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Optimization of the College Basketball Teaching Mode Based on the Applied Explainable Association Rule Algorithm and Cluster Analysis in Mobile Computing Environments

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ABSTRACT

Under the mobile computing environment, a large number of convenient mobile terminals and extensive mobile network application services have been produced. The technology has been used in college sports teaching to optimize the management of sports teaching. In this context, this paper studies the application of the association rule algorithm and cluster analysis in basketball teaching, which will effectively promote the practice and application of the association rule algorithm and cluster analysis in college PE teaching in China. This paper studies basketball teaching in colleges and universities based on the applied explainable association rule algorithm and cluster analysis. It is concluded that the p value of positioning shooting in the basic basketball technology test between the experimental class and the control class before the experiment is 0.883, which is greater than 0.06, indicating that there is no significant difference between the experimental class and the control class before the experiment. The p value of round-trip straight dribble in the whole field is 0.735, which is greater than 0.07, indicating that there is no significant difference between the experimental class and the control class before the experiment. This teaching mode plays a significant role in cultivating beginners' learning interest and enthusiasm, preliminarily mastering movement skills and establishing solid technical concepts. With the complex emotional experience of the association rule algorithm, it is of great significance for teachers to grasp students' various emotional experiences in learning, cultivate students' team consciousness by cluster analysis, guide and dredge their negative emotions, and develop students' sense of cooperation, team spirit and democratic spirit, personal responsibility and personality.

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Introduction

With the continuous use and widespread popularity of mobile terminal equipment in recent years, it provides more convenience for teachers and students to obtain more sports knowledge and related information. Not only can we use mobile computing networks to obtain knowledge and information anytime and anywhere. At the same time, it can also effectively extend PE classroom teaching. The use of a mobile computing application platform can strengthen the communication and learning between teachers and students and between students and students. It can assist with physical education classroom teaching.

Basketball plays an irreplaceable role in educating and cultivating students' healthy growth. Basketball games can not only strengthen their physique but also cultivate students' strong will and indomitable spirit, cultivate students' team spirit and improve their sense and cooperation ability (Yan and Wu 2021). At present, basketball teaching still stays in the traditional teaching mode of teachers' explanation and demonstration and students' mechanical imitation, which requires students learning autonomy and teacher-student interaction. This teaching method based on full-house irrigation greatly reduces the overall effect and quality of basketball teaching and inhibits students' innovative thinking and creative potential (T, C, and S; Xiao et al. 2021). How can we give full play to the value of physical education and make students develop healthily in body and mind? This is the ultimate goal of physical education teaching, an extremely important problem faced by teaching (Pradhan and Alton 2021). Basketball is a comprehensive activity game and a modern competitive sports event. As the main teaching material of physical education, basketball is one of the favorite sports of college students. Its cooperative, entertaining, and social communication characteristics are consistent with the characteristics that young people like games and dare to compete. Therefore, it has attracted a large number of young students. Its social communication meets the social needs of students who want to make friends and exchange emotions in learning. It is adjustable and aesthetic, and the characteristics of universality and practicability also attract people of different ages to participate in it, giving the sport a broad mass base (Olavide et al. 2021; Shimoura et al. 2019). However, there are many problems with the current basketball teaching mode of various colleges and universities in China. We continue to take effective countermeasures to solve them. Basketball is not only a competition of strength and speed but also a competition of intelligence, scientific research, and the comprehensive quality of talent. The human resources, interdisciplinary advantages, and strong scientific research force of colleges and universities play an important role in the development of basketball and the cultivation of basketball sports talent (Fan et al. 2021; Clemente et al. 2019).

Against this background, this paper studies the application of the association rule algorithm and cluster analysis in basketball teaching in a mobile computing environment, which will effectively promote the practice and application of the association rule algorithm and cluster analysis in college physical education and provide a reference for the reform of physical education in China (Cabona et al. 2019). In real application scenarios, due to the existing security mechanisms of the database, people's operations on the database are normal (Al-Yaaribi, Kavussanu, and Ring 2018; Buscà et al. 2018). The access records stored in the database log are the normal access records of all user roles. The access habits of different user roles are generally very different. Therefore, by clustering the records in the database log, the original data set can be divided into access records of different user roles to achieve a preliminary analysis of the log data (González-Espinosa, Molina, and García-Rubio 2017; Harvey et al. 2016). However, if only the cluster analysis method is used to divide the user's historical behavior into different clusters, it cannot meet the requirements of system detection. The processing method of this paper is to mine the association rules of each cluster generated by cluster analysis by applying the association rule analysis algorithm and taking these association rules as the behavior patterns of users.

Based on the association rule algorithm, m is a dynamic learning process. When students are involved in basketball cluster analysis, they take physical exercise as the basic means, showing the distinct practicality of physical exercise. Learning of students' sports knowledge and the mastery of sports technology and skills should continuously transmit, process, and store information with the outside world through positive thinking activities (Sabine 2017). We cluster the scores of students and mine the association rules of the basic attributes of grades and the basic information of students. Through the above work, we obtain the clustering analysis results and the association rules we are interested in to help teachers understand the learning characteristics of all kinds of students and know the specific factors affecting students' test scores to formulate a reasonable teaching plan. With the complex emotional experience of the association rule algorithm, it is of great significance for teachers to grasp students' various emotional experiences in learning, cultivate students' team consciousness by cluster analysis, guide and dredge their negative emotions, and develop students' sense of cooperation, team spirit and democratic spirit, personal responsibility and personality (2016).

The innovations of this paper are as follows:

- (1) This paper proposes a college basketball teaching model based on an association rule algorithm. The association rule algorithm model discovers the value correlation or association pattern between itemsets from a large number of databases and emphasizes the interdependence of data, thus helping to make decisions and judge the feasibility of data.

In this model, the association rules mined from database audit logs are used as the behavior space of different user roles in the relational database. Then anomaly detection is carried out based on the user's historical behavior pattern database based on this behavior space.

- (2) A basketball teaching system is constructed based on an association rule algorithm and cluster analysis. Using the association rule algorithm and clustering analysis, the basketball teaching system may mine unknown groups in the data set, which is a major advantage of clustering over classification methods. Finally, we can summarize the specific characteristics of each cluster by further analyzing each cluster.

The research gap that necessitates the use of association rule and clustering algorithms is the lack of comprehensive research on applying these techniques in college basketball teaching. By filling this gap, the study aims to optimize sports teaching management and enhance students' learning outcomes in college PE teaching in China.

The overall structure of this paper consists of five parts.

The first chapter introduces the background and significance of college basketball teaching and then introduces the main work of this paper. The second chapter mainly introduces the related work of basketball teaching in colleges and universities at home and abroad. The third chapter introduces the algorithms and models of association rules and clustering analysis. The fourth chapter introduces the realization of the college basketball teaching mode and the analysis of the experimental part. The fifth chapter is a summary of the full text.

Related Work

Research Status at Home and Abroad

Koh T et al. proposed that in the traditional basketball course in colleges and universities, the teaching mode only focuses on improving students' basketball skills and emphasizes the standardization of movement skills. However, it completely ignores the health and lifelong nature of physical education. In recent years, due to the gradual deepening of the reform of college PE curricula, it has been difficult for this teaching mode to meet the educational needs of modern basketball curricula (T, C, and S). Stefanou L proposed that the flipped classroom teaching mode can stimulate students' interest in learning. Before class, students can take the initiative to learn, and during class, students can cooperate and explore learning together. Introducing the flipped classroom improves teachers' teaching behavior, enriches the teaching mode by stimulating students' interest in learning basketball, and returns the initiative in class to students (Stefanou, Tsangaridou, and Charalambous 2022).

Lentillon-Kaestner V et al. put forward that in recent years, many teachers have attempted to reform basketball teaching, and some results have been achieved. These reform modes reflect the idea of “harmony but difference” and, to some extent, promote the development of basketball courses in a scientific and modern direction, but there are still some problems. Specifically, the teaching process is dominated by teachers and students accepting passively, which makes the whole teaching process lack interaction between teachers and students, teaching and learning (Lentillon-Kaestner and Patell&016). Guij arrow E et al. proposed that China’s sports education sector has always used sports training theory instead of sports teaching theory, emphasizing explanation and demonstrating Repeated rated ever exercises k. Basketball ching is no exception (Guijarro, Macphail, and M). Jinlong et al. proposed the following. The formation of basketball skills has its own objective laws. TEstablishinga basketball curriculum system should guide and encourage students to like basketball. Learn and practice basketball skills in various ways; experience competitions in various forms and fin; and make students love basketball; master basic skills; form basketball as a lifelong sport means to exercise and experience happiness Bivand et al. proposed that the main method of basketball teaching is to strictly abide by the “three-step” strategy, that is, the first step is; hhatchersto demonstrate; the second step is teachers’ guidance; and the third step is for students to carry out free activities. The teaching content only explains the action skills of passing, shooting and dribbling but ignores the improvement of a team cooperation ability (S, J, and T). Youcef D et al. proposed that the existing basketball course performance evaluation form is single and that the incentive effect is not obvious. Students’ performance is judged by “quantitative” indicators. No matter what foundation you are or how your progress is, you use the same ruler to evaluate your sports performance. This summative evaluation has always been popular in the basketball course evaluation of colleges and universities (Youcef et al. 2018). Meekes J et al. proposed that while mastering movement skills, we should cultivate students’ creative spirit, decision-making, and adaptability so that students can establish a high degree of practice interest and exploration spirit and improve their application ability on the premise of in-depth understanding. However, traditional teaching methods cannot meet these requirements (MeeEs and Hassink 2018). Turkoglu B et al. proposed that in traditional basketball teaching, teachers’ classroom teaching is random, and the teaching content, methods, and means are single, so different teaching methods are not adopted for nonstudents (Turkoglu, Uymaz, and Kaya 2022). Pandey K et al. proposed that extracurricular physical education and sports training should be incorporated into the physical education curriculum to form a curriculum structure with organic connections inside and outside class. To enhance the charm of basketball classes, improve students’ physical and mental health levels, and develop sports skills and form s, ports habits, we

must innovate the curriculum structure and set up flexible and diverse new courses to meet students' physical and mental needs (Pandey and Shukla 2022).

Mobile computing terminals have become indispensable portable devices for people in contemporary society. Smartphones, tablets, and other mobile computing terminals have already started establishing literacy class teaching. In other fields, some developed areas of high school have even tried piloting device classes, called mobile classrooms, namely, smartphones or tablets, to realize online teaching, online reviews, online tutoring, online work, and even online examinations. The elements of traditional classroom teaching. The fragmentation of knowledge characterizes it. Students can realize the learning process if they hold mobile computing terminal devices at school, home, or anywhere else.

Research Status of College Basketball Teaching Based on the Association Rule Algorithm and Cluster Analysis in a Mobile Computing Environment

According to the summary of previous literature, it is not difficult to find that at present, the research on teaching mode basketball teaching in China is mainly based on theoretical research, mainly including the definition of teaching mode, the advantages of its application in basketball teaching, its application value and the necessity of its implementation. This paper studies college basketball teaching based on the association rule algorithm and cluster analysis. Although the teaching method based on this has a certain healthy effect on students' mastery of sports techniques, the traditional teaching method of teachers explaining, demonstrating, and leading, and students imitating exercises causes a lot of limited teaching time to be spent on repeating movement techniques, which makes it difficult to create an enjoyable, relaxing and entertaining teaching environment, resulting in students' inability to flexibly apply their skills in practice, which is not conducive to students' independence and exertion. The most important thing in basketball is to pay attention to teamwork, and improving individual ability is not the fundamental goal of college basketball teaching. However, for a long time, due to the influence of the traditional teaching mode, teachers only teach mechanically, while students only study mechanically. This study attempts to verify the feasibility of the association rule algorithm and cluster analysis teaching mode in basketball elective courses in colleges and universities through theoretical analysis and experimental research in elective basketball courses. On the other hand, it discusses the effects of the association rule algorithm and cluster analysis teaching mode on students' noncognitive abilities, such as communication level and cooperation ability.

Algorithm and Model of Association Rules and Clustering

The association rule algorithm is generally a data mining technique that aims to discover patterns or relationships among variables in a dataset. It is often used in market basket analysis to identify which items are frequently purchased together. The algorithm works by identifying frequent item sets, which appear together in a certain percentage of transactions, and generating association rules based on these item sets.

On the other hand, clustering analysis is a technique used to group data points based on their similarities. The goal is to identify clusters of data points that are similar to each other and different from other clusters. Various clustering algorithms are available, such as k-means, hierarchical clustering, and density-based clustering.

It is important to note that the specific mathematical formulations and algorithms used for association rule and clustering analysis may vary depending on the specific dataset and research question being investigated.

As mentioned above, clustering is a process in which data sets are divided into many groups. The data objects in the same group have high similarity, but the data objects differ greatly from each other in different groups. Unlike clustering and classification, clustering does not know the knowledge prior to experience in advance, while classification is guided by prior knowledge. The process by which people choose and use clustering algorithms to cluster the data that need to be mined is clustering analysis. It is also the research content of data mining, which is of great significance to reality. Clustering refers to grouping data objects that cannot be materialized or physical into different clusters according to some characteristics of data objects. The data objects in the same cluster have similar characteristics, but the data objects in different clusters do not have similar characteristics. The result of clustering analysis is that the intraclass similarity will be high, while the interclass difference will be high; that is, the data in the transaction set will be divided into obviously different categories as much as possible. The classification of this algorithm is based on the difference in attributes between different records. Commonly used classification methods include K-means and K-medoids, hierarchical methods such as Birch and Cure, and classification methods based on density. Different clustering results may be obtained when different clustering methods are used to analyze the same initial data set. The association rules mined from database audit logs are used as the behavior space of different user roles in the relational database. Then anomaly detection is carried out based on the user's historical behavior pattern database based on this behavior space. Because application scenarios in the real world are very complex, it is usually difficult to mine satisfactory user behavior rules only by using an analysis algorithm or a solution idea. The association rule is used to discover the value correlation or association pattern between itemsets from a large number of

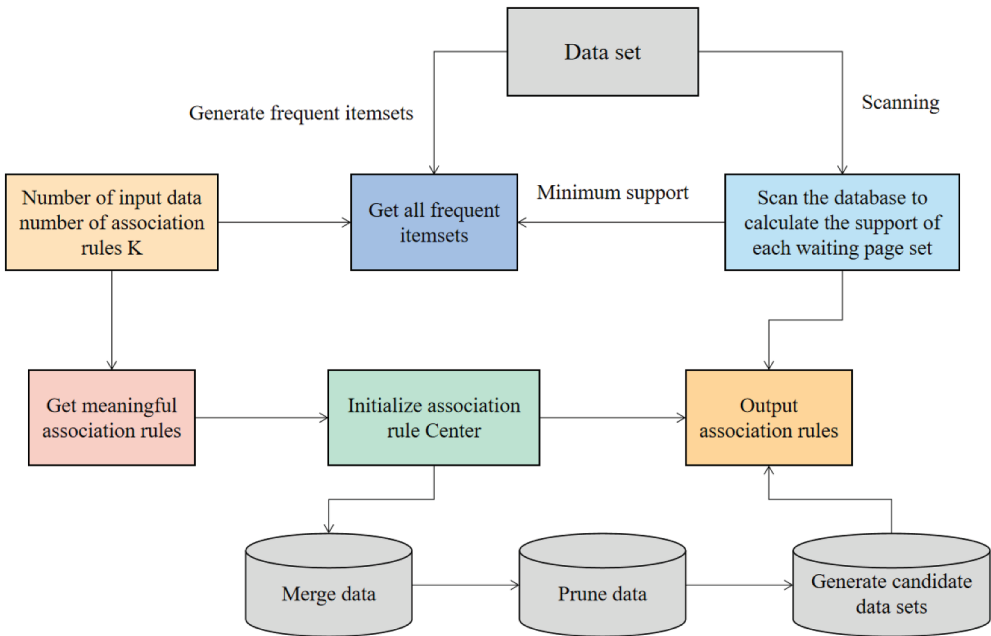


Figure 1. Association rule model.

databases and emphasize the interdependence of data, thus helping to make decisions and judge the feasibility of data. The key is to decompose the association task model, mainly to formulate association rules according to the determination of frequent itemsets. The model is shown in Figure 1.

The algorithm divides the size data set into classes to reduce manual intervention. It calculates the cluster center point according to the newly divided new classes until it is ensured that the cluster center point will not change so that the clustering criterion function converges to a fixed value; that is, the clustering is completed. The key point is that the data object adopts the distance-based dissimilarity measurement method and determines the criterion function. For a cluster, if the sum of the distances from all sample points to the centroid is the smallest, it is considered that the difference within the cluster is the smallest.

$$d(x, \mu) = \sqrt{\sum_{i=1}^n (x_i - \mu_i)^2}$$

Where represents a sample point in the cluster, μ represents the centroid in the cluster, n represents the number of features in each sample point, and represents each feature of the constituent point. The algorithm calculates the centroid of each cluster until the centroid does not change; that is, the sum of squares of errors is locally minimum.

Where is the word frequency of the keyword, what is the total number of documents, and what is the number of documents with the keyword? However, the calculation weight method does not consider the length of documents in the set. This paper uses the *TFC* weight method, which is very similar to the *TF – IDF* function weight, but it takes the length normalization factor as the factor to calculate the word weight

$$weight(i) = \left[TF_{ij} \times bg(D/DF_i) / \sqrt{\sum_{k=1}^M [TF_{kj} \times bg(D/DF_k)]} \right]$$

If the keyword contained in a document is W_1, W_2, \dots, W_n , the document can be represented by a dimensional vector $T = \langle T_1, T_2, \dots, T_n \rangle$. Is the weight value of W_1 .

The support degree s of the item set X is $sup\ port(X)$

$$sup\ port(X) = \sigma_x / |D|$$

The credibility c of the item set X is $confidence(X = > Y)$

$$confidence(X = > Y) = sup\ port(X \cup Y) / sup\ port(X)$$

Mining association rules first determine all the frequency sets that are greater than or equal to the minimum support in the transaction data set D . Then, determine the rules with the minimum credibility in the frequency set. Finally, the association rules are obtained. An analysis algorithm similar to association rule analysis is sequence analysis, but this method has a good analysis effect, especially on the causality between data. The method generally includes the steps of sorting, generating large data items, and converting and mining sequential patterns. Among them, Apriori All, Apriori Some, and PSP are representative algorithms. Pattern mining mainly examines the user's previous command sequences and, on this basis, depicts the user's behavior patterns. If the user's behavior goes against it in the later running process of the system, it will be regarded as suspicious behavior to achieve the purpose of anomaly detection. Association rules are first put forward for the analysis of shopping baskets and are mainly used to discover customers' buying patterns, which are of great significance to business decisions. For example, when customers buy milk, some people will buy bread. As long as this pattern is discovered, merchants will arrange the storage location of goods reasonably, which is convenient for people to buy and gain the greatest benefit. At present, association rules are widely used to discover valuable relationships among data in large data sets. The relationships among the data mined by association rules are not necessarily of practical significance, so it is necessary to evaluate the effectiveness of association rules and obtain the association rules that are helpful to users. Cluster analysis is widely used. In biology, cluster analysis is

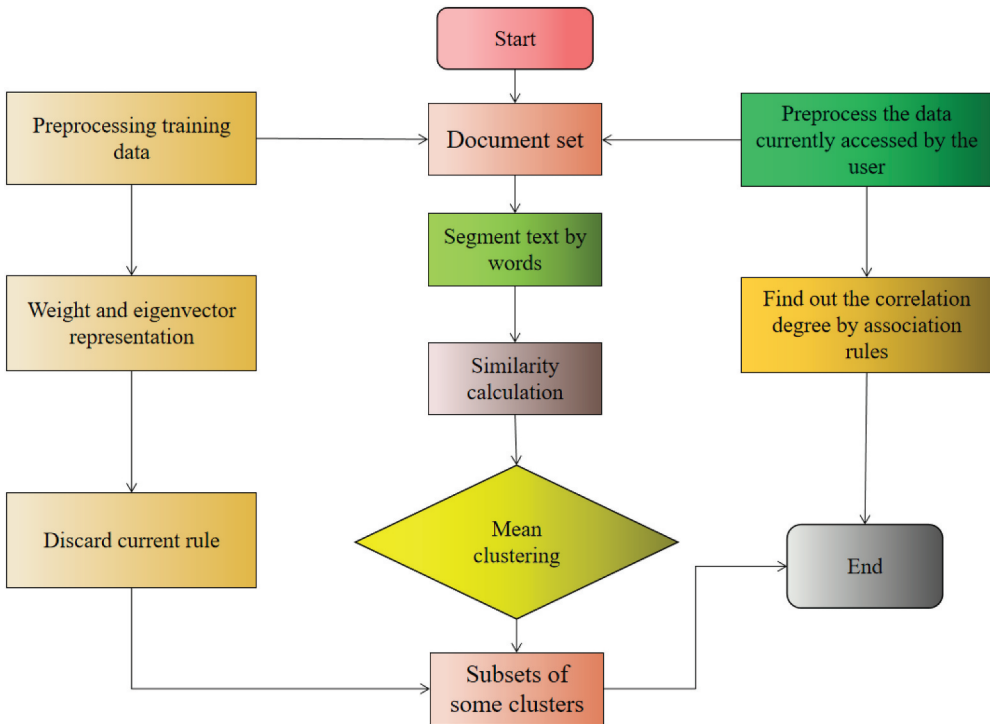


Figure 2. Algorithm flow chart of cluster analysis and association rule analysis.

a very important research method in animal and plant classification that can classify and analyze genes. In the business field, cluster analysis can help market information analysts divide consumers into different consumer groups according to their consumption information data. Each consumer group has a similar purchase pattern to formulate corresponding purchase patterns and maximize the interests of enterprises. The clustering algorithm model based on association rules adopts the idea of pooled mining, as shown in [Figure 2](#).

This module's association rule algorithm and cluster analysis improve the classical Apriori algorithm. The improved algorithm simplifies the generation strategy of frequent candidate itemsets and the operation of pattern matching between candidate frequent itemsets and transactions in the original data set. It reduces the number of required connection judgments. Simulation experiments have proven that these improved measures reduce the algorithm's time complexity. At the same time, the improved algorithm can also reduce the spatial complexity of the algorithm when there are many repeated transactions in the original data set (B'vand et al., 2017). The document set is preprocessed by word segmentation and then processed in two parts. The first part calculates the weight of each word and represents the text feature vector according to the weight. In the second part, each document is regarded as a transaction, and the keyword group in the document is regarded as a group of transaction

items. The association rule algorithm is executed to obtain the association rules based on words, and the association degree matrix between words is obtained according to the algorithm in this paper. As a result, students cannot master these basic skills quickly. To truly learn basketball well, students must love basketball, and the lag of teaching content and single teaching methods will not be conducive to the teaching of basketball courses. In addition, due to the varying level of students' basketball, it is difficult to stimulate students' interest in basketball learning, let alone cultivate students' sports awareness.

Realization of College Basketball Teaching Mode

Design of Teaching System Based on Association Rules and Clustering

There are many problems in the basketball teaching system. The existing mode and method of the basketball teaching system cannot meet the requirements of the physical education syllabus and cannot highlight the student-centered educational concept (Hao, Luo, and Pan 2021). However, in recent years, the following three teaching modes that have gradually emerged can be applied to the basketball teaching system to improve efficiency and enhance students' enthusiasm for basketball learning. By using the association rule algorithm and clustering analysis algorithm, it is possible to mine unknown groups in the data set in advance, which is a major advantage of clustering over classification methods. Finally, we can summarize the specific characteristics of each cluster by further analyzing each cluster. In basketball learning, students' acceptance ability is also quite different because of their differences. For example, students who like playing basketball every day have a relatively high basketball level; however, students who are not interested in basketball, especially girls, have little interest in basketball learning. If students' basketball foundation is relatively poor, teachers should first adopt simple teaching methods. First, students should master basketball skills and reduce their skills learning requirements. For the students of the basketball teaching system based on the association rule algorithm and cluster analysis, teachers can arrange for students to practice in pairs. In this way, students' sense of competition can be greatly improved. This algorithm belongs to the classification-based clustering algorithm, which takes Euclidean distance between data objects in the data set as the measurement standard of similarity. Among the K groups obtained after the algorithm runs, the data difference in the same group is as small as possible. In contrast, the data difference between different groups is as large as possible (Qiu and Cao 2022).

Understanding the teaching method is a major reform of the guiding ideology of the basketball teaching system. It changes from emphasizing action technology to cultivating students' cognitive ability and interest. The process of the basketball teaching system under the association rule algorithm and

cluster analysis mainly includes six cyclic parts: project introduction, game overview, tactical awareness training, instantaneous decision-making ability training, skill demonstration, and action completion. In 1982, BINGA and hope, two professors from the University of Loveburg, UK, first advocated the use of a comprehension teaching method to replace the traditional skill teaching method in ball teaching. Their guiding ideology is to take the characteristics and tactical consciousness of ball sports rather than the skill movement itself as the focus of ball teaching. Many practices have proven that the traditional basketball teaching evaluation method is relatively singular, which makes it difficult for students to master the learning situation. The evaluation of teaching includes teaching results, learning attitude, learning methods, etc. Therefore, teachers should not only pay attention to the evaluation of learning results but also pay more attention to the evaluation of the learning process and constantly encourage students to take the initiative to learn to give full play to their strengths. Understanding the association rule algorithm and cluster analysis teaching method guided students to become masters of learning. The traditional teaching concept has changed the relationship and status between teachers and students teaching. Teachers' attention has changed from the control of the basketball teaching system to the guidance of students' learning and understanding. Students learning is no longer aimless or passive. They will learn the skills of ball games according to their level and needs, which has deepened their understanding of a certain. The understanding of ball games and the continuous improvement of technical level. In the examination of PE courses, students can choose different basketball items to take the exam. Teachers should formulate the examination level and standards according to the student's actual level. Teachers randomly choose assessment methods for assessment. In this way, students are required to exercise and learn more to meet the various needs of students to cultivate their interest in basketball and finally form good exercise habits to improve their basketball skills comprehensively.

Experimental Results and Analysis

Learn the most knowledge and skills, Get the most credits, and Master a higher level of basketball knowledge and skills as soon as possible. This experiment investigated different grades of physical education classes, and the credits obtained in different semesters advocated the learning atmosphere of striving for excellence, encouraging students to spend the shortest time. Credits determine to give additional credits according to different levels of courses in different semesters. The higher the level, the more credits you receive, as shown in [Table 1](#).

As seen from the table, this way, the credit grade is widened so that the role of hierarchical teaching can be fully reflected; students are encouraged to take

Table 1. Credits obtained by different grades of physical education class in different semesters.

	First semester	Second term	Third semester	The fourth semester	The fifth semester	The sixth semester	The seventh semester
Junior class	1	1.3	0.4	0.5	0.4	0.5	*
Intermediate class	1.4	1.6	1	√	*	√	*
Advanced class	2.2	2	√	√	√	*	√
Club	*	*	*	*	*	*	*
Delegation	2	2.1	√	*	√	*	√

√ refers to the club activities at least once a week for which attendance is needed. * For voluntary club activities.

Table 2. Teaching content and class arrangement of the public basketball course.

Category	Content of courses	Teaching hours
Theoretical part	Introduction to Basketball	2
	A simple introduction to basketball referee law	3
Practice part	Footstep movement	3
	Pass and catch the ball	4
	Rebound	3

an active part in physical exercise, improve their sports ability, and advocate a learning atmosphere of striving for excellence so that every student can strive for excellent results on his basis.

The content of this teaching experiment is based on the syllabus of the Basketball Optional Course at Lingnan Normal University written by Liu Rui. The basic theory part: the first chapter is the overview of basketball, and the second chapter is the rules of basketball competitions. Practice part: The first chapter is basic technology, and the second chapter is basic tactics. The teaching content and class arrangement are shown in [Table 2](#).

It can be seen from [Tables 1 to 2](#) that through teaching experiments, it is verified whether basketball teaching can be implemented and popularized in public basketball teaching in colleges and universities. Through experiments, we can verify whether we can cultivate students' interest in sports learning, improve students' ability to engage in autonomous sports learning, improve the teaching effect of public basketball classes, and enhance students' physical quality. Through the experimental results, this paper analyzes whether the basketball teaching mode can solve the problems existing in current public basketball teaching in colleges and universities.

Three experiments were conducted for comparison, and the results of three data tests on physical fitness before the experiment are shown in [Figures 3, 4](#), and [Figure 5](#). Before the experiment, three physical fitness items were selected for testing, including 50 meters, standing long jump, and 1000 meters. The results of the three physical fitness tests of 50 meters, standing long jump, and

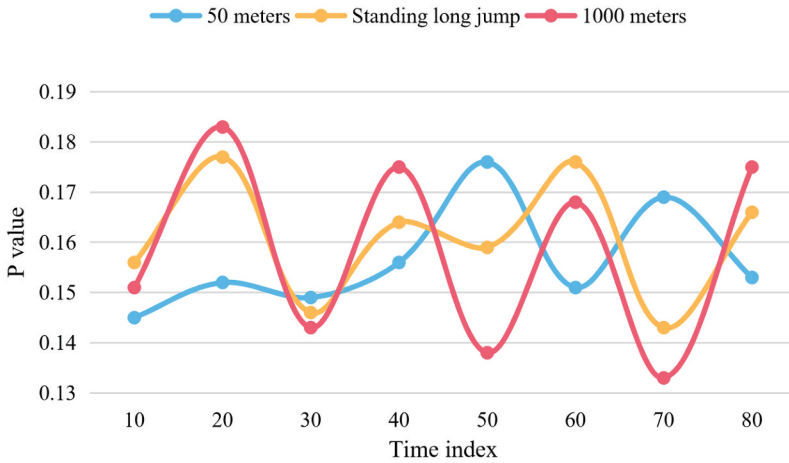


Figure 3. Physical fitness test results.

1000 meters are tested by independent sample T, the purpose of which is to test whether there are significant differences in the physical fitness level of students in the two classes before the experiment and to test the improvement degree of classroom teaching mode on students' physical fitness conveniently after the experiment.

It can be seen from Figures 3 to 5 that after the independent sample t-test of the three test scores of 50 m, standing long jump, and 1000 m, when the time index is 50, the average p-value of 50 m is 0.165, the average p-value of standing long jump is 0.1731000 m and the average p-value of standing long jump is 0.146. The *P* values obtained by the three indexes are greater than 0.08, indicating that there is no significant difference in the physical fitness level, which meets the requirements of the experiment and does not affect the

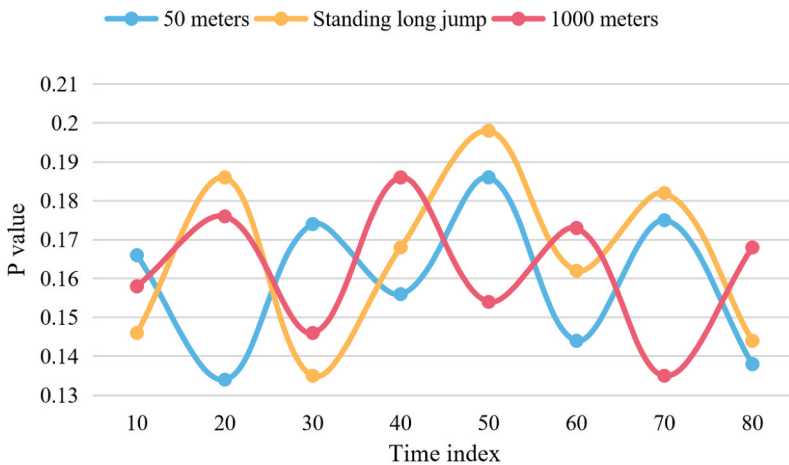


Figure 4. Physical fitness test results.

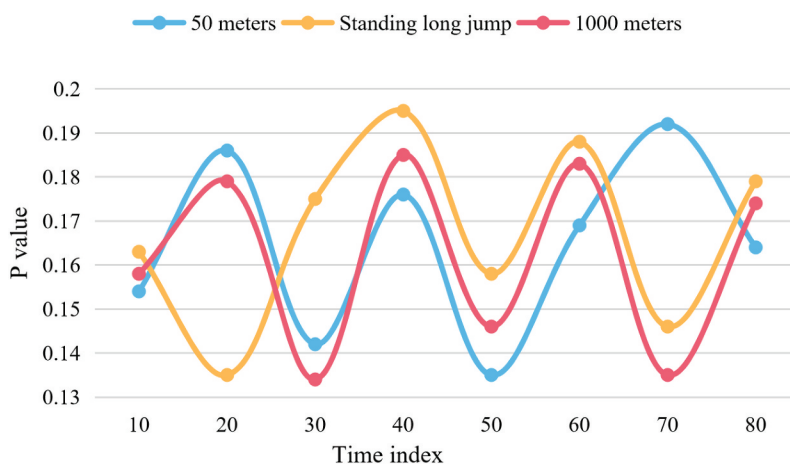


Figure 5. Physical fitness test results.

scientificity of the experimental results. This shows that there was no significant difference in the physical level of students before the teaching experiment.

Before the experiment, the students in the two classes were tested on the basic technical level of basketball, with positioning shooting as the test content. The independent sample T-test is conducted on the results of the positioning shooting test of the two classes to test whether there is a significant difference between the experimental class and the control class at the basic basketball technical level before the experiment. At the same time, the basic situation of basketball in the experimental class and control classes was directly interviewed, and two experiments were conducted for comparison. The experimental results are shown in Figures 6 and 7.

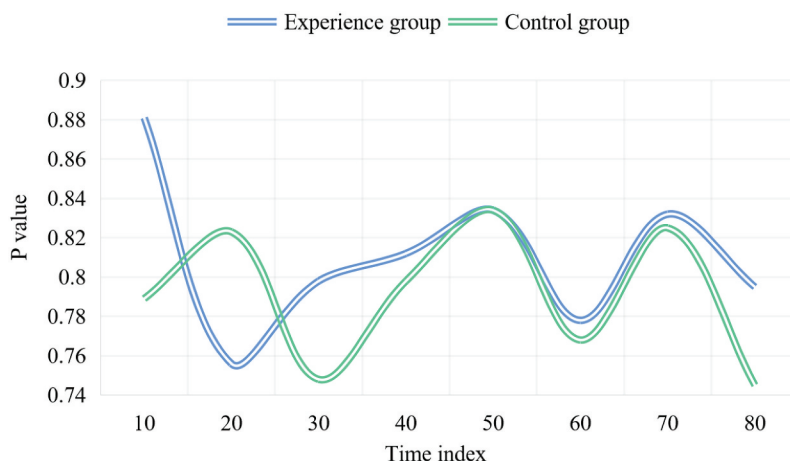


Figure 6. Test results of basic basketball skills in the experimental class and control class before the experiment.

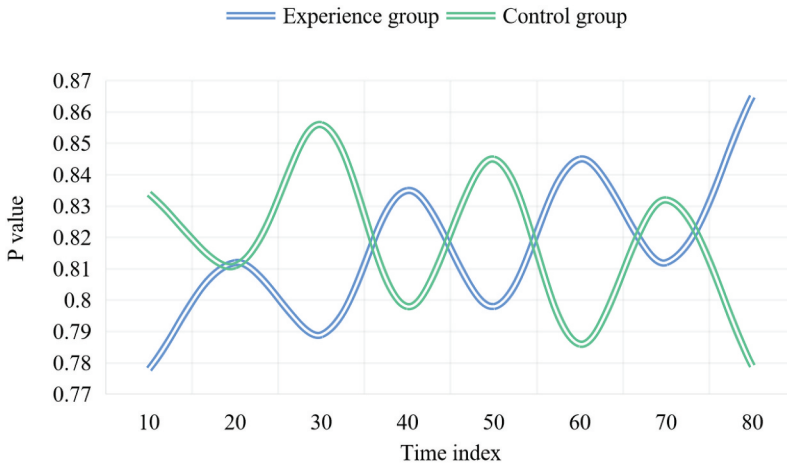


Figure 7. Test results of basic basketball skills in the experimental class and control class before the experiment.

As seen from Figures 6–7, before the experiment, the P value of position shooting between the experimental class and the control class is 0.883, which is greater than 0.06, indicating that there is no significant difference in position shooting between the experimental class and the control class. The P value of full-court round-trip straight dribble is $0.735 > 0.07$, which indicates that there is no significant difference between the experimental class and the control class before the experiment. This teaching mode plays an important role in cultivating beginners' learning interest and enthusiasm, preliminarily mastering motor skills and establishing firm technical concepts. It fully embodies the guiding ideology of teacher-led and student-centered students. Compared with traditional teaching methods, it can give full play to students' thinking and is more conducive to enlivening the classroom atmosphere and arousing students' enthusiasm and initiative.

One main difference between the current submission and previous studies is the focus on applying association rule algorithm and cluster analysis to college basketball teaching. While there have been studies that use these techniques in other domains, such as market basket analysis or customer segmentation in e-commerce, the application of these techniques to sports teaching is relatively novel. This makes the current submission unique in its focus on a specific application scenario and its potential to contribute to the optimization of sports teaching management.

Another difference between the current submission and previous studies is using an applied explainable association rule algorithm and cluster analysis. The emphasis on explainability is particularly important in educational settings, where educators need to understand how insights and recommendations are generated from data analysis. By using explainable techniques, the

proposed approach can help to build trust and understanding among educators and facilitate the adoption of data-driven teaching strategies.

Finally, the proposed approach may differ from previous studies in terms of the specific algorithms and methods used for association rule algorithm and cluster analysis. While there are various algorithms and methods available for these techniques, the proposed approach may use specific algorithms and methods that are particularly well-suited to the context of sports teaching. This may include adaptations or modifications of existing algorithms to capture better the unique features of sports teaching data, such as player movement patterns or game strategies.

Overall, the current submission offers a unique contribution to machine learning by focusing on a specific application scenario in college basketball teaching, emphasizing explainability in data analysis, and potentially using specialized algorithms and methods tailored to the context of sports teaching.

Conclusions

In general, in the face of the far-reaching impact of mobile computing on college PE, we must constantly develop and reform the PE teaching model and promptly change the thinking of PE administrators and teachers. Under the thinking of mobile computing, a teaching application platform of mobile computing is built to enrich the physical education teaching mode and better serve the students' personalized independent learning.

This paper proposes an applied explainable clustering algorithm based on association analysis for the college basketball teaching mode. The algorithm adopts the idea of pooled mining. First, the association degree matrix of keywords is obtained using the association rule algorithm. Then, the weight value of words is calculated and represented by an eigenvector. Finally, the sentence similarity value is calculated using a certain algorithm, and the K-means clustering algorithm is implemented. The clustering accuracy and recall rate are relatively high. Through the research on the college basketball teaching mode through the association rule algorithm and cluster analysis, it is concluded that the p-value of positioning shooting in the basic basketball skill test between the experimental class and the control class before the experiment is 0.883, which is greater than 0.06, indicating that there is no significant difference between the experimental class and the control class before the experiment. The p-value of round-trip straight dribble in the whole field is 0.735, which is greater than 0.07, indicating that there is no significant difference between the experimental class and the control class before the experiment. This teaching mode plays a significant role in cultivating beginners' learning interest and enthusiasm, preliminarily mastering movement skills and establishing solid technical concepts. In the examination of PE courses, students can choose different basketball items to take the exam.

Teachers should formulate the examination level and standards according to the students' actual level. Teachers randomly choose assessment methods for assessment. In this way, students are required to exercise and learn more to meet the various needs of students to cultivate their interest in basketball and finally form good exercise habits to improve their basketball skills comprehensively.

The proposed technique of using association rule algorithm and cluster analysis in college basketball teaching has the potential to be extended to cover a wider scientific area beyond sports teaching. By analyzing large datasets using these techniques, it is possible to identify patterns and relationships that may not be readily apparent using traditional statistical methods. This can provide valuable insights into various scientific areas, including social sciences, economics, and healthcare.

For example, in social sciences, the association rule algorithm and cluster analysis can help identify patterns and relationships in large datasets related to human behavior and social interactions. This can provide insights into how individuals and groups behave in different contexts and inform the development of interventions to improve social outcomes.

In economics, using association rule algorithms and cluster analysis can help identify patterns and relationships in large datasets related to consumer behavior and market trends. This can inform business strategies and marketing campaigns and contribute to developing more effective economic policies.

In healthcare, using association rule algorithms and cluster analysis can help identify patterns and relationships in large datasets related to disease outbreaks and public health issues. This can inform the development of interventions to prevent the spread of disease and improve public health outcomes.

To extend the proposed technique to cover a wider scientific area, it is important to ensure that appropriate data collection and analysis methods are used and that ethical considerations related to privacy and data protection are addressed. Additionally, it may be necessary to adapt the specific algorithms used for association rule and cluster analysis to suit the specific research question being investigated.

The paper proposes applying an association rule algorithm and cluster analysis in college basketball teaching to optimize the management of sports teaching. The proposed approach has several potential advantages, including:

- (1) Improved data analysis: Using association rule algorithm and cluster analysis can help identify patterns and relationships in large datasets that may be difficult to discern using traditional statistical methods. This can provide valuable insights into student learning outcomes and help to inform teaching strategies.

- (2) Enhanced teaching management: By analyzing student performance data using an association rule algorithm and cluster analysis, it is possible to identify areas of strength and weakness in teaching and adjust teaching strategies accordingly. This can help to improve teaching effectiveness and enhance student learning outcomes.
- (3) Promotion of collaborative learning: Cluster analysis can help identify groups of students with similar learning needs and styles. This can facilitate the formation of collaborative learning groups and enhance teamwork and cooperation among students.

However, there are also potential drawbacks to the proposed approach. These include:

- (1) Limited data availability: Using association rule algorithms and cluster analysis requires a large amount of data, which may not always be available in the context of college basketball teaching. This can limit the ability of the proposed approach to provide meaningful insights into student learning outcomes.
- (2) Complexity: Using association rule algorithms and cluster analysis can be complex and may require specialized technical expertise. This can be a barrier to adoption for some educators.

Overall, the proposed approach has the potential to improve teaching effectiveness and enhance student learning outcomes. However, careful consideration must be given to the potential drawbacks and ethical considerations associated with using association rule algorithms and cluster analysis in college basketball teaching.

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Data Availability Statement

The data set can be accessed upon request.

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