International Journal of Web-Based Learning and Teaching Technologies
Volume 18 • Issue 2

Badminton Teaching Mode in Network Teaching Platform Under Multimedia Environment

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ABSTRACT

This study analyzes the necessity of introducing multimedia technology into college badminton teaching and puts forward some countermeasures and suggestions for introducing multimedia technology into college badminton teaching. Taking badminton as an example, this paper studies the design and implementation of mobile teaching platform under O2O physical education teaching mode. Firstly, a learner trust model is established by using the idea of graph model, which considers three aspects: familiarity trust, social credibility, and deep circle of friends similarity. The trust source generates a candidate set of golfers based on the trust of learners. Then, based on SVD++, a learner interest model with implicit information feedback is constructed, and learners' learning behavior and social behavior are selected as implicit feedback to generate interest candidates for learners. Finally, the trust and interest models are sorted comprehensively to generate golf recommendations for learners.

KEYWORDS

Badminton, Multimedia Technology, O2O Teaching, Online Teaching

INTRODUCTION

In the multimedia content business scenario, how to choose an efficient clustering algorithm and how to make full use of multimodal information to discover topics are all problems that need to be solved and considered. *The National Guiding Outline of Physical Education Course Teaching in Ordinary Colleges and Universities* points out that physical education teaching in colleges and universities should effectively combine the principles of effectiveness and selectivity (Aryanti et al., 2021). When organizing sports activities, colleges and universities should further enrich the teaching content and give students more space to choose sports items (Blanca-Torres et al., 2020). The introduction of multimedia technology can help students better master the key points of badminton technology, and promote the improvement of education and teaching quality and effect (Berhimpong et al., 2021). Badminton teaching is to guide students through teachers with certain badminton teaching abilities. At present, badminton teaching is not limited to primary and secondary schools. In some college

DOI: 10.4018/IJWLTT.319967 *Corresponding Author

physical education courses, more attention has been paid to badminton teaching. In badminton teaching, teachers should formulate personalized guidance programs, strengthen students' understanding of badminton theoretical knowledge and sports skills, conform to the trend of information technology development, and organically combine multimedia technology with badminton teaching.

In recent years, the physical health of college students has continued to decline, and the habit of college students' active physical exercise has gradually disappeared, which has become a difficult problem that cannot be solved by college physical education courses (Buckley & Smith, 2007). According to the results of the National Physical Health Survey in 2014, compared with 2010, although the height and weight of college students showed an upward trend, their physical quality continued to decline, and the detection rate of obesity among students continued to increase (Cheng et al., 2022). As we all know, there are many deficiencies in the traditional college physical education course teaching mode, such as very limited teaching time, fixed teaching content, and a lack of interest in teaching activities (Chen & Xia, 2012). Therefore, it is difficult for traditional college physical education courses to cultivate college students' fun of participating in sports, and even more difficult for them to develop the habit of active exercise (Fu & Fu, 2020). At the same time, with the spread of the concept of fitness for all and the improvement of people's fitness awareness, Keep, Xiaomi Sports, Le Power, and a series of social sports mobile apps (Griwidz & Thoms, 2021). have been rapidly popularized and deeply welcomed, which has had a great impact on people's participation in physical exercise (Gao, 2020). Physical education courses can learn from this kind of sports app to build a teaching platform to improve the teaching effect and cultivate college students' interest in sports (Guo, 2021). At present, although the mobile teaching APP on the market is convenient to use and covers a wide range of courses, the previous relevant research only involves pure cultural courses, and there are few cases of research on the mobile teaching platform of sports courses. Physical education curriculum teaching is different from pure culture curriculum. Physical education curriculum not only pays attention to the study of curriculum theory knowledge but also pays more attention to physical practice. Therefore, only relying on online learning platforms cannot carry out physical education curriculum learning. Taking badminton teaching as an example, the online learning platform can provide learners with theoretical study, physical guidance, action demonstration, etc. of badminton courses, but the real course learning must be carried out offline in the physical classroom, and students should practice and participate in the practice.

Multimedia technology refers to the integration of text, sound, animation, image, and other media technologies with the computer as the core to provide a new means of information exchange between humans and machines (Huang & Zhang, 2021). Auditory acquisition of knowledge, comprehensive use of a variety of analyzers to implement learning, enrich teaching content, help students acquire more knowledge, and effectively improve teaching efficiency (Imania et al., 2021). Multimedia teaching means that based on the requirements of quality education, combined with the goals of talent training, fully meet the interests and hobbies of students, improve learning enthusiasm and initiative, so as to better master sports skills and related theoretical knowledge, and ultimately cultivate lifelong sports awareness and ability (Jiao, 2020). As a popular sport, badminton is a confrontational sport that integrates intelligence, physical fitness, and skills (Kamaruddin et al., 2020). It has the characteristics of simplicity, entertainment, and physical strength. With the popularization of sports option courses in colleges and universities, badminton has long gone (Klasmeier et al., 2006). It has become a favorite sport for college students (Liu, 2020). The badminton project is highly technical, fast, and has many changes (Moen, 2021). It is difficult to master and improve it well. In the practice of badminton teaching in colleges and universities, college students often feel that it is difficult to master and improve (Na, 2020). Badminton-assisted teaching helps college students to actively participate in the practice process. The degree of self-involvement has a great impact on learning skills (Rahman et al., 1999). It can use more brains and hands at the same time. Visual and auditory analysis can be used at the same time, which can mobilize the brain (Sudarwati & Pranto, 2020). Potential, continuously deepening memory, prompting college students to form a profound image

of technical movements, which is conducive to college students mastering badminton skills (Tang, 2020). O2O is a business operation mode and a mode of thinking. Applying this mode of thinking to the reform of teaching mode can bring new experiences to students and teachers. "O2O teaching mode" is a new teaching mode that combines online teaching with offline teaching.

Most traditional personalized recommendation systems or social network recommendation systems only involve online activities, and recommend suitable items, projects or social friends for users based on collaborative filtering of interests and hobbies. The player recommendation of the O2O badminton teaching platform is very different from the traditional personalized recommendation. Because its purpose is to make an offline appointment between learners, it is necessary to consider not only the user's interest model but also the user trust model. Users are more willing to accept strangers who are worthy of their trust than to let learners accept strangers who are equal to their skills. Therefore, if we only rely on the establishment of user interest model to make a personalized recommendation for users, I'm afraid that the recommendation results will not really satisfy learners. When making personalized recommendations for learners, the platform intends to model from two aspects: trust model and interest model, and double filter the candidate user set to produce final recommendation results for users.

To sum up, in order to make badminton teaching can be separated from the physical classroom, but also to play the advantages of the internet, this paper considers the combination of traditional physical education teaching and mobile learning platform, taking badminton course as an example, designed for badminton teaching O2O mobile teaching platform (Wang et al., 2022). The platform provides users with functions such as online course learning, online social networking, and personalized golfer recommendation based on trust and interest, so as to help learners learn badminton sports knowledge, cultivate badminton exercise interest, develop active exercise habits, and improve learners' physical fitness. etc. target (Yuan, 2022). The main research problem of this paper is to model from two aspects of trust model and interest model, double filter the candidate user set, produce the final recommendation results for users and make a personalized recommendation for learners. The network teaching platform under the multimedia environment is a very good teaching method that can improve the level of badminton technology. The data scientifically proves the previous conclusion that the network teaching platform under the multimedia environment is conducive to the study of badminton sports technology and is a very ideal teaching method. At the same time, it also discusses the practical application of the network teaching platform in badminton technology teaching in a multimedia environment. This provides a solid theoretical basis for improving the teaching of badminton technology in the future.

MATERIALS AND METHODS

Analysis of the Current Situation of Traditional Badminton Course Teaching

Compared with other pure cultural subjects, the badminton course teaching is very different (Yang et al., 2022). Badminton courses cause the particularity of teaching content, which requires not only theoretical study but also physical practice (Zhao et al., 2020). Especially for outdoor events like badminton, most coaches will use outdoor teaching methods to guide students to learn through action explanation and action demonstration. For a strange teaching action, students can only obtain vague potential consciousness through the coach, and cannot establish a correct and complete memory of the action. Students can only simply follow the coach's steps to learn. For students' learning, students should be allowed to explore independently. The coach only plays a leading and auxiliary role. The traditional education model may be in line with the teaching situation of the coach in the previous era, but the traditional teaching model has played a binding role in the innovation and diffusion of students' ideas, which greatly reduces the attraction of badminton to students.

The traditional badminton teaching mode in colleges and universities is too boring and simple. Basically, educators organize students to carry out corresponding badminton activities. The teaching

process is basically to prepare equipment, organize students to warm up, divide them into groups, and then start teaching. There are few knowledge points involved in the classroom, and basically, only one is involved. Then organize students to conduct actual combat. The time for this part of the classroom is basically about 20 minutes, which occupies a long time in classroom teaching. It should be noted that when educators switch from theory to practice, students need to buffer the theoretical knowledge points taught by teachers. The author of this paper randomly selects college students in our school to do a questionnaire about the current situation of badminton course teaching, looking for the problems existing in the teaching of traditional physical courses from the perspectives of teaching mode and learners. The following conclusions were drawn from the analysis of the questionnaire results.

Course teaching:

1. Traditional badminton courses have short teaching times, fewer class schedules, and a lack of interest in teaching content, making it difficult for students to learn useful knowledge.
2. The content of traditional badminton course teaching activities is solid and not comprehensive enough, and does not take into account individual differences such as students' starting point and comprehension.
3. Traditional badminton courses have few after-school learning resources, and it is difficult for students to review and exchange courses after class.

For learners:

1. It is difficult to obtain comprehensive and professional physical education curriculum theory and action guidance, so the efficiency of autonomous learning is not high.
2. The learners lack partners for communication, collaborative learning, and sports together, so they have insufficient mobility and low interest in sports.
3. The learner lacks self-discipline and cannot maintain the motivation of learning for a long time.

A survey on satisfaction with the application of multimedia technology in badminton in colleges and universities has been conducted. Through the survey, it is found that most students in colleges and universities in China support this kind of auxiliary teaching, especially for those schools that have applied multimedia technology to teaching practice, the satisfaction with multimedia technology-assisted teaching is very good. It can be seen that multimedia classroom teaching can vividly display the standardized actions in badminton teaching. Students can understand the movement track of badminton more clearly, know the content and method of learning, and understand it more simply through multimedia technology.

The Necessity of Introducing Multimedia Technology in Badminton Teaching in Colleges and Universities

Enrich badminton theory teaching. The traditional badminton theory teaching is boring and boring. College students are easily distracted in the process of learning, and it is more cumbersome to explain the key points and difficulties. The repeated emphasis by teachers can easily make college students feel tired of learning. The use of multimedia technology in theoretical teaching, badminton teachers' actions can be played for students to watch, repeated and slow playback can be implemented on the key points and difficulties of the technology, and the necessary sound and image display can be used to highlight the key points and difficulties, thereby helping college students to intuitively and comprehensively master badminton skills.

Stimulate college students' interest in badminton learning. Educational psychology shows that interest is the most active factor in learning motivation, that is to say, people learn in the state of interest, and they usually master it quickly and firmly. The introduction of multimedia technology in the process of badminton teaching in colleges and universities can bring a new stimulus to college

students, induce them to have an exploratory reflection on new and different stimuli, and show great interest in the content presented.

Conducive to the establishment of a clear action image. In the process of badminton technology teaching, some techniques are difficult to express clearly in words, especially the technical details after being vacated. It is difficult to explain, and the demonstration effect is not satisfactory. However, multimedia courseware can easily solve such difficult problems. It helps college students understand movements, form movement concepts, and finally establish a clear movement-image in the brain. For example, in the teaching of badminton jump kill technology, there is a process of vacating the technology, and teachers can only carry out coherence during the demonstration.

The technical movements of the game cannot be stopped in the air so that college students can clearly see the movements in the air, but the use of multimedia technology can realize the complete demonstration of the technology and the decomposition and slow playback, providing students with intuitive and standardized movement demonstrations, and help college students establish correct movement concepts and skills. Clear action image, which helps college students to master the correct badminton skills.

The Introduction Strategy of Multimedia Technology in College Badminton Teaching

College badminton teaching should not have the idea of "introducing for the sake of introduction" for the introduction of multimedia technology. If it only pays attention to the value that multimedia technology can produce as an educational tool, it is contrary to the "Internet +" education model. In view of this, after the introduction of multimedia technology into badminton teaching in colleges and universities, the corresponding links of teaching design, implementation and evaluation should be further improved.

After teachers introduce multimedia technology into the classroom, they can first carry out the necessary activities in the classroom, such as preparing equipment, warm-up exercise, and classroom grouping. Then organize students to watch the badminton teaching video. If the classroom location is in the venue, you can put it on the multimedia screen and organize students to watch the teaching video. Students can watch on their mobile phones if they are outside. Before organizing a class, teachers should prepare corresponding teaching videos of multimedia courses. When organizing students for actual combat, because students can watch relevant standard actions through mobile phones, teachers do not need to provide students with one-on-one tutoring can play a good teaching effect. Teachers should reasonably grasp the proportion of multimedia teaching in the whole badminton teaching process and the opportunity to use it. Although multimedia teaching can improve the overall training effect of students to a large extent, badminton is a competitive sport that needs repeated practice after all. We should pay attention to seize the opportunity, analyze the key points and difficulties of technical actions in the teaching process, and grasp the opportunity of multimedia to get twice the result with half the effort.

The "Opinions on Comprehensively Deepening the Reform of Teacher Team Construction in the New Era" emphasizes that educators are the core elements and primary resources for the development of my country's educational undertakings. Whether educators have a good ability to use, develop and design multimedia is directly related to the development of badminton education and teaching in colleges and universities. Therefore, the effective introduction of multimedia technology in badminton teaching in colleges and universities needs to further improve teachers' ability to use multimedia teaching. First, to develop badminton educators to design multimedia teaching abilities. The ability of teachers to integrate multimedia software and teaching content should be strengthened, such as adding subtitles, making animations, cutting videos, and other related software operation techniques. This ability does not require educators to be proficient, but must be able to play a practical role in teaching. Only in this way can badminton have more abundant educational resources to meet the actual needs and teaching needs of students. Second, teachers develop multimedia abilities. Badminton teaching is as much as other physical education courses, including corresponding theoretical knowledge and practical cases. Educators should have the educational concept of developing a school-based curriculum through multimedia, organize and collect fragmented educational resources, and form a unique multimedia systematic curriculum system.

Multimedia teaching will cost teachers a certain amount of effort and time in the preparatory work. The teacher needs to draw the teaching content of this lesson in pictures, audio, and other ways before class. For some detailed actions, teachers also need to shoot the actions themselves, and use relevant software to edit and draw. The production of lively multimedia courses and some auxiliary exercise videos requires careful preparation. All possibilities encountered in the course should be predicted in advance and given certain solutions. The actual teaching process of multimedia teaching is very easy and easy. The difficulty lies in the preparation of course content before class. Only when the course content is rich and different can the advantages of multimedia teaching be highlighted.

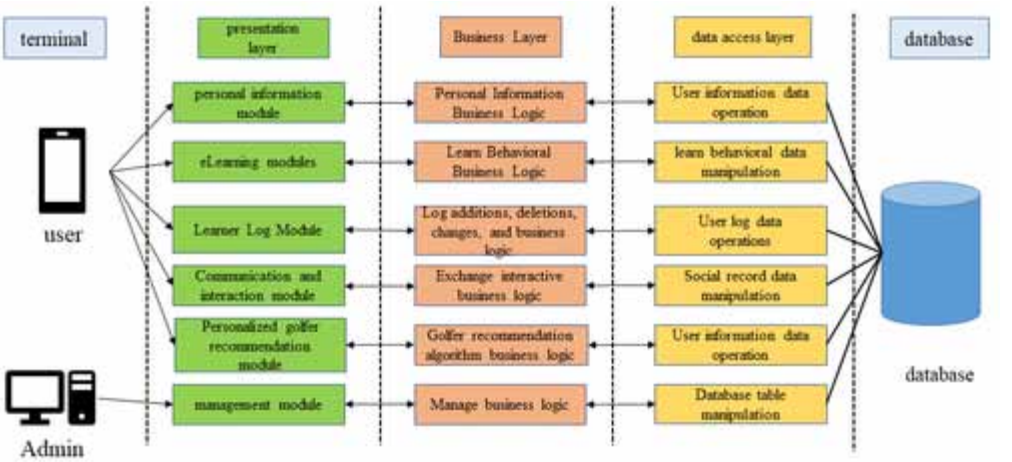
RESULTS AND DISCUSSION

Design of Architecture Mode of Badminton Online Teaching System

O2O, or Online to Offline, is a new business model that combines offline business opportunities with the internet. Consumers place orders on the internet and physical stores are responsible for the delivery and installation of goods. O2O teaching mode is a reference for this new business model. It applies the concept of e-commerce to teaching, uses internet technology, integrates online and offline high-quality teaching resources, and constructs a new two-way interactive teaching mode. O2O teaching mode needs to build a network teaching platform that can realize the interaction between teachers and students.

In order to give full play to the characteristics of the O2O teaching mode of learning anytime, anywhere, and facilitate teachers to manage students and teaching resources, the O2O badminton mobile teaching platform adopts a layered design mode of mixed C/S and B/S, and learners log in through the android client, use the platform functions, and at the same time, in order to make it more convenient for teachers to use the platform, teachers can edit and manage the resources uploaded by students and themselves through a web browser on the PC side; the administrator also manages the platform through the PC side's web browsing, manages student and teacher information, database information, user permissions, and maintains the normal operation and use of the platform. The administrator also manages the platform through web browsing on the PC side to manage students and teachers. Information, database information, user permissions, and maintain the normal operation and use of the platform. The layered architecture model of the O2O badminton mobile teaching platform designed in this paper includes four layers: presentation layer, business layer, data access layer, and database, as shown in Figure 1.

Figure 1.
Four-tier architecture model of the platform



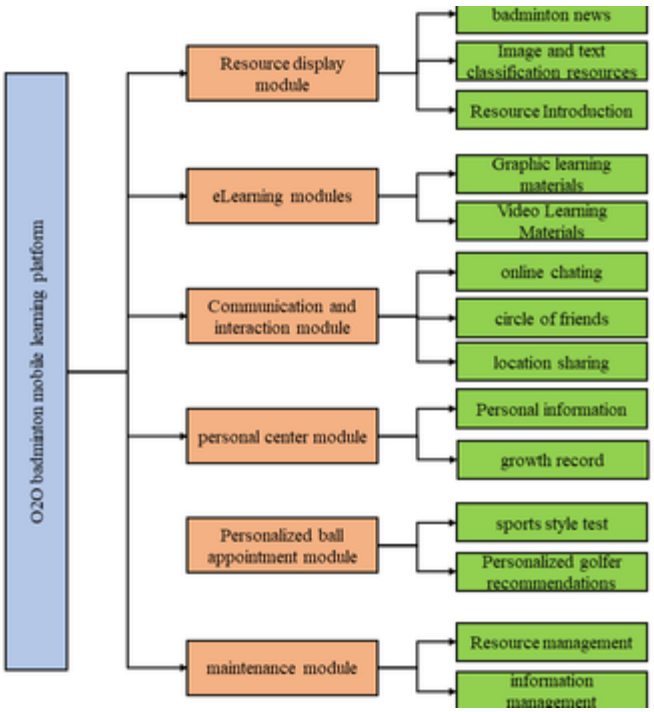
The presentation layer of the four-layer model corresponds to the Android client UI interface, including all graphical user-visualized operation interfaces and content-providing interfaces, such as pages for learners to learn independently, communicate and interact, find playing friends, and view growth records. The presentation layer corresponds to the view layer and the Controller layer of the MVC design pattern. Server business processing includes parsing requests, data processing, invoking database query operations, and returning processing results to clients. The business logic layer corresponds to the model layer of MVC. According to the design goals and system use cases of this paper, the functional modules of the platform are divided in detail, and the designed platform is roughly divided into the following six large modules: resource display module, course learning module, communication and interaction module, personal center module, personalized ball appointment module. The specific functional modules of the badminton mobile learning platform are divided as shown in Figure 2.

Calculation of Trust Degree Based on Graph Model

The relationship network on O2O social network is extremely complex: first, the trust relationship between people can be simply derived from the strength of their communication relationship, but it is not comprehensive enough; secondly, the trust relationship has the characteristics of directivity, asymmetry, and gradual change; third, the trust relationship between O2O social network users is not only derived from friends and relatives, but also from their good social reputation scores.

In the o2o badminton teaching platform, the trust score between learners cannot be obtained explicitly, so the mutual trust between learners cannot be directly obtained. The information exchange and interaction strength between social network users can approximately reflect their trust relationship. Therefore, this paper refers to the sources of social network trust, and divides the trust relationship between platform learners into the following three aspects: on the one hand, learners trust people who

Figure 2.
Platform function module design



have many connections in the real world, such as relatives and friends; People with higher prestige in the middle have high trust, such as celebrity effect; on the one hand, users trust people who have a similar social interest circle with themselves, for example, two people in the same social interest circle are more likely to establish a trust relationship. The graph model in graph theory is often used to describe the mutual connections between social network users, and this paper also builds a learner social network graph based on the graph model. In this paper, the social network of the platform is described as GN, E, W), where N represents the set of all learner nodes in the 020 badminton mobile teaching platform, and E represents the relationship between user nodes and nodes, that is, the learner's friend relationship, W represents the weight between nodes, that is, the learner's trust in his friends. In the real world, the trust relationship is directed and asymmetric, so this paper expands GQN, E, W) into a directed weighted graph. At this time, the learner nodes are connected by a directed double line, and their trust weights are not equal.

A social network concentric circle centered on A is established. The node directly adjacent to node A is the first-level friend (direct friend) of user A, and the node indirectly adjacent to node A is the second-level friend of the user, and so on. Equation 1 is used to measure the familiarity trust of node A and its immediate neighbors:

$$Ftr\left(A,n\right)=\frac{N\left(S_A,S_n\right)}{L_A} \tag{1}$$

In formula 1, n represents one of A's friends, L represents the sum of the social interaction information sent by A to all friends, and $N\left(S_A, S_n\right)$ is the number of interactive information sent by A to n. For example, LA in the figure is 25, $N\left(S_A, S_n\right)$ is 2. In this platform, the first social behavior is the online communication behavior, that is, the message, picture, voice, and location information sent by the learner to his friends, and the second is the interaction behavior in the circle of friends, that is, the commenting behavior on the friend. The calculation method of $N\left(S_A, S_n\right)$ is shown in Equation 2:

$$\frac{N\left(S_A,S_n\right)}{L_A}=\alpha\frac{N\left(S_{A1},S_{n1}\right)}{L_{A1}}+\left(1-\alpha\right)\frac{N\left(S_{A2},S_{n2}\right)}{L_{A2}} \tag{2}$$

On the platform, the time for establishing friendship between A and different users will not always be the same, so if the calculation is carried out by formula 2, the calculation result may be inaccurate. For example, the number of messages A to C and E is 200, but the time to establish contact is - year, and the contact with E is 6 months. Obviously, A and E are more familiar. Based on the above research, the influence of the time factor on the calculation of familiarity trust is introduced, and Equation 1 is revised to Equation 3:

$$Ftr\left(A,n\right)=\frac{N\left(S_A,S_n\right)}{L_A}*\frac{\sigma}{T_{A\leftrightarrow n}} \tag{3}$$

According to the theory of trust propagation, trust will be lost when passing through intermediate nodes. The more intermediate nodes between the target node and A, the more serious the loss, which is also in line with our daily cognition. Based on this, it is proposed that the trust degree of A to any other user in the trust network is expressed as Equation 4:

$$Ftrust\left(A,n\right)=\omega_{N}\cdot\sum_{k}^{i=1}\left[\prod_{m}^{j=1}FFr\left(P_{j-1},p_{j}\right)\right] \tag{4}$$

w_{N} represents the hierarchical distance between the root node A and the target node n in the trust network. As the level increases, the distance gradually increases. The calculation method of w_{N} adopts Equation 5:

$$\omega_{N}=\left(1-\frac{layer_{N}}{layer_{SUM}}\right) \tag{5}$$

In formula 5, $\mathrm{layer}_{\mathrm{sum}}$ represents the maximum hierarchical distance of the trusted network. According to the above theoretical research, its value is 7, and layer N is the hierarchical distance between the target node n and the root node. When layer N is greater than 6, w N is 0, that is, greater than 6.

Social credibility, which reflects a person's social status and influence, is the recognition of his credibility by other users in the o2o social network. Considering the user's social trust degree, that is, it is the weighted trust score of other users on their trust degree. When calculating the user's social trust degree, all nodes have the right to vote fairly. The trust score of any node depends on the score of other nodes to prevent the score result from being modified due to the evil behavior of a few nodes. On the O2O badminton teaching platform, most users' social identities are online college students and there are no stars. Therefore, when calculating the social credibility of users, this paper does not consider the social influence generated by the "star effect" based on the user's social identity. In the teaching platform, there is no explicit credit rating mechanism for learners, so it is impossible to directly obtain the credibility of learners. Referring to the solutions provided by the blockchain idea, this paper gives the following solutions for the calculation of social credibility: (1) Initially, all learners have the same social credibility and have the same fair voting rights; (2) The change of a learner's reputation in social networks comes from the weighted average change of other learners' reputation scores; (3) The higher the social credibility of a learner in the social network, the greater his voting power, and vice versa, that is, the size of social credibility reflects his voting influence; (4) The score of any node depends on the score of other nodes, and its score determines the score change of other nodes, so as to prevent a few nodes from doing evil to modify the score result. The following is the calculation formula 6 of social trust in this paper:

$$Fsoc\left(i\right)=\frac{1}{\sum_{j\in N,j\neq A}Fsoc\left(j\right)}\sum_{j\in N,j\neq A}Fsoc\left(j\right)\times Ftr\left(j,i\right) \tag{6}$$

According to our simulation experiments, the similarity of the circle of friends beyond the third layer of the trusted network has basically no reference value, so this paper sets the maximum number of computing layers for group similarity to 3. This trust calculation, which considers both the similarity of the direct circle of friends and the similarity of the indirect circle of friends, adopts the idea of the Jaccard coefficient, formula 7 to calculate:

$$STr_{G}\left(u,f\right)=\sum_{3}^{n=1}\alpha_{n}\left|\frac{F_{u}^{n}\cap F_{f}^{n}}{F_{u}^{n}\cup F_{f}^{n}}\right| \tag{7}$$

where α_n is the weight coefficient:

$$\sum_{3}^{n=1} \alpha_n = 1 \tag{8}$$

This paper divides the trust between learners due to social behavior into three aspects: familiarity trust, social credibility, and deep friend circle similarity. The comprehensive trust between learners is the weighted sum of the three. The calculation method is as formula 9:

$$tr\left(A,n\right) = Ftrust\left(A,n\right) + Fsoc\left(n\right) + STr_G\left(A,n\right) \tag{9}$$

Singular value decomposition (SVD) is one of the most used models for implicit semantic models due to its good scalability and prediction accuracy. This paper also decomposes the learner learning resource rating matrix R in the basic SVD model. On this basis, the user's implicit feedback information is appropriately selected to expand the model to achieve a good recommendation effect. We write R as the product of two low-rank matrices *P* and *Q*, as in Equation 10:

$$R_{m\times n} = P_{m\times k} Q_{k\times n} \tag{10}$$

P and *Q* represent learner and resource feature matrices, respectively, and *k* is an autonomously chosen hyperparameter. Predicting the score of learner u on resource *i* in R is transformed into solving the product of the *u*-th row of P and the *i*-th column of Q. Some learners are generally rated high, while some learners are generally rated low. In addition, some learning resources are generally rated high or low due to their authority, particularity, and other factors. Therefore, user bias and resources are added to the rating prediction. Bias will make the prediction effect more accurate. The scoring prediction formula of the SVD model with the bias added is denoted by 11:

$$\hat{r}_{ui} = f\left(b_{ui} + q_i^T p_u\right) \tag{11}$$

In Equation 11, $\hat{r}_{ui}$ is the score prediction of resource *i* by learner *u*, *f* is a leading function that maps the actual value to a certain interval, P_u is the user feature vector, q_i is the learning resource feature vector, and b_{ui} is defined as Equation 12:

$$b_{ui} = \mu + b_u + b_i \tag{12}$$

Assuming that the known score in the user learning resource score matrix is r_{ui}, the error between the actual value and the predicted value is Equation 13:

$$e_{ui} = r_{ui} - \hat{r}_{ui} \tag{13}$$

The total error sum of squares can then be calculated and expressed in Equation 14:

$$SSE = \sum_{u,i} e_{ui}^2 = \left(r_{ui} - \hat{r}_{ui}\right)^2 \tag{14}$$

Model solving then translates into solving the least squares problem as shown in Equation 15:

$$\begin{aligned} &\min_{p_*, q_*, b_0} \sum_{(u,i)\in K} \left(r_{ui} - f\left(b_{ui} + q_i^T p_u\right)\right)^2 \\ &+\lambda_1 p_u^{\ 2} + \lambda_2 q_i^{\ 2} + \lambda_3 b_u^2 + \lambda_4 b_i^2 \end{aligned} \tag{15}$$

The regularization coefficients λ_1, λ_2, λ_3, and λ_4 are introduced to prevent overfitting during data training.

This paper uses SGD to solve the above problems. The SGD (Stochastic Gradient Descent) algorithm is the most used and most efficient gradient descent algorithm to solve the above problems in the current machine learning algorithm. The idea is to loop through a set, select appropriate parameters to iterate, and select a small step of gradient descent each time to find the optimal solution.

In the personalized recommendation of friends in the O2O teaching environment, we comprehensively consider the three factors of user familiarity trust, social trust, and similarity trust based on the graph model, and find the most appropriate weight parameter, which can obtain more accurate recommendation results and obtain satisfactory results for users. When calculating user familiarity, this paper considers trust directionality and asymmetry. When calculating user social trust and user similarity, it not only considers the nodes directly adjacent to each other but also deeply mines the useful information of users' indirect adjacent nodes, which improves the recommendation quality.

RESULT ANALYSIS

Experimental Purpose and Experimental Data Processing

Through the comparative study of online badminton teaching and traditional badminton teaching mode, it reflects the advantages of online teaching and offline teaching, improves the quality of badminton courses and teaching efficiency, enables students to master more badminton-related knowledge, and enriches teaching methods. On the basis of stimulating students' interest in badminton learning, improving students' learning efficiency, providing a reference for future research on online teaching in badminton classrooms, and promoting the application of online teaching in physical education teaching plays a positive role.

The study selected 26 male students (age 21. 88+1. 03 years old, height 174. 80+4. 01 cm, weight 67. 36+7.09 kg) from the 2014 badminton special class of the School of Physical Education of Yangzhou University as experimental subjects. In the teaching practice of the badminton special course in the normal teaching plan, according to the hours required by the syllabus (see the appendix for the syllabus and lesson plan), the teaching time: September-December 2016 (semester--semester of the 2016-2017 school year), the use of multimedia technology Comparing with traditional teaching methods, auxiliary teaching methods can complete badminton technical teaching. Before the experiment, the two groups of students' learning motivation, basic physical fitness, badminton skill level and other basic conditions were tested, and differences were compared; after the experiment, the research results were analyzed to explore the actual teaching effect produced by this teaching method.

In this study, EXCEL2010 was used to conduct statistical analysis on the survey results, SPSS20.0 was used to test the correlation of the data, and the data was organized in accordance with the basic principles of sports science research methods. Ensure that the experimental group and the control group conduct teaching experiments in the same classroom under the condition that teachers, venues, teaching tasks, and time schedules are consistent. At the same time, the entire process of the experiment

is required to be carried out on the basis of not informing the students of the purpose of the study. Avoid the experimenter effect and affect the measurement of real experimental data.

Experimental Results and Analysis

The orange in the speed & strength curve section in Figure 3 represents the strength curve, which records the action behavior. The force state of the practitioner; blue represents the speed curve, which records the swing speed state of this action behavior. The peaks of the two curves show that the closer the time points are, the more inward and inward the stroke completion is. The fluctuation in the power curve reflects the kinetic energy loss during the swing process; the jagged fluctuations of the speed curve are used to indicate whether the force exerted during the swing process is coherent (if there are obvious fluctuations before the first peak of the speed curve, it means that the lead is incoherent. there is a secondary repetitive force phenomenon). In the actual swing application, the generation of the downward acute angle indicates the existence of reverse force, which is reflected as misleading, limiting force, and affecting the timing of hitting the ball. The smoother the force is, the calmer the recording curve will be, and it will tend to be regular without violent ups and downs.

In this paper, the comparison algorithm is selected as the recommendation method based on the similarity of learners' friends, that is, the Jaccard distance is used to calculate the similarity of learners' common friends, which is called the basic collaborative filtering algorithm. Using the idea of a graph model to calculate the learner's trust relationship to recommend golfers, it is called a graph model algorithm. Integrating the learner's trust degree and interest model to recommend golfers is called the fusion algorithm of trust degree and interest model. In the experiment, the values of the golfer recommendation candidate set are selected as 5, 10, 15, 20, 30, 40, and 50. The results are shown in Figure 4, Figure 5, and Figure 6.

It can be seen from the experimental result curve that the number of golfer recommendations gradually increases, the accuracy of the algorithm decreases slowly, and finally tends to be stable, the recall rate increases slowly, and tends to be stable, the F1-measure curve increases slowly, and the growth rate increases. slow and eventually stabilize. Compared with the other two algorithms, the algorithm that integrates trust and interest models has achieved better performance, indicating that the fusion algorithm that comprehensively considers the learner's trust model and interest model utilizes more learner information and can achieve better results.

After the 18-week teaching experiment, a questionnaire survey was conducted again on the interest of the two groups of students in badminton. Statistical changes of the proportions investigated

Figure 3.
Speed and Velocity Curve Display

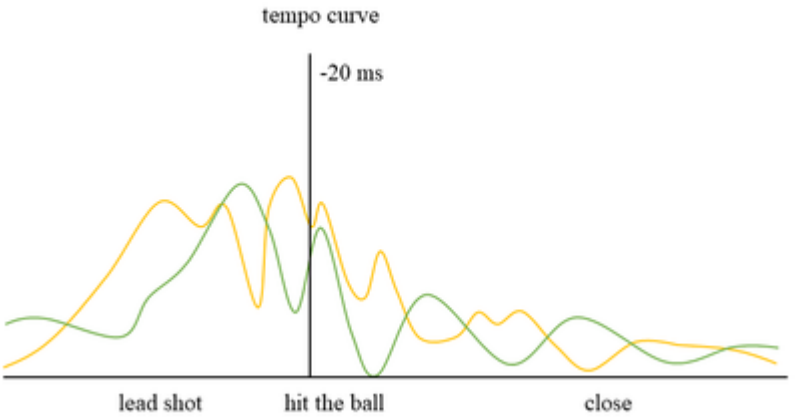


Figure 4.
The experimental results of the algorithm accuracy

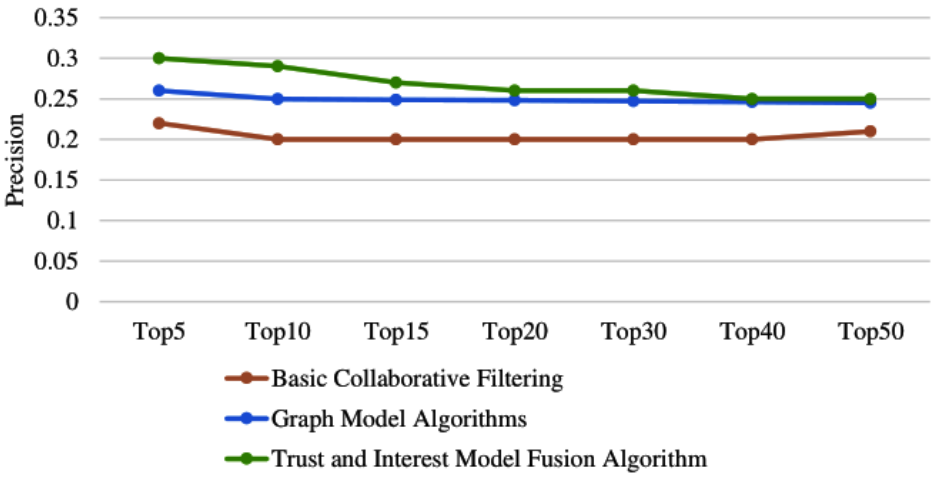
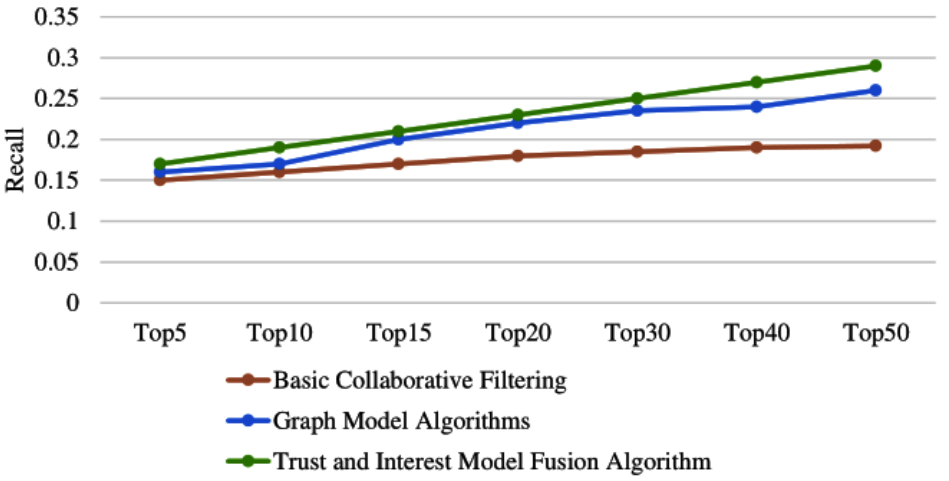
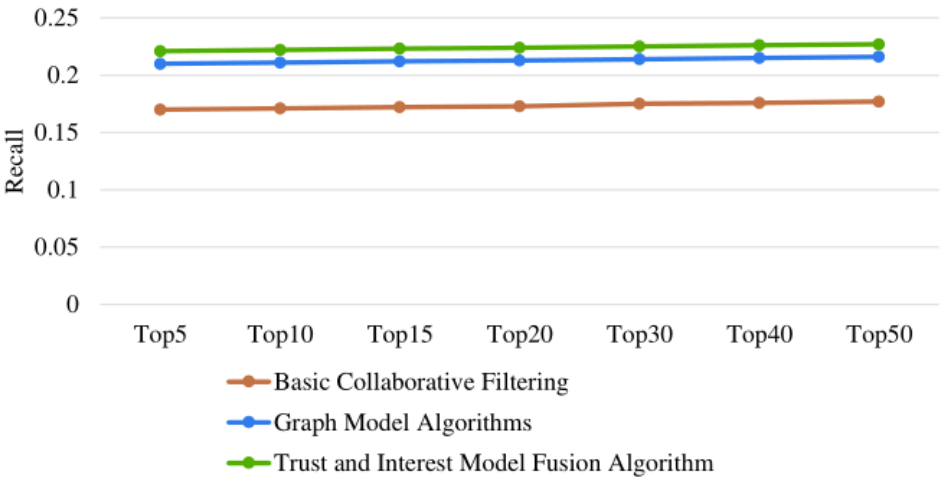


Figure 5.
The experimental results of the recall rate of the algorithm



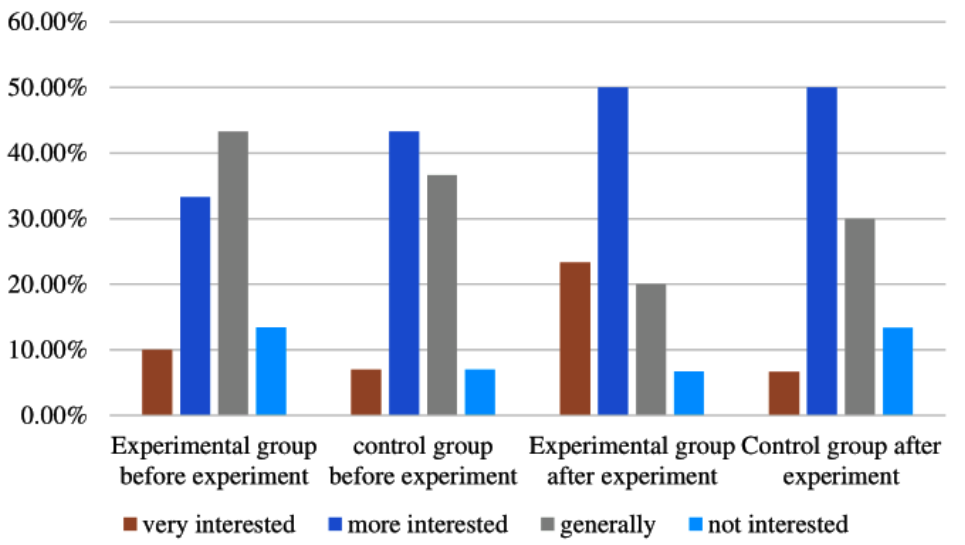
after the experiment and before the experiment are shown in Figures 7. The two groups of students have a certain degree of improvement in their interest in badminton. The number of students in the experimental group who said they liked the sport very much increased from 9.1% before the experiment to 30.3% after the experiment, an increase of 21.2%, and the number of people who said they liked the sport increased from 42.4% before the experiment to 63.6% after the experiment, the growth rate is 21.2%, which means that the general number of people has dropped from 45.5% in front of the experiment to 6.1% after the experiment, and the reduction rate is 39.4%, which means that the number of indifferent people is changed from the number before the experiment. 3% was reduced to 0% after the experiment, the reduction rate was 3%, and no one was forced to choose courses. The number of students in the control group who said they liked it very much increased from 11.8% before

Figure 6.
Fl-measure experimental results of the algorithm



the experiment to 26.5% after the experiment, an increase of 14.7%, and the number of people who said they liked it decreased from 58.8% before the experiment to 26.5% after the experiment 55.9%, the reduction range is 2.9%, which means that the general population is reduced from 29.4% before the experiment to 17.6% after the experiment, and the reduction range is 11.8%. None of the students were forced to take courses. The comparison of the increase rate and the decrease rate between the experimental group and the control group shows that the number of students in the experimental group expressing their liking for badminton is more than that in the control group, and the general number is less than that in the control group.

Figure 7.
Comparison of students' interest in badminton before and after the experiment in the experimental group



DISCUSSION

The badminton teaching method of the network teaching platform under the multimedia environment can meet the needs of students, respect the individual differences of students, and fully mobilize students' enthusiasm for learning according to many careful preparations made by teachers before class so that all students can participate in it, and learn in a happy atmosphere, and achieve good learning results. As a competitive sport, badminton is deeply loved by students. However, when setting teaching objectives, teachers should effectively transform the difficult teaching content into specific actions that are easy to understand according to the actual situation of students. This can not only improve students' enthusiasm for learning but also enhance students' confidence in learning. Traditional teaching methods often set teaching objectives too high, In the process of teaching, students' confidence in learning may be wiped out and even disgusted. If the teaching objectives are set too low, it will affect students' interest in learning, but it will be even more detrimental to future learning. The network teaching platform assisted badminton teaching under the multimedia environment can ensure teachers' grasp of teaching objectives and understanding of students, and formulate scientific and reasonable teaching plans based on this. The organizational form of badminton teaching is directly related to the teaching content, teaching environment, student differences, and other factors. Different teaching contents can have different organizational forms, and different teaching environments will inevitably lead to changes in organizational forms. Therefore, the organizational form of badminton teaching is dynamic, and it can change with many factors. However, in the process of change, teachers must follow the principles of physical education, which should meet the requirements of physical education. The traditional badminton teaching organization form is relatively simple, and teachers are easy to use the inherent form to carry out multi-technology teaching, so in traditional badminton teaching, students' interest will be reduced, and even the bored psychology will lead to the decline of learning effect. In the multimedia environment, the organization form of badminton teaching assisted by the network teaching platform is flexible and rich. Teachers create reasonable and feasible experiential programs that can stimulate students' interest in learning according to different teaching objectives and teaching contents. Students can fully experience various technical action essentials, increase their sense of urgency, improve their sense of competition, and observe the technical actions in the video. To improve their own problems, in the whole process, teachers not only pay attention to students' technical experience but also pay more attention to students' emotional experience. By enhancing the competitiveness, entertainment, and cooperation of the experience process, they can improve students' satisfaction with the form of classroom organization, and finally achieve the goal of improving students' learning interest and teaching quality.

CONCLUSION

The use of multimedia technology to implement badminton auxiliary teaching is centered on college students. Through intuitive and vivid animation demonstrations, the theoretical explanation and action exercises are closely combined to help college students establish correct action concepts and effectively improve the utilization of classroom time. It greatly increases the amount of teaching information, and its introduction provides a broader development space for badminton teaching in colleges and universities, brings new development opportunities to badminton teaching, and brings more severe challenges to college physical education teachers. Educators should strengthen the study of multimedia technology, design multimedia courseware for badminton, be bold in innovation, and be brave in practice. This paper studies the design and implementation of the badminton mobile teaching platform based on O2O. Based on analysing the deficiencies of the university's traditional physical education curriculum model, it is considered to construct a new badminton teaching process with reference to information technology, and a detailed business demand analysis and performance analysis of the badminton mobile teaching platform based on O2O is carried out. On this basis, the

learner's trust model and interest model are constructed to find the most suitable potential golfers. The goal of the author to build the O2O badminton mobile teaching platform is to use the platform to recommend personalized golfers based on the trust and interest model for learners and to find suitable golfers for learners.

The badminton mobile teaching platform has been initially built and runs well on Android phones. It is preliminarily verified that the platform provides learners with an independent learning environment and communication interaction function, and recommends suitable players for them, which is conducive to promoting learners' offline participation in badminton course practice and enhancing their interest in badminton. In the next step of this paper, when making personalized recommendations for users, we plan to deeply explore the characteristics of users' offline sports behavior, obtain the information of users' preference to participate in sports, such as time, amount of exercise, length of exercise, etc., establish a detailed sports model, build a more comprehensive user model, and improve the accuracy of the platform's recommendation for users. In the future, more functions will be designed to support more multimedia types of learning resources, the introduction of learner sports data into the sports ranking display, the badminton venue reservation function, the ball group activities section, the topic square section, and so on. This research can also be transferred to other curriculum fields. Considering the shortcomings of the traditional curriculum teaching mode, the mobile teaching platform under O2O mode is constructed to provide comprehensive and rich resources for learners to learn relevant theories and guidance on the platform. By introducing the social function into the O2O mobile teaching platform, learners can easily exchange experiences and experiences with friends online and cultivate learning interests.

DATA AVAILABILITY

The figures used to support the findings of this study are included in the article.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

FUNDING STATEMENT

This work was supported by the 2022 Shanxi University Teaching reform and innovation Project "Scientific design of ideological and political teaching system of physical education major curriculum research" (No. J20221147); and the Ministry of Education's Cooperative Education Project (No. 220502458244742).

ACKNOWLEDGMENT

The authors would like to show sincere thanks to those techniques who have contributed to this research.

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