the teacher tries to guide the students as much as possible, so that the students can actively participate in learning badminton teaching. The application of intelligent computer in badminton teaching is shown in Figure 4.

The use of intelligent computer technology to assist the teaching process of badminton is mainly divided into four parts: First, badminton and stimulate students' motivation to learn badminton. Before the course, the teacher usually starts the game to increase the interest of the students, and asks the students to design or choose games related to the teaching content of this lesson to stimulate students' enthusiasm to participate more actively in the badminton teaching process. Second, play teaching videos. Cabestrero [6] said the teacher plays the badminton technical video prepared before this lesson. The students watch the video several times and follow the video, practice several times, and then shoot the students' own movements. By comparison, the students can understand the content of the badminton technical movements more. Third, the teacher organization divides students into multiple groups to allow students to compare and discuss badminton technical movements, so that students can have a deep understanding and grasp of badminton technical movements, and make students become the main body of the classroom. Fourth, summary evaluation. After the badminton course is completed, students are required to summarize their own badminton technical actions and video regular technical actions, sum up the unreasonable and good technical actions of themselves and their classmates, and ask students to obtain technical experience and classmates communicate with each other, so that an active and harmonious classroom atmosphere is also more conducive to the rapid proficiency of students' badminton technical movements. Finally, the teacher should evaluate and patiently guide the students according to the specific situation in the classroom, so that the students can learn the standard badminton techniques happily [10].

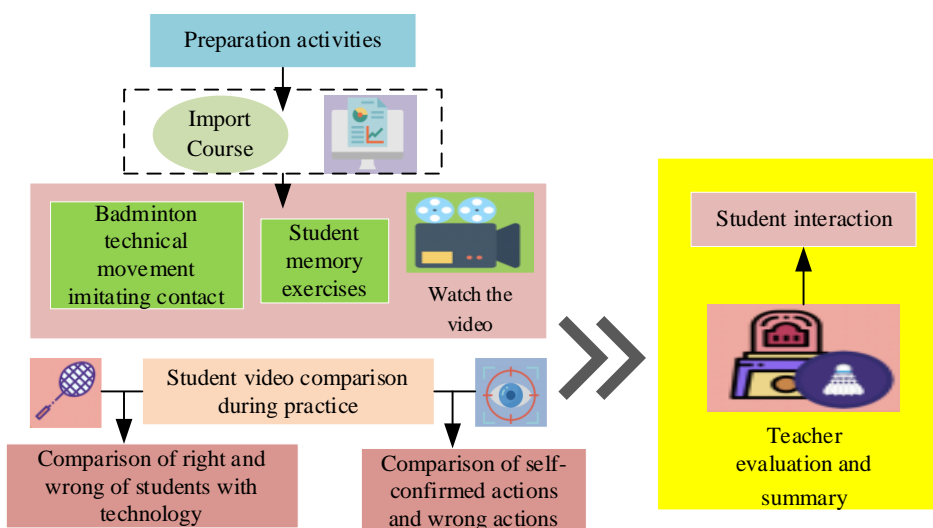


Figure 4: The application of intelligent computer in badminton teaching.

3.2 Experimental Results and Analysis after Teaching

- 1) The influence of intelligent computer-assisted badminton teaching and conventional teaching badminton teaching on students' attitudes towards badminton learning

	Attitudes of the students	Control class	Experimental class
Actively practicing in the classroom	Yes	66.3%	83.5%
	No	23.7%	16.5%
Actively asking questions in class	Yes	62.8%	82.4%
	No	37.2%	17.6%
The teacher asked whether to answer actively	Yes	64.8%	88.2%
	No	35.2%	11.8%

Table 1: Comparison of the attitudes of the students in the post-experiment experimental class and the control class in learning badminton.

After the experiment, three questions were set on the attitude of students to learn badminton (see Table 1 and Figure 5), namely: whether students actively practice in the classroom, whether they actively ask questions in the classroom, whether teachers actively answer questions, and the proportion actively answered up to 83.5% ,compared 66.3% of the students in the control class, it can be seen that the attitude of the badminton learning of the students in the control class is obviously lower than that of the students in the experimental class. Students' attitude towards learning badminton. This is mainly because the teaching of the experimental class enthusiasm is higher and their learning attitude is better.

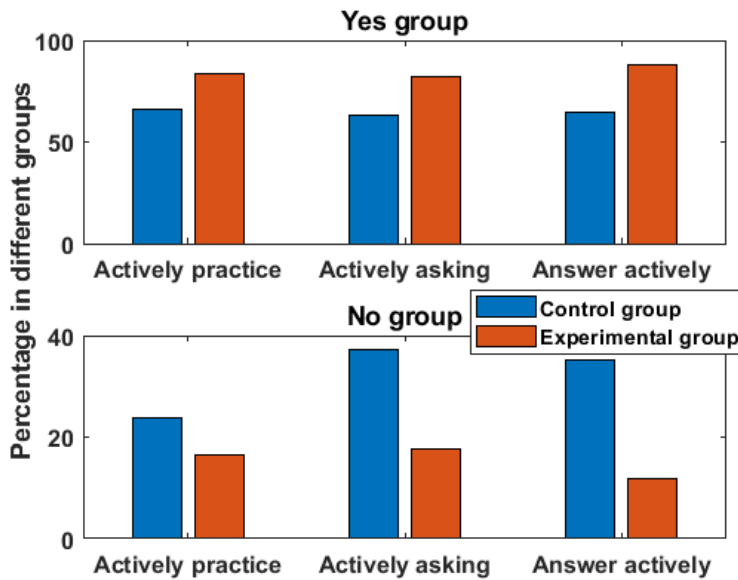


Figure 5: The comparison of the attitudes of the students in learning badminton.

2) Comparative analysis of students' satisfaction with badminton classroom organization

Different class	Very satisfied	Satisfied	Normal	Dissatisfied
Control class (%)	30.25	27.91	29.40	12.44
Experimental class (%)	47.53	29.29	20.81	2.37

Table 2: Comparison table of the satisfaction with the badminton classroom organization form.

By issuing questionnaires to investigate the students, the results show that more than 80% and very satisfied with the organizational form of the badminton class, while the students in the experimental class are not satisfied with the organizational form of the badminton class is 2.37%; The students in the control class are very satisfied and satisfied with less than 58% of the badminton class organization form, and 12.5% of the students are not satisfied. According to the above description, students are very satisfied with the use of intelligent computer technology in badminton teaching. As shown in Table 2 and Figure 6, the comparison results of students' satisfaction with the organization of intelligent computer technology-assisted badminton teaching classroom analysis shows that intelligent computer technology-assisted badminton teaching method can meet the needs of students, respect individual differences of students, according to teachers' pre-classes. A large amount of careful preparation can fully mobilize students' enthusiasm for learning, so that all students can participate in it, and learn in a pleasant atmosphere, and achieve good learning results. As a relatively antagonistic sport, badminton is deeply loved by the majority of students. However, when formulating teaching goals, teachers should effectively convert the more difficult to understand teaching content into easy-to-understand specific behaviors according to the actual situation of the students. This can not only enhance students' enthusiasm for learning, but also enhance students' self-confidence in learning. Traditional teaching methods often set teaching goals too high. During the teaching process, students' learning confidence may even be obliterated. Too low a goal setting will affect students'

interest in learning, but it will be more detrimental to future learning. Therefore, the core content of intelligent computer technology assisted badminton teaching is the teacher's grasp of the teaching objectives and the understanding of the students, and on this basis, formulate a scientific and reasonable teaching plan. The teaching organization form of badminton is directly related to various factors such as teaching content, teaching environment, and student differences. Different teaching content can have different organizational forms, and different teaching environments will inevitably lead to changes in the organizational form. Therefore, the teaching organization form of badminton is dynamic, and it can change with many factors. However, in the process of change, teachers must follow the principles of physical education and all should meet the requirements of physical education. Conventional badminton teaching has a relatively simple organization form, and teachers tend to use inherent forms to teach multiple techniques. Therefore, in the conventional badminton teaching, students' interest will be reduced, and even annoying psychology will lead to a decline in learning effect. The organization of intelligent computer technology-assisted badminton teaching is more flexible. Teachers create reasonable and feasible experiential solutions that can stimulate students' learning interest according to different teaching goals and teaching content. Students can fully experience various technical actions. Increase the sense of urgency, improve your own sense of competition, and improve your existing problems by observing the technical actions in the video. Throughout the process, teachers not only pay attention to the technical experience of students, but also pay more attention to the emotional experience of students. The process is competitive, entertaining, and cooperative, which in turn improves students' satisfaction with the organization of the classroom, and ultimately achieves the goals of increasing students' interest in learning and improving teachers' teaching quality.

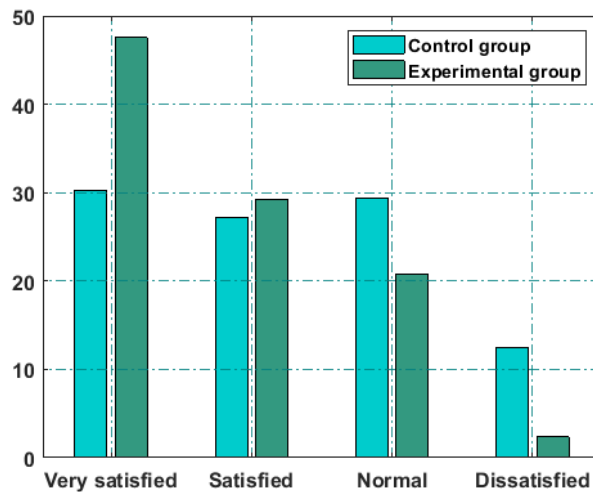


Figure 6: The comparison of the satisfaction of the students in learning badminton.

The influence of intelligent computer assisted badminton teaching and conventional teaching badminton teaching on teaching quality

Class	Control class	Experimental class	T	P
High serve	4.38	6.93	-0.0018	<0.05
Hit high ball	5.39	7.16	-0.0027	<0.05
Rub the ball in front of the net	6.38	7.91	-0.0041	<0.05

Flat draw	6.17	7.95	-0.0021	<0.05
Straight ball	6.95	7.29	-0.0045	<0.05
Front hook	6.22	7.86	-0.0037	<0.05
Straight forehand	6.94	7.59	-0.0024	<0.05

Table 3: Badminton technical test table after teaching experiment.

The results of the experiment (see Table 3) scored high forehands, high forehands, rubbing in front of the net, hanging straight forehands, hooking forehands in front of the net, and straight forehands. To be higher than the students in the control class, I conducted a T test on these seven techniques, and obtained that the experimental class had differences in the forehand high-end ball, the forehand high-end ball, and the ball in front of the net, ($P < 0.05$), which shows that the use of multimedia technology to assist badminton teaching compared to the traditional teaching of badminton has greatly improved the learning of students' badminton skills. This should be due to the blind spots of the students in the experimental class. The class helped him solve it, and many students in the experimental class also practiced after the class, so the experimental class scores exceeded the control class.

According to the comparison of the technical evaluation results of the experimental group and the control group, the comparative analysis of the use of multimedia technology in the badminton class. The main reason is that intelligent computer technology can more comprehensively target students' needs, formulate scientific and reasonable teaching programs, adopt more clear teaching methods, and have specific teaching objectives and simple and clear teaching methods, so that students can master and use various badminton technologies freely. Intelligent computer technology effectively solves the problems of difficult and slow mastering of technology in the badminton teaching process. Through the targeted guidance of teachers, the various technical actions of badminton can be more vivid and reflected in the students easier to understand In the simple movements of the students, the students will practice repeatedly through the guidance of the teacher, and finally the various technical movements will be improved and finalized. Therefore, intelligent computer technology assisted badminton teaching can effectively improve teaching quality.

- 2) Comparative analysis of the badminton comprehensive score test assessment of the students in the two classes after the teaching experiment

Class	N	$\bar{X} \pm s$	T	P-value
Control class	45	74.29 ± 3.29	-2.891	<0.05
Experimental class	45	89.27 ± 2.91		

Table 4: Comparison of badminton test scores between students in experimental class and control class after the experiment.

As shown in Table 4 and Figure 7, the results of the comprehensive test of the badminton test of the experimental class and the control class students, the experimental class and the control class students have significant differences in the badminton technology comprehensive test assessment. It is concluded that the use of multimedia technology to assist badminton teaching can not only promote the mastery of badminton technology, but also promote the comprehensive quality of students to learn badminton.

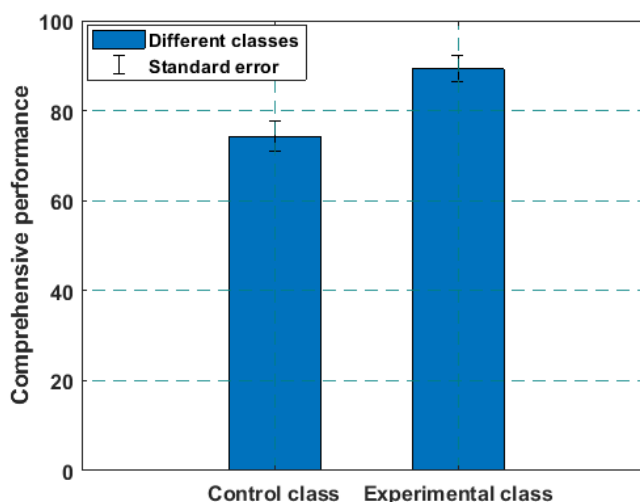


Figure 7: The comparison of the test scores of the students in learning badminton.

4 CONCLUSIONS

In the teaching of badminton, intelligent computer technology is used to assist teaching methods. According to teaching goals, teachers create effective teaching programs, dominant position, and carry out targeted teaching, which improve the teaching quality of badminton lessons. Intelligent computer technology assists badminton teaching, enhances communication and exchange among students, and cultivates the spirit of mutual cooperation, mutual help and mutual progress among students. Through the intelligent computer technology created by teachers to assist badminton teaching program, students can enhance self-confidence in the process of learning and have a positive effect on the learning of badminton. Intelligent computer technology assists badminton teaching, which basically achieves the principle of student's subjectivity and comprehensive development of body and mind, further inspiring students 'initiative and enthusiasm in learning badminton and cultivating students' lifelong sports awareness.

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