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Development of Multimedia Teaching Content for Basketball in High School

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Abstract

Background and Aim: In the continuous development of information technology, the global education sector has been greatly impacted by the globalization of information, the application of modern information technology can be seen everywhere, which will profoundly change education. Modern information technology with network and multimedia technology as the core has been applied in physical education teaching in schools and universities. It is necessary to reform and upgrade the traditional education mode and develop multimedia teaching methods. Therefore, this research was to develop multimedia teaching content for basketball in high school, to promote the use of multimedia technology in physical education teaching.

Materials and Methods: The survey included 516 students and 35 teachers from 10 high schools in Guangzhou, questionnaire was used to investigate the current situation of basketball teaching. Then, 7 teachers were interviewed to consult the problem solutions, and the indicator contents of multimedia teaching content for basketball in high school was constructed by literature review and content analysis. Through 19 Delphi experts' consensus, multimedia teaching content for basketball in high school was established. Finally, 9 experts were invited to confirm the developed multimedia teaching content by the Connoisseurship method. In this research, mean, standard deviation and coefficient of variation were used to analyze the data.

Results: After two rounds of Delphi method investigation, statistics, and modification, there are 92 indicators suitable for using multimedia in high school basketball teaching content. The content of high school multimedia basketball teaching is designed and includes the origin and development of basketball, sports injuries, and prevention, basic movement of a basketball player, dribble technique, one-handed marching shot, basic movement of a basketball player, basic basketball rules, shoot technique, pass technique, defend technique, breakthrough technique, advanced dribbling, steal technique, zone cooperation, pick and roll and defense, attacking match, fast break and defense, one-on-one check, offensive zone defense.

Conclusion: The multimedia teaching content for basketball high school in Guangzhou was effective and appropriate, and can be integrated into the teaching plan.

Keywords: Multimedia, Teaching Content, High School Basketball Courses

Introduction

Since the information revolution of the mid-1950s, mankind has entered the information age for several decades, and information technology represents the general trend of development in the present era and advanced productive forces. In today's world, an information technology revolution is unfolding, which is specifically manifested in the fact that information technology has been widely introduced into all kinds of production activities, bringing automation to a new level. Especially since entering the 21st century, information technology has touched most of the fields related to our lives, but its impact on education is not obvious. Therefore, since entering the new era, China has attached great importance to educational information. In April 2018, the Ministry of Education (MOE) issued the Action Plan for Education Informatization 2.0, and in February 2020, the MOE issued the Priority Work on Education Informatization and Cyber security for the Year 2020. Both documents emphasize the important role of education informatization. Education informatization requires the application of certain IT means and methods in teaching, the core content of which is teaching informatization. This requires the comprehensive use of computers, multimedia, and other modern information technology means in the process of education and teaching, and the promotion of education and teaching reform to meet the requirements of the new era of informatization (Ministry of Education, 2018).

In high school physical education and health teaching, physical education teachers can not only use the Internet to teach students multi-dimensional, comprehensive, personalized knowledge and skills, but

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also use the existing information technology and the current high school physical education and health curriculum, innovative teaching methods, to meet the individual learning needs of students, and to truly achieve the students as the main body. At present, information technology in the field of education is of great significance, so it is particularly important to carry out the reform of information technology in education, the application of information technology to physical education is imperative (Liu & Wang, 2021).

In the continuous development of information technology, the global education sector has been greatly impacted by the globalization of information, and information is also affecting our lives, the application of modern information technology can be seen everywhere, which will profoundly change education. Modern information technology with network and multimedia technology as the core has been applied in physical education teaching in colleges and universities. It can be seen that multimedia technology has become an important research topic in physical education teaching. At present, most of the teaching modes in our schools have undergone great changes, and the traditional teaching modes can no longer meet the needs of education in the new era. It is necessary to reform and upgrade the traditional education mode, introduce multimedia technology, develop multimedia teaching methods, improve teachers' classroom efficiency, and promote the development of physical education (Zhang & Chen, 2020). However, there is no referable multimedia teaching content for basketball, and many secondary school physical education teachers have no reference in theory and cannot keep pace with the development of the times in practice, which greatly restricts the effective use of multimedia technology in physical education. Therefore, this research discusses and analyses the basketball multimedia teaching content in physical education courses based on studying the actual situation of physical education teaching in secondary schools, aiming to build multimedia teaching content for basketball in high schools and promote the use of multimedia technology in physical education teaching.

Objectives

Main objective

To develop multimedia teaching content for basketball in high school.

Subsidiary objectives

1. To investigate the current situation and problems of basketball teaching in high schools in Guangzhou City.
2. To draft the multimedia teaching content for basketball in high school in Guangzhou City.
3. To confirm the multimedia teaching content for basketball in high school in Guangzhou City.

Literature review

1. Multimedia application for teaching and learning

Multimedia applications for teaching and learning involve the use of digital tools, such as video, audio, animation, graphics, and interactive content, to enhance the educational experience. These applications provide diverse modes of representation that support different learning styles, engage students more effectively, and make complex concepts easier to understand. Key components of multimedia application in education such as (1) videos, podcasts, and animations help illustrate complex topics that are difficult to convey through text alone. For example, science teachers might use video simulations to demonstrate chemical reactions; (2) adding game elements, such as point systems and leaderboards, motivates students and turns learning into an enjoyable experience. It enhances engagement by rewarding progress and encouraging friendly competition; (3) teachers can organize and present information in a visually engaging way through tools like PowerPoint, Prezi, or Google Slides, making it easier for students to follow lessons; and (4) platforms such as Google Classroom or Microsoft Teams allow for collaboration and interaction, encouraging communication and group work in virtual environments. Therefore, incorporating multimedia in education enhances both teaching efficiency and student learning outcomes by leveraging the power of technology to create richer, more interactive experiences (Mayer, 2009).

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Wan (2021) proposed that basketball curriculums belong to elective curriculums in the physical education curriculum structure of high schools. Since the establishment of basketball curriculums, traditional teaching methods have been used, and the contents related to basketball teaching follow the footsteps of the syllabus. Traditional teaching methods are completely bound by the syllabus, and the content focuses on theoretical knowledge, while the teaching methods are mainly explained and demonstrated by teachers combined with theories. For technical teaching, the teaching is arranged according to the steps of fixed posture, dribbling and shooting, team cooperation, and tactics, which are too monotonous inflexible, and unattractive to stimulate students' interest in learning. Moreover, the movement released in this process is too mechanized, and it is difficult to mobilize students' enthusiasm for learning through simple imitation, resulting in a lack of innovation and mobilization of thinking.

Wang et al., (2013) believe that reasonable and scientific teaching methods can arouse the enthusiasm of students in the teaching process, and students gain knowledge in an active and relaxed learning atmosphere, which is conducive to the cultivation of students' outlook on life and values. How to use teaching methods has a very important impact on the development of teaching activities.

Zhou (2019) proposed that factors affecting the innovation of teaching methods are influenced by traditional teaching concepts, teaching management systems, teaching evaluation mechanisms, etc. For the reform of teaching, teachers should be provided with a good platform and learning environment, constantly improve their ability to innovate teaching methods and highlight the core position of students in teaching.

There are commonalities between traditional teaching and multimedia teaching, which are embodied in the demonstration image, intuitive and clear. The difference is that multimedia teaching combines high-tech technology based on traditional teaching mode to stimulate students' enthusiasm for learning, and makes full use of a complete demonstration part, decomposition part, group discussion part, post-learning feedback part, evaluation part, introduction part, and other links in teaching, so that multimedia teaching is needed by students and teaching, and becomes an important means of teaching assistance.

Lui (2019) selected the difficult point in traditional teaching and the teaching of basketball tactical fundamentals as the teaching content, designed and made multimedia teaching courseware, analyzed the teaching effect through teaching experiments, and found that: (1) The application of multimedia assisted teaching in the teaching of basic basketball tactical cooperation has a positive effect on students' understanding of the overall structure of tactical cooperation, cooperation timing, moving routes, and mutual cooperation among players; (2) Compared with traditional teaching methods, both theoretical knowledge and technical and tactical mastery have significant advantages; (3) Through the questionnaire survey, it is found that most students are satisfied with the teaching effect of the basic basketball tactics by using multimedia auxiliary teaching means; (4)The use of multimedia assistant teaching means can stimulate students' interest in learning, can mobilize students' enthusiasm for learning; (5) The use of multimedia assisted teaching can help understand the teaching content, accelerate the mastery of the basic cooperation of basketball tactics, has been recognized by students, the use of multimedia assisted teaching will effectively make up for the shortcomings of traditional teaching, is an effective means to improve the quality of basketball tactics teaching.

Dou (2020) Vocational colleges are not equipped with perfect teaching facilities, weak teachers, and poor student foundation. Physical education is taught only by explaining and demonstrating the method. The traditional teaching mode makes it difficult to complete the teaching task, and students have low interest in class, which cannot well reflect students' subjectivity. To improve the teaching quality and enhance students' learning interest, an experimental study was carried out on the application of multimedia technology in calisthenics teaching in vocational colleges at Shandong Provincial Vocational Technical College. The results showed that multimedia can improve students' technical skills and knowledge, learning interest and efficiency, solidarity and cooperation ability, and students' self-confidence in four aspects. Improve students' learning quality, and make multimedia technology better applied to physical education classrooms.

Zhang & Chen (2020) selected the multimedia teaching method under the background of "Internet" and applied it to the teaching of alpine skiing. The multimedia teaching method is more helpful for students

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to master the technical movements. 2. Multimedia teaching method is more effective in stimulating students' interest in learning; 3. Multimedia teaching methods can effectively improve students' autonomous learning ability; 4. Multimedia teaching methods can promote students' communication and collaboration ability; 5. The multimedia teaching method has a good effect on eliminating students' fear.

The multimedia teaching is helpful: in improving the relationship between teachers, students, and classmates, promoting students' teamwork ability, enhancing students' subjective initiative in learning, and further cultivating students' interest in learning; Improve the combination of students' technical movements and theories, and make the technical movements of long jump more standardized. It can make students fully grasp the essentials of technical movements, and the technical movements of students in the experimental group are more standardized than those in the control group. Enhance students' ability to analyze and solve problems. The technical movements of the students in the experimental group should be relatively standardized, and the achievement of reaching the standard was higher than that of the control group.

Yunwei (2020) In the process of traditional primary school physical education, teachers usually combine oral instruction with blackboard writing, and only when the key points of teaching are involved will they write them on the blackboard. However, students attention is often unable to concentrate, and there is less communication and interaction between students and teachers. Multimedia teaching can avoid these drawbacks. It can present the key points of teaching, and by adding some images and video clips, the presentation of key contents is very intuitive. In this case, it is easier for primary school students to master the related knowledge of sports. It is interesting and can improve the enthusiasm of students to learn, to promote the quality of primary school physical education.

2. Basketball teaching and learning in high school

Basketball teaching and learning in high school is an essential component of physical education, designed to develop students' physical skills, teamwork, and understanding of the game. The structured approach to teaching basketball in high school focuses on both technical skills and theoretical knowledge, promoting physical fitness, strategic thinking, and social interaction. Fundamental skills development such as dribbling, shooting, passing, and defense and rebounding. Tactical and strategic learning such as offensive plays, defensive strategies, and game rules and regulations. Physical conditioning such as endurance training and strength training. By integrating technical training, physical conditioning, and team dynamics, basketball education in high schools contributes to the holistic development of students, fostering both athletic abilities and essential life skills (Smith, 2018).

Zhao (2016) believes that the physical education and health curriculum semester teaching plan is a kind of teaching progress. It is to make reasonable and effective planning in advance according to the academic year teaching plan, curriculum standards, textbook content, local and school requirements, and special situations that may be encountered in this semester. The teaching contents of the semester stipulated in the teaching plan of the academic year are organized into several teaching units according to the scientific and reasonable number of teaching hours, and the teaching progress file of the approximate class time plan is planned. "Everything in advance is established, not in advance is lost", the semester teaching plan is the guarantee of normal teaching, for improving the quality of teaching has a great role.

Gao (2015) believes that the current rapid development of science and technology has been applied in all walks of life, and school teaching is no exception, which has become a hot spot in current teaching. This teaching method is also used in physical education teaching. The multimedia teaching method can help students understand and master the technical essentials of basketball jump shot action more intuitively. Compared with the traditional teaching method, the teaching effect has been significantly improved.

Deng (2012) proposed that teachers should organically combine scene setting with sports skill teaching according to the teaching content and students' actual level, to make the physical education teaching content closer to students' actual learning and life. By creating a relaxed and happy physical education classroom atmosphere, teachers can enhance the overall development of students' sports skills and physical quality, improve students' learning effect, and further stimulate students' learning interests. In the teaching process, try to avoid the pursuit of formal situational teaching, pay attention to the use of

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situational teaching, improve the enthusiasm and initiative of students to learn motor skills, cultivate sentiment, enlighten the mind, and promote the healthy development of students. Handle the relationship between sports skill teaching and cultivating interest well, the relationship between the two is mutually promoting and complementary, and cannot be separated artificially, good sports interest cultivation can promote students to actively learn and practice, and better master sports technical movements. Strengthen the training of PE teachers' innovative ability, advocate teachers to explore hidden PE curriculum resources, and so on.

3. Development of multimedia for sport teaching

The development of multimedia for sports teaching involves integrating various technological tools and resources to enhance the learning and training experience. Multimedia can significantly improve how sports skills and knowledge are conveyed, making learning more engaging and effective (Doolittle & Hicks, 2020). Multimedia for sports teaching are as follows: (1) Interactive Learning Tools: Interactive applications and software can simulate game scenarios, provide video analysis, and allow athletes to practice skills virtually. VR can immerse students in simulated game environments, providing practical experience and improving decision-making skills (Gabbett, 2020). (2) Video Analysis: Coaches can use video analysis tools to break down game footage, highlight techniques, and review performance. Slow-motion and frame-by-frame video can help in analyzing and correcting athletes' techniques (Coutts & Duffield, 2019). (3) Digital Simulations: digital games and simulations can teach strategies, tactics, and game understanding. Interactive digital boards can be used to plan and visualize game strategies. (4) E-Learning Modules: E-learning platforms can offer courses on sports techniques, strategies, and physical conditioning. Online tutorials and webinars can provide additional training and expert insights (Harvey & Morrow, 2021) (5) Data Visualization: Tools for tracking and visualizing performance data can help athletes and coaches understand strengths and weaknesses. Visualization tools can present statistical data in an accessible format for better analysis. (6) Interactive Whiteboards: Interactive whiteboards can be used for drawing up plays, strategies, and game plans during team meetings (Kuehn & McCullough, 2020).

Molei (2013) argues that cognitivism emphasizes learning as an active process of understanding, not just passive absorption of knowledge from teachers or textbooks. This theory highlights the importance of internal motivation alongside necessary external stimuli, as learners are encouraged to engage deeply with ideas and concepts rather than merely memorizing facts. Molei notes that developing students' interest in the subject matter is key to fostering meaningful and effective learning experiences.

Guo (2023) explains that constructivism originated in the 1990s, based on the work of renowned modern psychologist Jean Piaget, particularly his theory of children's cognitive development. Constructivism posits that knowledge is not directly transmitted from teachers to learners. Instead, learners actively construct their understanding of the world, with the support of teachers and peers, within a specific context or social and cultural framework. This approach highlights the importance of interactive learning environments where students can engage in meaningful discussions and activities that foster deeper comprehension.

Liu (2019) explains that the humanistic teaching concept evolved from the humanistic learning concept, primarily represented by Carl Rogers and Abraham Maslow. Rogers emphasized that education should focus on developing individuals with fully realized personalities. Such individuals are characterized by their initiative, sense of responsibility, and their ability to adapt to changes. They are also capable of independent growth and can work toward self-actualization, fulfilling their potential and realizing their value. This approach stresses the importance of emotional well-being and personal growth in the learning process, aiming to create a holistic educational experience that nurtures both the intellectual and emotional development of students.

Summary

The application of multimedia technology in physical education teaching is favored by the majority of teachers and students. It must be said that multimedia technology-assisted teaching brings a lot of convenience to teachers and students, and shows great advantages in the teaching of various physical

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education subjects. In the classroom course, multimedia technology should be used appropriately to assist teaching, give full play to its guiding role, and teach students how to carry out independent learning. In the process classroom, the phenomenon of students‘ inattention often occurs, and multimedia technology-assisted teaching, so that the classroom atmosphere becomes active, and the content becomes novel, can well attract the attention of the students, to improve the students’ learning efficiency in the classroom. The application of multimedia technology after class can obtain a large number of resources and information to help teachers better prepare for class and reduce the burden on teachers. The application of multimedia technology in the teaching classroom can strengthen the communication between teachers and students and increase the interest in learning. The students‘ subjectivity is reflected, and they can learn independently, explore learning, and grasp the important and difficult points of the classroom content, which is of great help to the formation of students’ sports skills, the improvement of sports performance, and the cultivation of sports interest. Therefore, developing and formulating the content of high school basketball multimedia teaching, so that it can be used for teachers to set students' learning goals and tasks, and change the traditional concept of teaching, has certain research significance.

Conceptual Framework

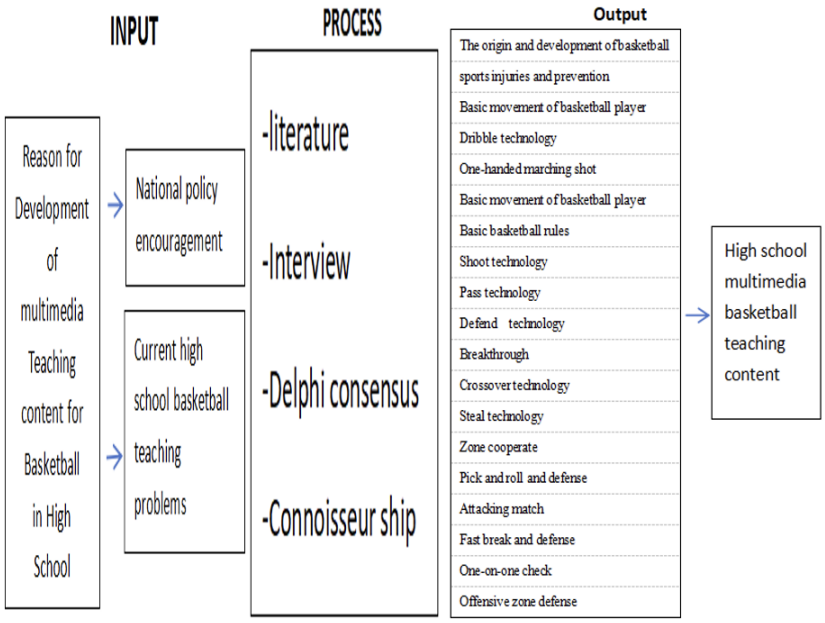

Figure 1 Conceptual Framework

Methodology

Research Tools: In this research, the following tools were used to conduct the research: (1) Teacher questionnaire; (2) Student questionnaire; (3) In-depth Interview Questionnaire; (4) Delphi questionnaire; and (5) Questionnaire for Connoisseurship.

Population and Sample: 516 students and 32 teachers from 10 high schools in Guangzhou City were selected as a sample, to survey on the current status of basketball teaching. Systematic sampling was employed to select the sample. In this regard, 7 teachers were interviewed and consulted on solutions to current teaching problems. 19 experts were invited to conduct Delphi consensus, to develop multimedia teaching content for basketball in high school. 9 experts were invited to conduct connoisseurship to confirm the developed multimedia teaching content.

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Data Collection

Stage 1: Investigating the problems in teaching basketball in senior secondary schools and consulting experts for advice. Questionnaires were distributed to 516 students and 32 teachers from 10 high schools in Guangzhou City to survey the current situation and problem of basketball teaching. After that, 7 teachers were interviewed for consulting the problem solutions.

Tools: 1. questionnaire survey of students and teachers

2. in-depth interviews with 7 teachers on semi-structured questions

Stage 2: The construction of multimedia teaching content for basketball in high school. 19 experts were invited to conduct two rounds of Delphi consensus, to develop multimedia teaching content for basketball in high school.

Tools: 1. Literature and content analysis

2. Delphi questionnaire

3. Draft multimedia teaching content for basketball

Stage 3: Appreciation. After the multimedia teaching content for basketball in high school was developed by 19 Delphi experts consensus. The developed multimedia teaching content was confirmed by 9 experts using the Connoisseurship method.

Tools: Appreciation by 9 experts through questionnaires, using the Connoisseurship method.

Data Analysis

Use a software package for data analysis, applying the following statistical techniques:

1. Descriptive statistical methods, such as calculating the mean and standard deviation, are used to analyze the data collected from the questionnaire survey and questionnaire for Connoisseurship.

2. Descriptive statistics, namely the mean, and coefficient of variation, were used to analyze the data from the Delphi consensus. For Delphi questionnaire data analysis, assessment criteria are Mean > 3.6, CV < 0.25, and SD < 1.

3. For Connoisseurship data analysis using the Likert scale as follows:

Average Level	Meaning
1.00-1.79	Lowest
1.80-2.59	Low
2.60-3.39	Moderate
3.40-4.19	High
4.20-5.00	Highest

Research Process

Phase	Method	Tool	Output
Phase 1 To survey about a problem of basketball teaching in high school	1. Literature 2. Teachers and students investigate together. 3. In-depth interviews	1. Summarize and organize 2. Questionnaire survey 3. Semi-structural problems	problem factor of basketball teaching in high school
Phase 2 To development of multimedia teaching content for basketball in high school.	draft concepts. 2.Delphi by 19 experts	questionnaire	multimedia teaching content for basketball in high school.
Phase 3 To connoisseur ship	Connoisseur ship by 9 experts	questionnaire	Appreciation of high school basketball multimedia teaching content.

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Results

Analysis of the current situation of basketball teaching in high school

To investigate the current situation and problems of basketball teaching in high school the 10 high school teachers and students in Guangzhou, questionnaires were distributed to 516 students and 32 teachers.

Table 1 Survey on the Teaching Objectives of Basketball Teaching (N=32)

objective	Improve the level of basketball skills and tactics	Stimulate your interest in sports	invigorate health effectively	Promote mental health	Learn to study on your own	Cultivate the ability of innovative thinking	Improve your ability to appreciate basketball	Improve the ability of cooperation and communication
number of people	34	30	29	17	8	4	10	5
percentage	98.5%	86.6%	83.6%	47.8%	22.4%	10.4%	29.9%	14.9%

It can be seen from Table 10 that in the current teaching target mode adopted by the basketball teachers in Guangzhou, The two highest proportions in the survey correspond to "improvement of technology and tactics" and "development of sports interest" " accounting for 98.5% and 86.6% of the total population, It shows that Guangzhou high school basketball teachers attach great importance to students' technical and tactical level and interest training, In other aspects, such as improving cooperation and communication skills, Cultivating innovative thinking ability is still far from enough, To effectively promote the all-round development of students, Basketball teachers should let students form a correct concept of sports, Guide the students to correctly understand the meaning of sports, Establish the concept of lifelong sports, Attach importance to the cultivation of students' interests, Cultivate students' self-exercise ability and habit. To fully and deeply understand the teaching objectives, while paying attention to the skills and tactics, we should also pay attention to cultivating students' spirit of cooperation, and innovative spirit, and comprehensively improving the quality of students.

Table 2 Student satisfaction survey with basketball teaching content (N=516)

Class	Very satisfied	Satisfied	Moderate	Not satisfied	Very not satisfied
number of people	62	99	190	107	58
percentage	12.1%	19.2%	36.8%	20.7%	11.2%

After surveying students' satisfaction with their basketball class, it was found that many were dissatisfied. According to Table 2, only 12.1% of high school students in Guangzhou reported being very satisfied with their basketball class, 19.2% were satisfied, 36.8% felt moderately satisfied, 20.7% were dissatisfied, and 11.2% were very dissatisfied. The survey revealed that teachers tend to spend too much time explaining and demonstrating skills during basketball class, with limited opportunities for students to engage in games. As a result, the class atmosphere becomes monotonous and boring, causing students to lose interest and preventing effective learning outcomes.

In basketball instruction, while students need to learn and apply technical skills, the emphasis on repetitive drills and lack of gameplay detracts from the enjoyment of the class. Many students feel that basketball class should not consist solely of technical practice; the absence of games diminishes the excitement and engagement. The goal of teaching should be to help students experience the joy of sports,

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foster a lifelong interest in physical activity, and develop healthy habits. If students are unable to find enjoyment in the class and lose interest, basketball class risks becoming just another routine physical activity.

2. Analysis of teacher interview content

Through interviews with 7 experts, the interview results can be summarized as follows:

2.1Basketball, as a popular outdoor sport, has been lacking for many years in more practical courses, or even no theory courses. This is not because the teacher's theoretical level is low, not good at explaining, but from the thought that students' understanding is limited, no interest in in-depth explanation. On the other hand, the single media makes the technical teaching and theoretical explanation of basketball class limited to dictation, and the media used is also limited to blackboard, chalk, books, wall charts, etc., which can only express and transmit information with numerical values, text, teacher's voice or static images. Even if the introduction of some new video data, also cannot like multimedia information integration, control, and interaction, lets the students achieve the height of perceptual knowledge and rational knowledge, make profound meaning, need divergent thinking basketball technology, tactical theory to live, become boring, limit the students understanding of the connotation of basketball.

2.2Basketball teaching is generally based on teachers' personal demonstration, explanation, and diagram. In a poor outdoor teaching environment, the teacher's teaching is limited, the audio-visual effect of the teaching is not ideal, and the problems in the teaching cannot be timely feedback to students so that students cannot get the correct concept of action. It is very difficult to establish the correct action concept in the teaching process. To enable students to master the action in a short period, teachers generally use demonstration, explanation, the use of wall charts, slides, and other means, although there has been improvement, there has been no fundamental change, or it is difficult to make teaching reach a higher level.

2.3The teacher's demonstration has no background object, the explanation is empty, the key points are difficult to highlight, the action process demonstration is short, lacks the relevance of space-time and space change, so the detail of the action is difficult and inaccurate. Students can not generate associations according to the description to form the appearance of the action, while the competition video is all a technical demonstration, which is not easy for students to understand and understand the technical action.

Delphi consensus results

3.1 First round of Delphi consensus

In the first round, there were 190 three-level indicators subject to expert investigation and evaluation. The average of three-level indicators was not greater than 3.66, standard deviation greater than 1, and variation coefficient greater than 0.25. Therefore, they were selected out of the content system of high school multimedia basketball. After the feedback, analysis, and modification of the first round of the Delphi survey, 92 indicators were screened out and suitable for use in multimedia teaching content for basketball in high school.

3.2 Second round of Delphi consensus

The mean value, standard deviation, and coefficient of variation of multimedia teaching content for basketball in high school are obtained, and the results are as follows:

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Table 3 Delphi Statistics of the second round of tertiary indicators

Index	x̄	SD	CV	Result
A-1-1 The origin and development of the basketball movement	4.46	0.79	0.18	Keep
A-1-2 Prevention and treatment of common sports injuries in basketball	4.34	0.76	0.18	Keep
A-2-1 Introduction to basketball rules	4.86	0.90	0.12	Keep
B-1-1 Sliding step	5.00	0.00	0.00	Keep
B-1-2 Turn-back	4.94	0.38	0.08	Keep
B-1-3 Change to run	4.72	0.49	0.10	Keep
B-1-4 Side running	3.96	0.90	0.23	Keep
B-1-5 Step	4.46	0.96	0.22	Keep
B-1-6 Back step	4.32	0.95	0.22	Keep
B-1-7 Speed agility run	3.74	0.76	0.20	Keep
B-1-8 Backward running	4.19	0.90	0.22	Keep
B-1-9 Step to a stop	4.32	0.76	0.18	Keep
B-1-10 Jump stop	4.28	0.82	0.20	Keep
B-1-11 Attack step	4.36	0.95	0.22	Keep
B-1-12 Cross feet	4.49	0.79	0.18	Keep
B-1-13 Activate	3.96	0.90	0.23	Keep
B-1-14 Jump on one foot	4.14	0.69	0.17	Keep
B-1-15 Two-foot jump	3.74	0.76	0.22	Keep
B-1-16 Quick stop	4.46	0.96	0.22	Keep
B-1-17 Quick short steps	4.34	0.95	0.22	Keep
B-1-18 Cast off	3.96	0.69	0.18	Keep
B-1-19 Fake move	3.96	0.90	0.23	Keep
B-2-1 One-handed shoulder pass	4.38	0.95	0.22	Keep
B-2-2 Both hands in front of the chest pass	4.46	0.79	0.18	Keep
B-2-3 Two-handed rebound pass	3.92	0.91	0.23	Keep
B-2-4 Two-handed chest catch	4.13	0.92	0.22	Keep
B-2-5 Catch the ball on both hands in front of chest	4.46	0.96	0.22	Keep
B-2-6 Two hands to catch the rebound ball	4.34	0.76	0.18	Keep
B-2-7 Pass the ball on the chest	5.00	0.00	0.00	Keep
B-2-8 one hand ball catching	5.00	0.00	0.00	Keep
B-2-9 Catch the ball on your chest while marching	4.62	0.82	0.22	Keep
B-2-10 One-handed rebound pass	5.00	0.00	0.00	Keep
B-2-11 One-handed rebound	4.46	0.96	0.22	Keep
B-2-12 Catch the ball at the chest height	4.16	0.90	0.22	Keep
B-3-1 Shift forward dribble	4.36	0.76	0.18	Keep
B-3-2 The dribble starts and stops quickly	4.36	0.95	0.22	Keep
B-3-3 The dribble turned around	4.14	0.90	0.22	Keep
B-3-4 Low dribble in situ	4.36	0.76	0.18	Keep
B-3-5 High dribble in situ	4.48	0.98	0.22	Keep
B-3-6 Behind-the-back dribble	4.64	0.79	0.31	Keep
B-3-7 Change direction dribble	5.00	0.00	0.00	Keep

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B	B-3-8 Cross-leg dribble	4.76	0.49	0.12	Keep
B	B-3-9 Low dribble between marching	4.74	0.76	0.16	Keep
B	B-3-10High dribble between marching	4.92	0.38	0.08	Keep
B	B-4-1 One-handed underhand shot on the march	4.16	0.69	0.32	Keep
B	B-4-2 Marching one-handed shoulder shot	4.46	0.69	0.32	Keep
B	B-4-3 Jump in place with one-handed shoulder shot	5.00	0.00	0.00	Keep
B	B-4-4 The dribble stops jumping and shooting	4.92	0.38	0.08	Keep
B	B-4-5 Marching backhand shot	5.00	0.00	0.00	Keep
B	B-4-6Hook shot	4.92	0.38	0.08	Keep
B	B-4-7 Board shot	4.46	0.28	0.22	Keep
B	B-4-8 Catch and stop jump shot	5.00	0.00	0.00	Keep
B	B-5-1 Cross step breakthrough	5.00	0.00	0.00	Keep
B	B-5-2 Same side step breakthrough	5.00	0.00	0.00	Keep
B	B-6-1 Hitting ball	5.00	0.00	0.00	Keep
B	B-6-2 Challenge for the ball	5.00	0.00	0.00	Keep
B	B-6-3 Cross break the ball	5.00	0.00	0.00	Keep
B	B-6-4 Vertical broken ball	5.00	0.00	0.00	Keep
B	B-6-5 Blocked ball	4.92	0.38	0.08	Keep
B	B-7-1 Take position	5.00	0.00	0.00	Keep
B	B-8-1 Prevent shooting	5.00	0.00	0.00	Keep
B	B-8-2 Prevent breakthrough	5.00	0.00	0.00	Keep
B	B-8-3 Prevent the dribble	5.00	0.00	0.00	Keep
B	B-8-4 Prevent passing	4.74	0.38	0.08	Keep
B	B-8-5 Prevent catch the ball	4.74	0.76	0.16	Keep
B	B-8-6 Defensive escape	4.92	0.38	0.08	Keep
B	B-8-7 Prevent cut into	4.46	0.79	0.18	Keep
C	B-8-8 Block shot	4.74	0.38	0.08	Keep
C	C-1-1 Pass and cut match	4.74	0.76	0.08	Keep
C	C-1-2 Pick-and-roll combination	5.00	0.00	0.00	Keep
C	C-1-3 Two attack one	5.00	0.00	0.00	Keep
C	C-1-4 Breakaway play	5.00	0.00	0.00	Keep
C	C-1-5 Fast attack	5.00	0.00	0.00	Keep
C	C-1-6 Support by coordinated action	5.00	0.00	0.00	Keep
C	C-1-7 Three attack two	5.00	0.00	0.00	Keep
C	C-1-8 The "1-2-2" formation	5.00	0.00	0.00	Keep
C	C-1-9 A 2-1-2 formation with one center attacking	5.00	0.00	0.00	Keep
C	C-1-10 The 2-3 formation of a single center in attack	5.00	0.00	0.00	Keep
C	C-1-11 Two attack two	5.00	0.00	0.00	Keep
C	C-1-12 Three attack three	4.92	0.38	0.08	Keep
C	C-1-13 A 1-3-1 formation	5.00	0.00	0.00	Keep
C	C-1-14 Match the throw-in	5.00	0.00	0.00	Keep
	C-2-1 One-on-one half-court defense	5.00	0.00	0.00	Keep
	C-2-2 Switch defense	4.84	0.82	0.20	Keep
	C-2-3 Cover defense	3.96	0.90	0.18	Keep
	C-2-4 Pass through	4.96	0.38	0.08	Keep
	C-2-5 Full-court one-on-one defense	4.74	0.49	0.12	Keep
	C-2-6 Two defense three	4.76	0.49	0.10	Keep
	C-2-7 Squeeze through	3.92	0.92	0.23	Keep
	C-2-8 Converging attack	4.14	0.90	0.22	Keep
	C-2-9 One defense two	5.00	0.00	0.00	Keep
	C-2-10 Defensive fast attack	5.00	0.00	0.00	Keep

Table 3 found that, in the second round of the 92 indicators expert survey, the average of all indicators was greater than 3.66, the standard deviation was less than 1, and 92 indicators with a coefficient of variation less than 0.25, retained the system. Therefore, after two rounds of investigation, statistics, inquiry, and modification of the Delphi method, there are 92 indexes for high school basketball teaching content suitable for using multimedia.

The indicators of multimedia teaching content for basketball in high school obtained above, combined with the high school teaching plan, and interview the expert opinions, the following multimedia teaching content for basketball in high school was developed as follows:

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Table 4 19 lessons of multimedia script

Lesson	Teaching content	Multimedia scrip
1	The origin and development of the basketball movement	Chapter1: "The Origin and Development of Basketball"in 5minutes
2	Common sports injuries and prevention	Chapter2: "sports injuries and prevention "in 5-6minutes
3	Start, stop, slide Turn, cross, break	Chapter3: "Basic movement of basketball player "in 5-7minutes
4	High dribble in situ, low dribble in situ Travel between high dribble, travel between low dribble	Chapter4: "Dribble technique "in 5-7minutes
5	One-handed low-hand shooting, marching one-handed shoulder shooting Marching backhand shooting, hook shooting	Chapter5: "One-handed marching shot "in 5-7minutes
6	Change speed running, side running, change to running Get rid of it, jump on one foot, and jump on both feet	Chapter6: "Basic movement of basketball player "in 6-8minutes
7	Introduction to basketball rules	Chapter7: "Basic basketball rules "in 13-15minutes
8	dribble stop jumper, catch stop jumper Play board shooting, Jump in place with one-handed shoulder shot	Chapter8: "Shoot technique"in 5-7minutes
9	Two-handed chest pass, one-handed shoulder pass, two-handed head pass, rebound pass and catch	Chapter9: "Pass technique"in 5-7minutes
10	Prevent shooting, breaking, passing, blocking Prevent off, prevent cut, prevent the ball， take position	Chapter10: "Defend technique"in 6-8minutes
11	Cross step breakthrough Hold the ball and break through	Chapter11: "Breakthrough technique"in 5-6minutes
12	Between the legs to the dribble, forward to the dribble	Chapter12:
	Back to dribble, turn to dribble， Cross-leg dribble	"Advanced Dribbling"in 5-7minutes
13	Grab the ball, play the ball, and cross the ball	Chapter13: "Steal technique"in 4-6minutes
14	Pass and cut match Breakaway	Chapter14: "Zone cooperate "in 5-6minutes
15	Pick and roll， cover defense Change, repair, though, squeeze	Chapter15: "Pick and roll and defense "in 6-8minutes
16	Match the throw-in， Switch defense support by coordinated action	Chapter16: "Attacking match "in 5-7minutes
17	Two attack one, three attack two One prevention, two, two prevention, and three	Chapter17: "Fast break and defense "in 6-7minutes
18	One-on-one half-court defense Full-court one-on-one defense	Chapter18: "One-on-one check " in 5-6minutes
19	Joint defense formation The "1-3-1" attacking formation、The "1-2-2" attacking formation 、The 2-1-2attacking formation、The 2-3 attacking formation	Chapter19: “Offensive zone defense”in 6-8 minutes

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3. Confirm the multimedia teaching content for basketball in high school

After the multimedia teaching content for basketball in high school was developed, 9 experts were invited to conduct connoisseurship discussions. In terms of whether the content corresponds, there are five answers, respectively strongly agree, agree, neutral, disagree, strongly disagree, recorded as 5, 4, 3, 2, 1. This pattern is confirmed by calculating the mean and standard deviation of statistical data. For connoisseurship data analysis using the Likert scale. 1.00-1.79 is lowest; 1.80-2.59 is Low; 2.60-3.39 is moderate; 3.40-4.19 is high; 4.20-5.00 is highest. The test results are as follows:

Table 5 Survey statistics of high school multimedia basketball teaching content were confirmed.

Teaching Contents	Expert（N=9）
	$\bar{X}$ ±SD
The origin and development of basketball	4.71±0.48
sports injuries and prevention	4.85±0.37
Basic movement of basketball player	4.14±0.37
Dribble technology	4.28±0.48
One-handed marching shot	4.57±0.53
Basic movement of basketball player	4.71±0.48
Basic basketball rules	4.85±0.37
Shoot technology	4.71±0.48
Pass technology	4.48±0.48
Defend technology	4.57±0.53
Breakthrough	4.85±0.37
Crossover technology	4.71±0.48
Steal technology	4.71±0.48
Zone cooperates	4.80±0.57
Pick and roll and defense	4.85±0.37
Attacking match	4.85±0.37
Fast break and defense	5.00±0.00
One-on-one check	4.85±0.37
Offensive zone defense	4.57±0.53

From table 5 found that through the analysis of the expert evaluation results, the average score of each index was more than 4 points, so the index was retained, which recognized that the multimedia teaching content for basketball high school has been established. The experts' comments are summarized as follows:

1. The Origin and Development of the Basketball Movement & Common Sports Injuries and Prevention.

The content covers rich historical materials and authoritative references, and displays the historical process through videos, charts, timelines, etc., to enhance students' interest; Through videos showing practical operations, musculoskeletal models, 3D animations, etc., the mechanism of physical injury and rehabilitation techniques can be vividly presented. Combined with case studies and professional advice, students can effectively understand prevention methods. It is suitable for basketball players and coaches of all ages and different skill levels, especially in the youth group, and the educational role of this kind of content is particularly significant.

2. Basic Movements & Dribbling Techniques

Through clear teaching videos, the multimedia content gradually demonstrates the key points of each movement, such as the placement of steps, the change of body center of gravity, etc., and explains the

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correct hand control, eye direction, body posture, and other elements. At the same time, the use of slow-motion replay and different angles of the camera can help students better observe and imitate the movement.

3. Shooting Techniques & Basic Basketball Rules

Through animations and demonstration videos, various foul actions and penalty standards are explained to help students understand basketball rules more intuitively. At the same time, the actual competition case analysis deepens the students' memory of the rules. 3D animation can be used to show the Angle of the shot, the mechanics principle, the rotation trajectory of the ball, etc., to help learners better grasp the shooting skills.

4. Passing & Defense Techniques

The teaching video gradually explains the passing technique, the timing of the ball, and the power control, supplemented by the application in the specific game scene; Video demonstrations and slow-motion analysis show the best positions, movements, and reaction times when defending. Subsequent demonstrations of different match situations can be used to help learners understand how to deal with defensive tasks in real confrontations.

5. Advanced Dribbling & Steal Techniques

Through detailed action analysis and visual presentation of action details, learners can understand and master these techniques more deeply. Interactive virtual training can be added in the future so that students can get timely feedback.

6. Zone Cooperation & Pick and Roll

Cover with teaching to show the timing of cover, foot movement, and the action details of different attack options after cover; 3D animations can more clearly show how players move between different defensive positions, as well as the strategy of defending outside shooters and players under the basket, and slow-motion replays can help students understand the timing of every detail during rapid rotation and coordination.

7. Attacking Match & Fast Break and Defense

Analyzing offensive possessions in actual games, showing how to break defensive formations through passing and running. 3D animations and tactical diagrams help players understand the interactions and stance changes in various positions on the court; Tactics boards, 3D animations, and slow-motion videos detail running routes, screen timing, and post-catch decisions during pass and cut matches, as well as demonstrate different types of defensive responses.

8. One-on-One Check & Offensive Zone Defense

In the instructional video of man-to-man defense, the animation can clearly show the player's stance, movement path, and body posture, helping students understand how to limit opponents through reasonable pace and confrontation. For zone defense, animations combined with slow-motion replays show the rotation and fill-in details of each defensive player on the court, ensuring that students understand the defensive responsibilities and tactical execution process for each area on the court.

Conclusion

The research results found that 1) Problems were that the class time is limited, and teachers need to make full use of the class time; a multimedia facility is needed next to the basketball court; and multimedia teaching resources need to be updated constantly to ensure cutting-edge and practical content. 2) The benefit was that a multimedia short video helps to enhance teacher teaching and student learning because it can integrate modern teaching technologies for students to use in the classroom and after class, making it more convenient and motivating for students and teachers in teaching and learning. 3) The multimedia teaching plan for high school basketball, encompasses a wide array of skills and strategies. It strategically categorizes content into new lessons, reviews, and tests, ensuring a structured learning progression. The plan employs diverse multimedia formats, including videos demonstrating techniques like dribbling, shooting, and passing, and interactive quizzes to reinforce learning. It covers fundamental movements, injury prevention, and basketball rules, providing a holistic understanding of the sport. Additionally, the plan delves into advanced tactics such as zone cooperation, pick-and-roll plays, and

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fast breaks, catering to students with varying skill levels. This well-structured, multimedia-rich approach aims to enhance student engagement and facilitate a deeper comprehension of basketball, fostering both technical proficiency and tactical acumen. 4) Confirmation of designed high school multimedia basketball teaching content was found that the multimedia basketball teaching content for high schools was accepted as possible, appropriate, and practical by stakeholders.

Discussion

The integration of multimedia content into high school basketball education represents a significant advancement in pedagogical practice, fostering a dynamic and efficient learning environment that resonates with the digital natives of today. The efficacy of multimedia lies not only in its ability to enhance learning outcomes but also in its capacity to streamline the instructional process, making it a valuable tool for both educators and students.

The theoretical basis of the multimedia teaching method is as follows:

1. Cognitivism theory

Molei's (2013) cognitivism believes that learning is not a passive acceptance of knowledge from teachers or books, but an effective understanding of what has been learned. In addition to necessary external stimuli, students' learning is more important to have internal motivation, and the main theme is to cultivate students' interest in ideas and concepts. From this, we can know that learning is an active internal process. According to this view, the learning process is interpreted as the process of reconstructing knowledge based on individual needs, interests, hobbies, etc. using the original knowledge cognition to actively make selective information processing for the current external stimuli (such as new learning content). Therefore, multimedia teaching methods should take into account how to stimulate students' learning interest and improve learning initiative and learning efficiency. Develop students' cognitive ability, make students become the subject of the learning process, and students' feedback information becomes the wind vane of the teaching process.

2. Constructivist theory

Guo (2023) Constructivism originated in the 1990s and was proposed by the famous modern psychologist Piaget from the theory of children's cognitive development. Constructivism holds that knowledge is not instilled directly by teachers to learners, but that learners can use the help of teachers and learning partners in a certain context, that is, under a social and cultural background. Use relevant learning materials to construct their ability to make sense of relevant knowledge. Knowledge is not the final answer, but an explanation, an assumption; Knowledge is created according to situational needs; Knowledge is built by students based on their own experience and background. The constructivist learning concept emphasizes: the active constructivism of learning, the social interaction of learning, and the situational nature of learning. These three characteristics require teachers to fully realize the importance of independent learning and cooperative learning. The students' independent preview and after-class communication and discussion advocated in the multimedia teaching method are similar to the constructivist learning concept, and at the same time conform to modern curriculum standards. Constructivism is different from the traditional learning theory and teaching thought and has important guiding values for teaching design.

3. Humanistic teaching theory

Lui (2019) Humanistic teaching concept is developed and formed based on the humanistic learning concept, and the main representatives are Rogers and Maslow. Rogers believed that education should produce people with fully developed personalities. This kind of person has initiative and responsibility, can adapt flexibly to changes, is a person of independent development, and can realize self-worth. In contrast to the traditional teaching practice of teachers and book content as the core, the humanistic education principle is "student-centered", regards students as the master of learning, and all teaching activities revolve around students. The essence of multimedia teaching is to use its diversity such as sound, pictures, etc., to replace the teacher's oral ambiguity, demonstration immediacy, and other traditional teaching methods, so that the learning content is richer and the learning way is more convenient. Humanistic education is to cultivate students into flexible, adaptable, and creative people, in line with the "four-in-one" goal advocated

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by our school sports, through the addition of multimedia teaching to promote students to enjoy the fun of learning basketball, mobilize students' interest in learning, enhance physique, improve personality, exercise will so that students can give full play to their learning ability. Change the traditional teacher-student relationship in teaching, teachers from the masters of the classroom into the guides of students, and students become the real masters of learning.

Multimedia's efficiency is rooted in its ability to cater to diverse learning styles through the integration of visual, auditory, and interactive elements. This multifaceted approach facilitates the comprehension of complex concepts, such as basketball techniques and strategies, by presenting information in multiple formats. Research by Lui (2019) supports this notion, demonstrating that multimedia-assisted instruction significantly improves students' understanding of tactical fundamentals compared to traditional methods. This is further corroborated by Dou's (2020) study, which reveals that multimedia integration enhances technical skills, knowledge acquisition, and overall learning enthusiasm among vocational college students. Beyond its ability to enhance comprehension, multimedia fosters efficiency by promoting active participation and intrinsic motivation. Interactive simulations, virtual reality experiences, and gamified tasks transform the learning process into an immersive and enjoyable endeavor, encouraging students to take ownership of their learning journey (Zhang & Chen, 2020). This active engagement not only enhances learning outcomes but also cultivates essential 21st-century skills such as problem-solving, collaboration, and critical thinking.

The efficiency of multimedia is further amplified by its adaptability to individual learning needs. Personalized learning pathways, enabled by multimedia platforms, empower students to progress at their own pace, ensuring that both novices and advanced learners are optimally challenged (Yunwei, 2020). This tailored approach, coupled with the ability to access content beyond the classroom, fosters a culture of self-directed learning, a critical skill in the digital age. Moreover, the efficiency of multimedia instruction is bolstered by its alignment with the learning habits and technological proclivities of contemporary students. Digital natives, accustomed to navigating a multimedia-rich world, readily embrace instructional modalities that mirror their everyday experiences (Gao, 2015). This familiarity enhances engagement and facilitates the seamless integration of multimedia tools into the pedagogical landscape.

In conclusion, the incorporation of multimedia content into high school basketball education is not only effective but also remarkably efficient. Its capacity to enhance learning outcomes, stimulate engagement, personalize instruction, and align with the digital fluency of modern learners positions it as an indispensable tool in the contemporary educational arsenal. As technology continues to evolve, the potential of multimedia to revolutionize basketball education and beyond is boundless.

Recommendation

Recommendation for this research

1. Schools should encourage and support multimedia teaching, and the hardware facilities provided should be updated in time to keep pace with The Times.

2. Teachers need to update multimedia teaching resources constantly to ensure that the content is cutting-edge and practical.

3. Multimedia teaching cannot completely replace conventional teaching; it can only be used as an auxiliary teaching means. The traditional teaching methods complement each other, complement each other, to achieve the best teaching effect.

Recommendation for further research

1. With the continuous development of multimedia teaching in high school sports and health courses, the research space for multimedia basketball teaching will be more and more large. The follow-up research can focus on the teaching content design of the multimedia basketball unit course.

2. Empirical research is carried out to improve the teaching program of the multimedia basketball module.

3. Feasibility study of providing multimedia teaching content for other projects.

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