Research on Physical Education Teaching Quality Improvement Based on Clustering Analysis

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Abstract: With the ever-expanding scientific research scale and the influence of the trend of "integration, comprehensiveness and systematization" of modern scientific knowledge, the idea and enthusiasm of the common research topics among the disciplines in physical education (PE) have been activated. The physical education research gradually develops to a highly differentiated and integrated aspects of teaching scientific research, which has solved many complex theoretical and practical problems in the development of physical education. In order to further promote the nationwide fitness program, clustering analysis method has played an important role in physical education research for the implementation of the Olympic Games glory strategic plan. Hot topics in modern PE research, such as China's sustainable development of competitive PE research issues, China's national sports power and state policy research issues, competitive PE reserve personnel optimization training mode research issues etc. need to be highly integrated. By analyzing and discussing the existing problems and evaluation systems of China's physical education, this study aims to improve the theory of China's higher physical education evaluation system, and to provide a reference for exploring the improvement measures for the further study of PE teaching problems.

1. Introduction

With the rapid development of science and technology and the continuous popularization of sports, especially since the reform and opening up, the mass emergence and quotation of physical education research at home and abroad has promoted the rapid development of physical education in our country. Physical education has developed into a relatively independent discipline system [1]. Since 1981, China has set up a master's degree program in physical education in colleges and universities. In 1986, it started to set up a doctoral program in physical education at colleges and universities [2]. In 1997, under the discipline of sports theory, sports biomechanics, sports physiology, sports biochemistry, sports training, physical education theory merged with the humanities and social science, producing the sports human science, sports education and training of traditional sports and other subjects [3]. The continuous improvement of the disciplinary system of sports and the continuous development of physical education play an increasingly important role in raising the level of competitive sports, enriching people's cultural life and enhancing the constitution of the people [4]. To this end, all-round, multi-angle, deep examination and discussion of contemporary physical education research development status and development trend for physical education research out of fruits, more results, and constantly improve the quality of research results, to speed up the scientific development of physical education needs.

However, from the retrieved domestic research results on the development of sports disciplines, most of them are from the perspective of macroscopic qualitative research, which includes the construction of disciplinary system of four second-level disciplines of physical education and the sports of China Sports [5]. The current situation of research in the field of disciplines is to research hot spots and the trend of physical education at home and abroad; at the same time, a small number of scholars also found

that the use of citation analysis of this quantitative method statistic analysis of physical education and technology in a period of time research status and research hot spots Some problems and countermeasures are explored, but so far no scholar has used the method of bibliometric analysis of poems in the study of physical education. In view of the fact that there are few empirical studies to explore the development of sports disciplines from the perspective of information science, this study draws forth a comprehensive and comprehensive application of citation analysis methods, co-word clustering analysis methods and logic analysis methods in bibliometrics so as to make a deeper study and discussion Research Progress of Physical Education Level Two Subjects in China in Recent Ten Years.

Clustering analysis is a statistical analysis method, which can analyze the aggregation among some scattered influencing factors and help to extract the key factors from the complicated influencing factors [6]. We use cluster analysis method to analyze the current influencing factors of PE teaching quality evaluation in our country, extract the key factors from it, and explore the improvement measures for the further study of PE teaching problems.

2. Current Situation of College PE Teaching Quality in China

Based on the "Basic Standards for Physical Education in Colleges and Universities" requirements [7], it is necessary to fully implement the education policy, the school physical education into school quality education in all its work. Constantly update the basic model of personnel training in colleges and universities in our country, train students to master the basic knowledge, skills and basic methods of scientific physical training, learn at least two items of physical exercise, and gradually develop good exercise habits to maximize the effective excavation of school PE in moral education, intellectual development, body health, aesthetic qualities and healthy lifestyle in the formation of a variety of educational functions, and comprehensively enhance the overall quality of students. "The National General Distance Education Physical Education Curriculum Guide" should take the school physical education as a middle school in physical education work. According to the outline of the course guidance, the quality of physical education in colleges and universities in our country should accomplish two goals: First, the basic goal is divided into five areas. Including sports participation goals; sports skills goals; physical health goals; also health goals; social adaptation goals. Second, development goals cover the participation of sports goals, which are divided into five areas of goals: the participation of sports goals, sports skills goals, physical health goals, health goals and social adaptation goals.

2.1 Formulation and Implementation of PE Teaching Standard and Plan

It is well-known that the standard of PE curriculum now being implemented is also the previous syllabus. As a baton of teaching in our country, it plays a very important role in teaching [8]. Physical education is the same school, requiring teachers to practice teaching according to the standard curriculum. The inspection and assessment of the superior department in charge of the mouth is also it. Specific to physical education teachers teaching standards (that is, teaching plan) to be directly related to the implementation of physical education curriculum. The implementation of curriculum standards for practical teaching to avoid the failure to meet the requirements of the curriculum standards and beyond the scope of the curriculum standard for teaching is the basic responsibility of each college PE teacher's basic responsibility.

According to the survey data, only 25.00% of private colleges and universities in our country use the standard of national physical education curriculum and have formulated their own sports teaching plan. The corresponding quarter-quarters of the private institutions of higher learning to implement their own schools and the uniform development of physical education teachers to develop their own curriculum standards or teachers carefully prepared teaching schedule and plan, and based on the school flexible conditions were adjusted. According to these physical education teachers, sample sending can motivate students more actively and make adjustments according to the preferences of students. Students can meet their basic needs and cater to students 'preferences and enhance students' academic performance. However, the survey found that under many circumstances, the teacher-run PE teaching program only

considered the students and deviated from the standard of the course, which was not covered by the necessary contents of the course standards. The course standard was knitted by experts for many years, and after the practice of testing and adjustment, with good scientific and systematic development of college students have a good guide.

It is unscientific and impractical for such a curriculum plan to be developed through the challenge of a physical education teacher without the good implementation of the curriculum standards. Teachers themselves are also greatly reduced in implementing their own good teaching plans.

Table 1 shows that only about 12.50% of school teachers strictly according to their teaching progress to complete their own plans. However, more 87.5% of school PE teachers reported that they had made some tentative adjustments because of a variety of reasons, including the school squeeze-out of class hours, and excessive adjustments in the target formulation so that they could only partially implement the teaching plan in education and teaching. Survey found that there are individual leaders and teachers of private colleges and universities said that the physical education curriculum is just the case, to develop, to implement it. Its attitude completely reflects the lack of attention and its implementation can be imagined.

Tab.1   Formulation and implementation of the standard of college physical education in China (n = 160)

Teaching curriculum standards for the situation			Teaching curriculum standards implementation		
Item	Number	Ratio	Item	Number	Ratio
Unified Curriculum Standards	40	25.00%	Strictly Enforced	20	12.50%
School-based Curriculum Standards	100	62.50%	Executed Most	100	62.50%
Self-made Course Standard	20	12.50%	Course standard is only Formalistic	40	25.00%

2.2 Physical Education Teaching Objectives

At present, the goal of PE teaching implemented by college teachers is the refinement and concrete manifestation of the teaching curriculum standard, which is the ultimate goal of implementing the teaching standard and plan. The survey found that the teaching objectives set by PE teachers in private universities vary greatly, and the teaching objectives of teachers with the same teaching content and even the teachers in the same school are also very different from each other.

The survey in Table 2 shows that 93.75% of physical fitness goals are cultivated, and 93.75% of the schools mobilize students' interest greatly. The corresponding sports goal only contains 31.25%. According to the order of the primary and secondary sports content, it is found that the preferred teaching goal of physical education teachers in private universities is consistent with that of ordinary colleges and universities. However, Table 2 shows that the first priority is to cultivate a healthy body, but to mobilize students' interest in sports, physical exercise is located in the second and third place. The idea of establishing lifelong sports is involved, but the degree of emphasis is far from the requirements of the curriculum standards and therefore needs constant revision and enhancement.

Tab.2   Physical Education Teaching Objectives and its Primary and Secondary Sequence (n=160)

Physical Education Goal	Ratio (%)	Ranking
Cultivate a healthy and healthy socialist successor	93.75	1
Mobilize and develop student interest in sports	87.50	2
Make students establish lifelong sports thought, and master the method of lifelong physical exercise	31.25	3

2.3 Investigation and Analysis of Physical Education Teaching Content

Physical education teaching content is a direct reflection of the goals. The teaching content setting and implementation can well reflect the basic teaching situation. The survey shows that many private colleges and universities physical education content by sports venues and equipment and other factors, constraints, the physical education curriculum settings are not reasonable. Mentioned above, many physical education teachers to meet the preferences of students, made the appropriate adjustments, resulting in less demanding teaching content of the instruments, making entertainment teaching activities a lot. It can be concluded from Figure 1 that private undergraduates in China are better off than undergraduates. Undergraduate teaching more comprehensive health. The content of entertainment accounts for one part, while the basic content of teaching accounts for only about one-fifth. College students physical education content, entertainment content more. Teachers reflect that such an arrangement mainly takes into account the physiological and necessary development of undergraduates. Physical education content more choice entertainment and comprehensive content.

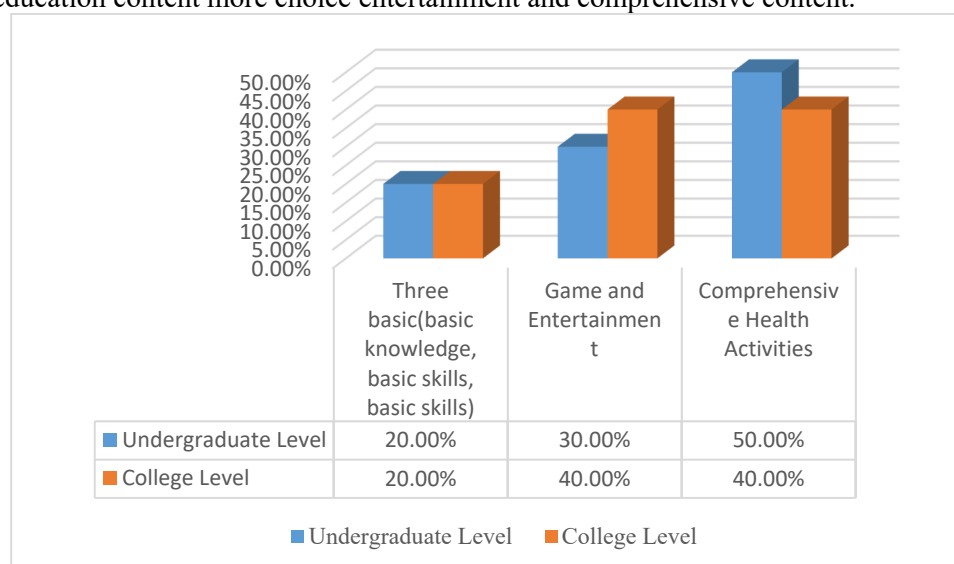|	Three basic(basic knowledge, basic skills, basic skills)	Game and Entertainment	Comprehensive Health Activities
■ Undergraduate Level	20.00%	30.00%	50.00%
■ College Level	20.00%	40.00%	40.00%

■ Undergraduate Level ■ College Level

Fig.1   College Physical Education Content Selection

However, in practical teaching, teachers should grasp the scale and make college students develop strong will in entertainment and comprehensive training to form good quality and lay the foundation for fierce social competition. Grasp well to mobilize students interest and enthusiasm to complete the basic goal of physical fitness. Especially in the comprehensive activities to enable students to have the spirit of unity and cooperation, to master the methods of cooperation, with a certain degree of interpersonal harmony. But also guide students in the active physical exercise at the same time, also planted the seeds of sports, have the awareness of lifelong sports. Colleges and universities are an important position. Private colleges and universities are not only an integral part of the teaching content, they have more autonomy, which makes them have more opportunities to develop more space for teaching reform. The leaders of Anhui private colleges and universities should pay great attention to the arrangement of physical education teaching content. All PE teachers in private universities attach importance to the implementation of teaching contents so that they can accomplish their teaching goals satisfactorily while serving the teaching reform and curriculum development better.

3. Research on Clustering Methods

Clustering is a process that divides a data set into several classes or clusters and makes the data objects in the same group have a high degree of similarity while the data objects in different groups are not

similar. Similar or dissimilar metrics are based on the value of the data object description. Usually is to use (the distance between objects) to describe.

A set of physical or abstract objects are divided into groups according to the similarities between them. Similar objects form a group, and the process is called clustering. A clustering (clustering), also known as a cluster, is a set of objects that are similar to each other, and objects in different clusters are usually dissimilar. Clustering analysis is to search data objects from a given data set.

3.1 Clustering Analysis Definition

Clustering analysis is an important human behavior. As early as in childhood, a person learns to recognize different objects, such as cats and dogs, animals and plants, by continuously improving the subconscious classification pattern. Clustering analysis has been applied to many areas, including: pattern recognition, data analysis, image processing and market analysis. By clustering, one can identify open and crowded areas and find out that the entire distribution model type, as well as the data between the existence of valuable correlations.

The typical applications of cluster analysis are as follows: On the commercial level, cluster analysis can help marketers find groups of different characteristics existing in the customer base and use the purchasing mode to describe these customer groups with different characteristics. In biology, cluster analysis can be used to obtain the taxonomies that animals or plants are present in and to classify them according to their function to gain a deeper understanding of the structures inherent in the population. Clustering can also help to identify areas with similar land use from Earth observation databases. In addition, you can help categorize documents on the Internet for information discovery. As a function of data mining, cluster analysis can also be used as a standalone tool to help analyze the distribution of data, understand the characteristics of each data class, and identify the data classes of interest for further analysis. Of course, cluster analysis can also be used as a preprocessing step for other algorithms, such as classification and qualitative induction algorithms.

Data cluster analysis is a booming area. The areas involved in cluster analysis include: data mining, statistics, machine learning, spatial database technology, biology and marketing. Due to the increasing amount of data contained in each application database, clustering analysis has become a very active research topic in data mining.

As a branch of statistics, clustering analysis has been around for many years and these studies mainly focus on distance-based clustering analysis. Many statistical software packages, such as S-Plus, SPSS, and SAS, include many clustering methods based on k-means, k-centers, and many more. In machine learning, cluster analysis belongs to a non-instructor-led learning method. Unlike classified learning, no (teacher) supervised learning does not rely on a predetermined set of data categories, as well as a set of learning training samples labeled with data categories. Because of this, cluster analysis is a learning by observation, not a teaming by example. Concept clustering method, only when a group of objects can be described by a concept, these objects can form a class. This is different from the traditional clustering method that represents the degree of similarity based on the geometric distance and performs clustering. Concept clustering method mainly consists of two parts: find the appropriate class; according to each class to form the corresponding feature description, which is similar to the method in the classification of learning. The basic guiding ideology of cluster analysis is to maximize the similarity of objects in a class and to minimize the similarity between classes.

In data mining, much of the work has focused on designing methods that enable efficient and efficient clustering of large databases. Relevant research topics include: scalability of clustering methods, clustering analysis of complex shapes and complex data types and their efficient and efficient clustering techniques, high-dimensional clustering techniques, and clustering analysis in mixed numeric attributes and symbolic attribute databases.

3.2 Clustering Process

In practical application of cluster analysis, we decompose the whole process into three parts according to the presence or absence of field knowledge. Each step has its explicit tasks, so that we can have a clearer understanding of the whole cluster analysis process.

The first step is feature extraction. Its input is the original sample, which features are used by field experts to profoundly characterize the nature and structure of the sample. The result of feature extraction is the output of a matrix, with each row being a sample and each column being a feature variable. The merits of the selected features will directly affect the future analysis and decision-making. If the first step is to select a feature variable that has nothing to do with the intent of the clustering, trying to get good clustering results is no different. Because no matter how good the subsequent steps using clustering algorithm selection scheme, it is impossible to calculate the executor's intentions. Reasonable feature selection scheme should make similar samples in the feature space closer, heterogeneous samples are far apart.

In some applications, it is also necessary to perform some post-processing on the obtained sample matrix. For example, in order to unify the dimension, the variables are normalized so that variables of different dimensions are comparable. In some cases, too many characteristic variables may be selected, which is not conducive to future analysis and decision making. Dimensional treatment; the characteristic variables selected based on experience and domain knowledge may be related, and the principal component analysis can eliminate the correlation between variables and get some independent characteristic variables.

The second step is to perform a clustering algorithm to obtain a cluster pedigree map. The input to the cluster is a sample matrix that visualizes a sample as a point in the feature variable space. The purpose of the clustering algorithm is to obtain the nature of "Baotuan" which reflects the most essential of these sample points in N-dimensional space. This step does not involve the participation of a field expert who does not consider any domain knowledge except geometric knowledge and does not consider the specific meaning of the feature variable in its field, simply considering it as one dimension in the feature space. The output of the clustering algorithm is generally a clustering pedigree map, which reflects all the classification conditions from coarse to fine; or directly gives a specific classification scheme, including a total of divided into several categories, each category contains those sample points and so on.

The third step is to select the appropriate classification value. After getting the cluster phylogeography, domain experts rely on the experience and domain knowledge, according to the specific application, decide the threshold selection. After selecting the closed value, the classification scheme can be directly seen from the cluster spectrum diagram. Without the involvement of experts in the field and without considering the specific application background, relying solely on looking for clustering index mutation points from the cluster pedigree, or finding the long side of the minimum spanning tree and so on, often do not get satisfactory results.
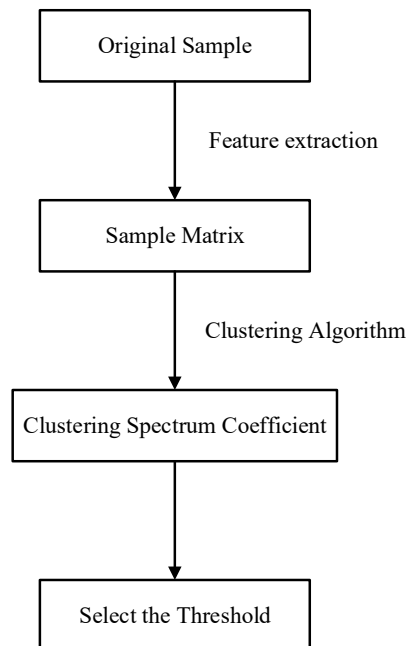
Fig.2   Class process diagram

In short, the practical application of cluster analysis is a multi-participatory process. It cannot be separated from experts in the field. The clustering algorithm is just a part of the whole clustering process. The experts who rely on clustering algorithms generally will not be satisfied.

3.3 MS SQL Server Analysis Services Overview
Data mining is a very active emerging field in the research of international artificial intelligence and database. Rapid growth of massive data collection In large databases, without strong tools to help, the result is that important decisions are not based on the wealth of information in the database, but on the mindset of policymakers. In order to effectively use computers for data mining, many data mining tools have been developed. Currently on the market to provide data mining products) - the business is very much, such as the famous products SAS Enterprise Miner, NCRTerad Warehouse Miner, SPSS Clementine 7.0, SQL Server 2000 data mining components, Dminer and so on. These products have their own characteristics.

Microsoft has developed a set of data storage and management tools based on its own strengths and fully supports Extensible Markup Language (XML) and has a new, integrated data-mining engine that integrates data mining engines with SQL Server 2000 Analysis services, thus greatly reducing the complexity of this advanced and powerful tool. Data Mining is a new addition to SQL Server's suite of data management tools. It can run independently of SQL Server in other systems engineering, providing a powerful OLAP environment.

MS SQL Server 2000 Analysis Services components named: Analysis Services, which includes online analytical processing (OLAP) and data mining in two parts. Microsoft implemented two algorithms in OLE DB Provide for DM: Microsoft Decision Trees and Microsoft Clustering These two algorithms cover two important areas of data mining: classification (and prediction) and clustering.
SQL Server 2000 Analysis Services mainly includes Analysis Server and PivotTable Services.
Server Architecture. Analysis Services Analysis Server Structure As shown in Figure 3, Analysis Services enables the server to create and manage multidimensional OLAP cubes and provide the data to clients through PivotTable Services.

Client Structure: PivotTable. The client's application connects to the PivotTable service through an interface or object model. The PivotTable service communicates with the analytics server through a specialized protocol and returns the OLAP data to the client.
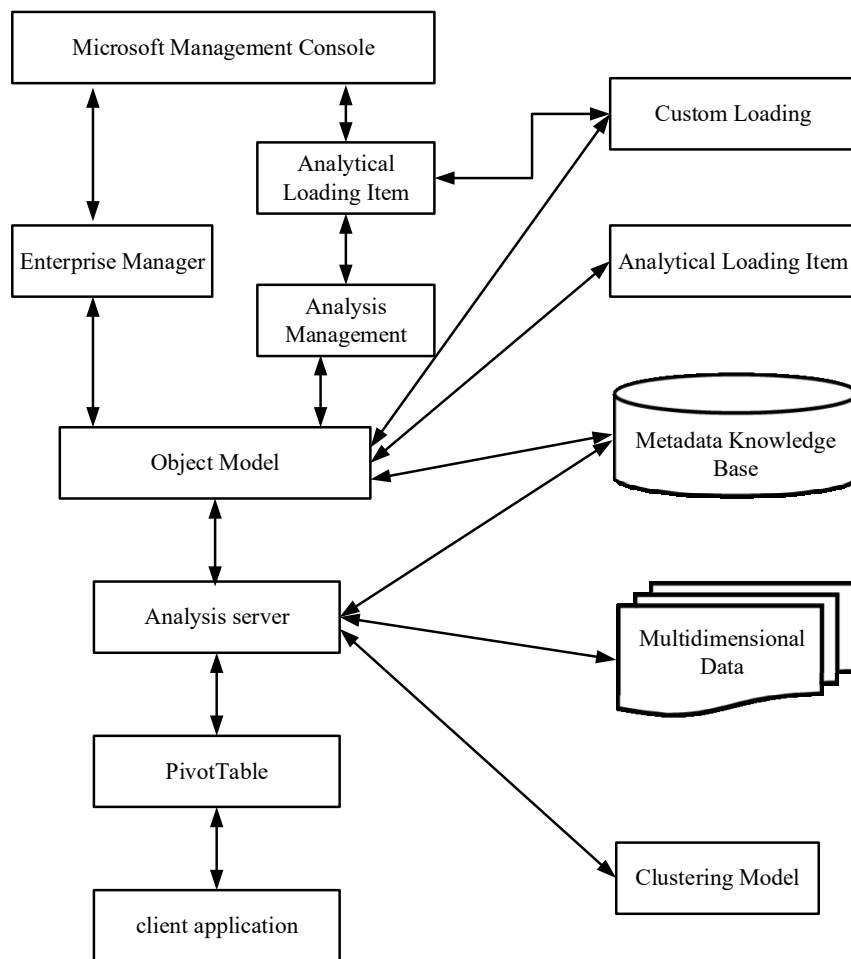
Fig.3   Analysis Service structure

3.4 Evaluation Results Clustering Analysis

According to the contents and standards of the PE teaching evaluation (as shown in Table.3), the quality of teaching is evaluated (N = 245) for PE teachers in colleges and universities randomly selected from China. MS SQL Server 2000 Analysis Services statistical analysis software is used to do the cluster analysis, and the result is shown in the Figure.4.

Tab.3   Physical Education Teaching Quality Evaluation Project Content and Standards

Number	Evaluation of project content and standards	Weights	Rating level			
			A	B	C	D
			10	6	3	
			0	7	3	0
1	Lecture enthusiasm, full of energy	5				
2	Lectures are contagious, articulate, vivid and attractive to students	8				

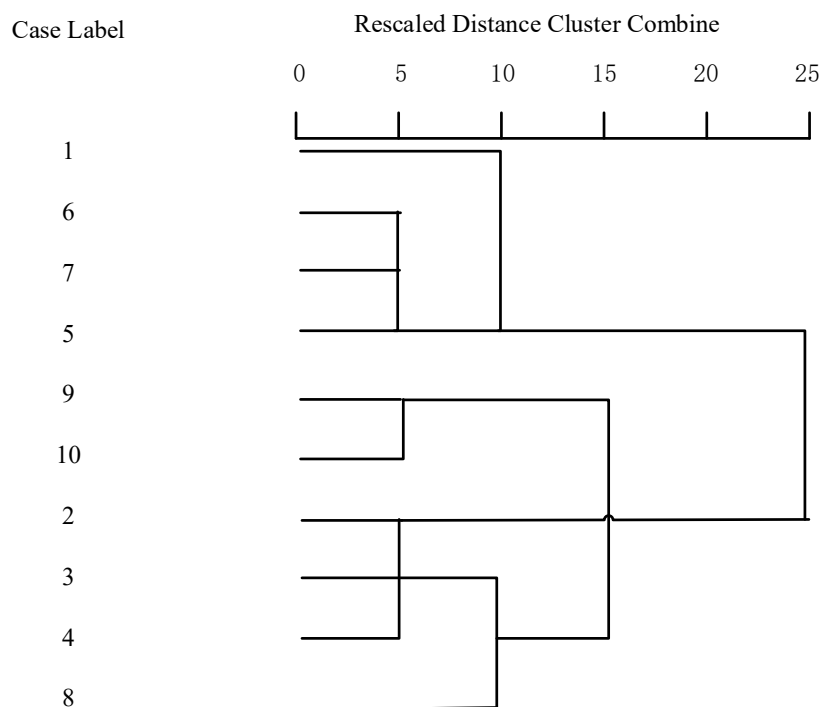| 3 | Explain the problem in simple terms, instructive | 8 |
4	The explanation of the problem is concise and accurate, the key points are highlighted and the thinking is clear	8
5	Skilled in content, easy to use	6
6	Venue application and team transfer in teaching is reasonable	6
7	Action demonstration is accurate, the venue layout is reasonable	6
8	Give students thinking, thinking, innovative inspiration	7
9	Can stimulate students 'interest in this subject knowledge, mobilize students' emotions, active classroom atmosphere	9
10	According to the teaching content, can effectively use a variety of visual, modern teaching methods for teaching	9

Fig.4   Hierarchical Cluster Analysis

As can be seen from the Table 3 and Figure 4, 10 PE teaching quality evaluation items are extracted and aggregated into two categories, of which 2/3/4/8/9/10 are a category mainly reflecting that the teachers Overall control and knowledge of the lesson, after-school student mastery and practice situation; the 1/5/6/7 items are a category, mainly reflects the teacher's preparation of the curriculum schedule, preparation before class, in-class counseling, after-school assessment and other basic aspects of control ability.

4. Conclusion

Taking the teaching of college physical education in our country as the research object, this article takes various methods to influence the quality of physical education in our country, including the common teaching methods of physical education, the evaluation methods of sports scores, the students' attitudes

towards physical education, the source of sports funds and put into the status quo to conduct research. Secondly, based on the analysis and research of the clustering mining technology and its basic concepts, the clustering analysis is applied to the teaching evaluation by systematically summarizing and classifying the clustering data mining technology. Based on MS Analysis Services, Applying the analysis of the relevance of speaking courses to find out some of the hidden rules behind the problems and provide a basis for teaching evaluation.

Finally, the countermeasures to improve the quality of physical education in colleges and universities in our country are put forward. The first is to improve the level of teachers. Strict control of new teaching qualifications, enhances the existing teacher education level; strengthens training, at the same time, maximizes the treatment of teachers. The second is to improve the level of physical education. Effectively change the teaching methods and means; strict implementation of physical education norms; the establishment of integrated curricular and teaching models. The third is to improve the level of sports software and hardware construction, to maximize the logistical support to improve the quality of teaching. The above strategies and the related research in this paper have certain guiding effect on the quality of physical education in colleges and universities in our country.

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