

Retraction

Retracted: Facing Big Data Information Fusion and Data Mining Technology to Construct College Physical Education Teaching Evaluation System

Journal of Sensors

Received 17 October 2023; Accepted 17 October 2023; Published 18 October 2023

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/participant consent to participate, and/or agreement to publish patient/participant details (where relevant).

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external

researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] Y.-t. Ma, "Facing Big Data Information Fusion and Data Mining Technology to Construct College Physical Education Teaching Evaluation System," *Journal of Sensors*, vol. 2021, Article ID 7168855, 15 pages, 2021.

Research Article

Facing Big Data Information Fusion and Data Mining Technology to Construct College Physical Education Teaching Evaluation System

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Received 26 August 2021; Revised 9 October 2021; Accepted 26 October 2021; Published 16 November 2021

Academic Editor: Mu Zhou

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The purpose is to enrich the evaluation system of physical education (PE) teaching in colleges and universities and to improve PE teaching methods and improve teaching quality. Based on big data information fusion and data mining technology, firstly, the related theories of teaching evaluation are analyzed and expounded, as well as the characteristics and principles of the construction of college PE teaching evaluation system. Secondly, from the perspective of evaluation index system of sports teachers' teaching and students' sports teaching, the content and evaluation index of college sports teaching evaluation are analyzed under the background of big data information fusion and data mining by questionnaire survey. Combined with model test, the results show that traditional college sports teacher pays more attention to the design and teaching methods of PE and ignore the learning process of students. The evaluation process of PE ignores the individual differences of students, the feedback method lacks openness, and the evaluation process is isolated. Based on the big data technology and teaching evaluation theory, the evaluation index is designed for PE teaching in colleges and universities. The average value of the first layer indexes is above 4, and the coefficient of variation is less than 0.2, which can basically reflect the content of PE teaching evaluation and provide some reference for the research of PE teaching evaluation.

1. Introduction

Physical education (PE) teaching evaluation is an important part of the PE teaching process. The evaluation method, evaluation executant, and evaluation object directly affect the improvement of the PE teaching quality and the development and progress of teachers and students in PE classes in colleges and universities. At present, the evaluation of college PE teaching is mainly based on students' evaluation of online teaching at the end of the semester [1]. Students are scored according to the classroom situation of PE teachers and the teaching evaluation elements formulated by the school. Finally, PE teachers have made achievements in PE this semester. This model has serious deviation, which is a significant obstacle to the model for education at all levels and PE in China. In addition, the training of PE talents and the quality of education in the index system are one of

the key elements to measure the overall quality of students. To adapt to the requirements of the development of the times, school education and teaching reform are constantly being processed to ensure that students' professional knowledge level, physical level, and mental state can meet the social expectations of innovation level and personnel training objectives [2]. Colleges and universities are the last implementation stage of PE teaching in junior high school and university. They not only involve the all-around improvement of students' physical quality and spirit, and the comprehensive promotion of quality education, but also take charge of the implementation of national activities of physical conditioning and higher education personnel training [3]. However, due to many historical and social factors, college PE teaching is far from universally recognized. Therefore, in addition to increasing support in PE teaching and talent team construction, it is necessary to carry out

the essential investigation on the teaching process and assessment results, explore the existing problems, and find the direction for improvement.

With the rise of large-scale application, automatic evaluation becomes possible for college PE teaching. A large amount of data can be provided to evaluate PE teaching, making the evaluation of PE teaching more scientific and fairer. Based on information fusion of big data and data mining technology, PE teaching evaluation can provide more timely feedback on the evaluation results of PE teaching [4]. Appearing of information fusion of big data and data mining technology rises a doubt on the current technology, system and system of PE evaluation system, and other aspects. Therefore, it is necessary to explore and establish a peer PE teaching evaluation system to meet the era of big data, which is reliable and operable and really conducive to the development of students and PE teachers [5]. In the traditional PE teaching, the final examination results are the only standard to measure and evaluate students, which is not conducive to the all-round development of students. The application of big data enables schools to evaluate all aspects of students and teachers, rather than just one aspect of students or teachers [6]. For example, when evaluating students' PE, students' physical ability, physical ability, theoretical knowledge, learning attitude, and progress should be all put into consideration. In the evaluation of teachers, both students' achievements and teachers' classroom effect, record work should all be given attention [7].

Based on this, a college in Shaanxi Province is taken as the research object. A systematically study is made on the construction of college PE teaching evaluation system. And the components of the evaluation system are analyzed. The innovation is the combination of big data information fusion and data mining technology and the research of PE teaching evaluation system. The purpose is to provide reference information for PE teaching and the comprehensive quality training of talents in colleges.

2. Construction Theory of College PE Teaching Evaluation System under the Background of Big Data

2.1. Big Data and Data Mining. Big data is a set of data with large capacity, multitype, fast access, and high application value. It is rapidly developing into a new generation of information technology and services to collect, store, and analyze large amounts of data from different sources and of various formats and to discover new knowledge, create new values, and improve new capabilities [8]. Continuous assessment methods and evaluation of subjects of PE teaching are beneficial to the healthy development of the fair evaluation system, which can promote PE teaching and improve the teaching level of college PE [9]. Therefore, the advantage of big data should be utilized to ensure the integrity of the evaluation means and topics, through online, offline, and comprehensive evaluation means. Moreover, the evaluation subjects should be diversified, including the evaluation from subordinates, students, and teachers to superiors, and the

evaluation from students and peer teachers to teachers, to ensure the fairness and objectivity of the evaluation. In this way, the attention of teachers and schools can be attracted to PE teaching, to ultimately promote the healthy development of school PE teaching [10]. In the era of big data, new technologies have become the mainstream. In such an environment and situation, it is also the development trend and a smart popularization to promote peer education by virtue of these new technologies which accelerate people's pace of life and improve people's work efficiency [11]. On the evaluation of college PE teaching, the traditional manual statistics and evaluation methods not only need lots of manpower and material resources but also are prone to errors. In contrast, intelligent evaluation methods can not only reduce unnecessary consumption but also ensure the speed and accuracy of evaluation, which is consistent with the development trend of the new era [12]. According to the traditional evaluation method of PE teaching in colleges and universities, the evaluation of students and teachers is generally manual [13]. There are likely to be calculation mistakes in this evaluation process which requires a lot of human and material resources and cannot achieve ideal effects efficiently [14]. However, the application of artificial intelligence (AI) to PE teaching evaluation system can achieve practical and fast results with few errors [15]. The AI technology can quickly collect, count, classify, and analyze students' indexes and data for the college PE evaluation system, save considerable time, and reduce errors with the same workload through intelligent processing [16].

Data mining is a process of extracting valuable information and knowledge from large, incomplete, noisy, unclear, and random data. The main methods of data mining include decision tree, association rules, clustering analysis, neural network, and rough set. Association rule exploration is a search process, which allows user to find some association rules between a set of data elements in the database. The design principle is to find frequent attribute sets in the database and then use frequent attribute sets to find strong association rules. Apriori algorithm is the most commonly used association rules. It finds all the common element sets after scanning the database many times. Mining association rule algorithm is the basic relationship between the information cited in the process of reasonable evaluation, so as to find out the design of education teachers and teaching effect, which is the premise and the research and development of reference teaching evaluation method.

2.2. Digital Information Fusion. With the advent of the era of big data and the rapid development of science and technology, the ability of digital information processing and large-scale collection has been greatly improved. The explosive growth of data leads to complex information structure, various forms, and scattered distribution, which is why electronic information is effectively collected and merged. The integration of digital information resources is an important process to explore the relationship between digital information resources from different perspectives by using a variety of technologies. The integration of digital information resources is an extension and development of

the integration of digital information resources. The integration of digital information resources is mainly the seamless connection between heterogeneous numbers on the same platform. This is the process of combining data information resources into an organic whole.

In big data environment, data fusion, service fusion, and platform fusion are three basic levels of digital information resource fusion. Among them, data fusion is the basis of digital information resource fusion, service fusion is the purpose of digital information fusion, and platform fusion is the key to digital information resource fusion. The integration of digital information resources and the establishment of service platform provide a new impetus for the harmonious development of information services and greatly improve the competitiveness of information institutions in the market. The merging data are mainly merging, and the atomic electronic information integrates all the digital information to connect with each other, including time, region, industry, theme, and topic, and establishes a database. Platform interoperability is a number of technologies for merging data and information in different formats and then integrated into a unified cloud platform or preconstructed integrated platform. On the basis of platform integration and data integration, the goal of service integration is to dynamically optimize service elements and realize the integration of service content, form, and function.

2.3. Teaching Evaluation and PE Teaching Evaluation. The teaching evaluation refers to a series of judgments on the achievements and values of education through information collection and processing. In the articles about modern teaching theory and PE, some experts think that “teaching evaluation is the process of measuring, analyzing and judging teaching work.” Some researchers stressed that “teaching evaluation is a value judgment of the teaching process and teaching results” [17]. In a new book on curriculum, some experts state that teaching evaluation is a process of measuring and judging the evaluation objects in teaching activities according to certain standards. On the basis of objective teaching practice, here, the concept of teaching evaluation is defined as the process of judging the value of teaching work with scientific and reasonable methods [18].

In modern education theory, the evaluation of PE teaching is to judge the teaching process using certain methods based on the purpose of PE teaching [19]. Some experts believe that PE teaching evaluation is a process of measurement, analysis, and judgment in accordance with relevant standards. In summary, PE teaching evaluation is a concept of education evaluation at a lower level. Here, the concept of PE evaluation is defined as a process of value judgment on the process and results of PE teaching activities by scientific evaluation methods on the basis of PE teaching [20].

2.4. Principle of Constructing the PE Teaching Evaluation System of Colleges and Universities. The design of PE teaching evaluation system for colleges and universities should rely on big data technology and consider all aspects of PE teaching process, mainly to follow the principles in Figure 1.

- (1) *Scientific and Objectivity.* Combined with the background and characteristics of the era of big data, on the basis of objective laws and practice, construction of college PE teaching evaluation should be made scientifically and objectively. For example, the selection of evaluation indicators should be based on the data collected and surveyed to ensure the scientific and objectivity of evaluation indicators [21]
- (2) *Integrity and Comprehensiveness.* Namely, when constructing the evaluation system of PE teaching in colleges and universities, the selection of evaluation indexes should be comprehensive, clear, and widely representative but not repeated, which can basically reflect the whole process of PE teaching [22]
- (3) *Feasibility and Measurability.* Feasibility refers to the way of PE teaching evaluation has practical operability. Testability refers to the evaluation of the evaluation index has a testable quantitative standard, such as the selection of indicators must be easy to understand and test, and there is no ambiguous index [23]
- (4) *Combining Generality and Individuality.* Students in different disciplines have different learning purposes and characteristics. Teachers in different disciplines also have different teaching methods and styles. Therefore, different disciplines and students should be given different standards to evaluate. In the evaluation of PE teaching, the individuality of different subjects and students should be respected on the basis of the commonness of PE teachers and students [24]
- (5) *Openness and Timeliness.* Openness is to open to the public when constructing the evaluation system of PE teaching in colleges, so that students and teachers can better understand the evaluation of PE teaching, and better supervise and evaluate that. Timeliness refers to the evaluation; analysis and feedback should be timely, especially the college PE teaching evaluation system in the feedback of this piece to have enough openness and timeliness [25]

2.5. Characteristics of the Construction of PE Teaching Evaluation System for Colleges and Universities. With the advent of the era of big data, it is possible to reconstruct the PE teaching evaluation system in colleges and universities by using big data technology. Based on the characteristics of big data, the following characteristics of the PE teaching evaluation system of colleges and universities are analyzed to obtain the applicable scope of big data. The first characteristic is the evaluation mode from the subjective experience evaluation to the objective data support [26]. In the previous PE teaching evaluation, students’ physical performance is the main way of evaluation, and individual subjective image is as the main way of evaluation of PE teachers, so the evaluation is incomplete and objective. However, with the help of big data technology, the evaluation of PE class status can be recorded accurately. The second characteristic is the evaluation method from summary evaluation

- ☆ Principle 1 > Principles of scientificity and objectivity
- ☆ Principle 2 > Principle of integrity and comprehensiveness
- ☆ Principle 3 > Principle of feasibility and testability
- ☆ Principle 4 > The principle of combining commonness and individuality
- ☆ Principle 5 > Principle of openness and timeliness

FIGURE 1: Principles PE education needs to follow.

TABLE 1: Key questions of the questionnaire.

Content	No.	Question
Teaching	Q1	What evaluation subjects are contained in the current evaluation of the PE teaching by teachers?
	Q2	How does the school evaluate the teaching of PE teachers at present?
	Q3	What evaluation contents are contained in the current evaluation of the PE teaching by teachers?
	Q4	Is there any feedback after the evaluation of PE teachers?
	Q5	What basic contents of the feedback are the PE teaching evaluation of teachers at present?
	Q6	When does the school give feedback to the PE teacher after the evaluation?
	Q7	What are the current ways for schools to give feedback after evaluating PE teachers?
Student	Q8	What are the subjects of PE teaching evaluation for students?
	Q9	What are the modes of PE teaching evaluation for students?
	Q10	What are the contents of PE teaching evaluation for students?
	Q11	According to the time of teaching evaluation, what are the methods used by schools to evaluate the PE teaching?
	Q12	Is there feedback after the student is evaluated?
	Q13	What are the ways to give feedback after evaluating students?
	Q14	When does the school usually give feedback after evaluating students?
Individual	Q15	Do you think the current evaluation of PE teaching is reasonable?
	Q16	Do you think it is reasonable to implement PE teaching evaluation?
	Q17	What problems do you think exist in the school's PE teaching? What are your suggestions on the evaluation of PE teaching in the school?
	Q18	How many times has the school conducted teaching evaluation of PE teachers?
	Q19	What are the main contents of the teaching evaluation?
	Q20	When does the school generally evaluate your PE teaching?
	Q21	What are the models of PE teaching evaluation of the school currently for you?
	Q22	How important do you think the PE teaching evaluation is in teaching evaluation?

to concurrent evaluation, to enable teachers and students to evaluate the teaching more comprehensively and objectively [27]. At present, the evaluation of college PE teaching cannot reflect the situation of students and teachers at all stages of PE teaching, because it is mainly a summary evaluation. Meanwhile, the evaluation is the combination of summative evaluation and process evaluation, so the evaluation system of equal attention to the results and process is adopted to timely record students' learning state and teachers' teaching state. The third characteristic is the evaluation content from the uniqueness to diversity. That is, the content of evaluation is diversified. For example, the PE teaching evaluation for students involves not only theoretical knowledge, education and sports, sports skills,

physical condition, learning attitude, and learning ability but also the progress of sports skills and other aspects [28]. The fourth characteristic is the evaluation method from artificial evaluation to intelligent evaluation. The manual evaluation method is not only time-consuming and laborious but also prone to errors, while intelligent evaluation is fast and accurate. Therefore, the evaluation method of PE teaching in colleges and universities should be translated from the traditional manual collection, statistics and analysis to the intelligent acquisition, processing, and analysis of massive data. The fifth characteristic is the evaluation feedback from closed evaluation to open evaluation [29]. The collection, processing, and analysis of evaluation data are designed by big data technology, which will be open to

Scale value	Meaning represented
1	A is of equal importance to B
3	A is slightly more important than B
5	A is more important than B
7	A is obviously more important than B
9	A is absolutely more important than B
2/4/6/8	The degree of importance lies between two adjacent levels
1, 1/2...1/9	The importance of B relative to a is the reciprocal

FIGURE 2: Scale value method.

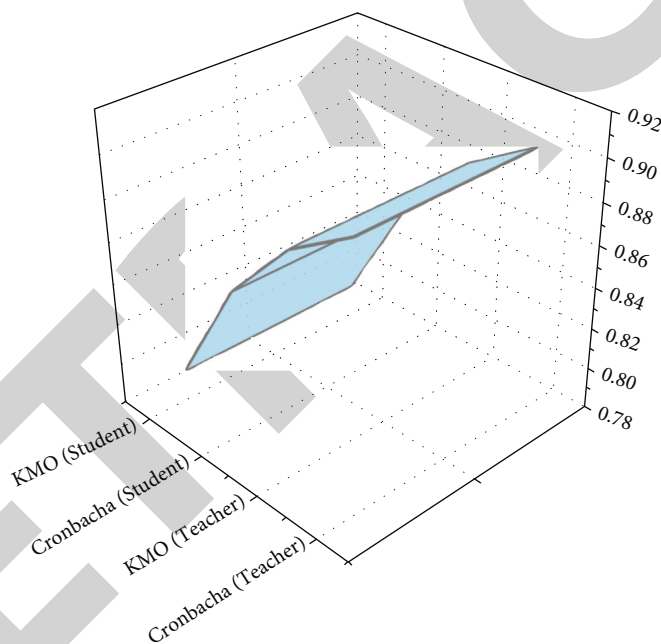


FIGURE 3: Reliability analysis of questionnaire survey results.

teachers and students, so that teachers and students can better understand their supervisory role in the classroom and at the same time better implement education evaluation in colleges and universities [30].

3. Research Methods of Constructing Evaluation System of College PE Teaching under the Background of Big Data

3.1. Design of Questionnaire. The research subjects of the construction of college PE teaching evaluation system based

on big data technology mainly include the evaluation of PE teachers from school administrators, students, and PE teachers themselves. The evaluation methods contain evaluating by school administrators on PE teachers, evaluating between PE teachers, evaluating by students on PE teachers, and self-evaluation. Besides, an online questionnaire survey is conducted, and the issuance of the questionnaires is mainly completed through the Wenjuanxing platform. A total of 250 questionnaires are issued, with 230 valid questionnaires back, among which 30 questionnaires are for PE teachers. For the recovered questionnaires, the SPSS 25.0 software is used for reliability and validity analysis, which

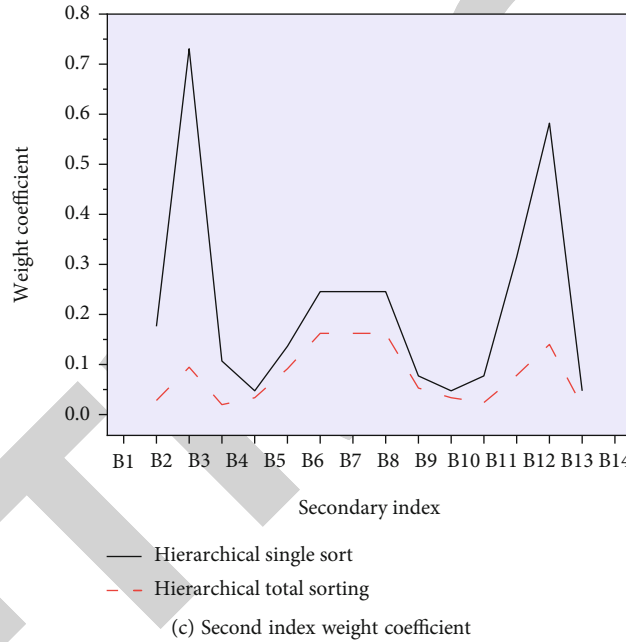
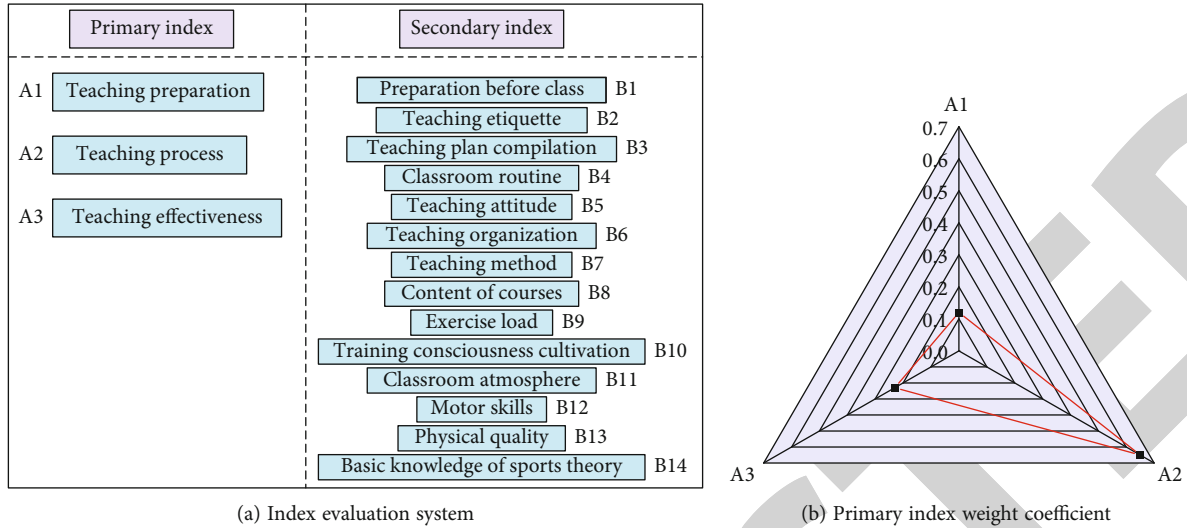


FIGURE 4: The weight of PE teachers' teaching evaluation index system.

indicates that the designed questionnaire has good reliability and validity. The purpose of this questionnaire survey is mainly to analyze the overall situation of the construction of college PE teaching evaluation system based on big data technology. Table 1 signifies the key problems involved in the questionnaire.

Compared with variance analysis, the advantage of coefficient of variation is that the average of reference data is not required. Coefficient of variation is a dimensionless parameter. When comparing two groups of data with different dimensions or mean values, coefficient of variation rather than standard deviation should be used as a reference for comparison. Therefore, the coefficient of variation is selected to analyze the data difference.

The coefficient of variation refers to the coordination degree, which are in a negative correlation. If the coefficient of variation is less than 0.25, the coordination degree is con-

sidered high [31]. The coefficient of variation is calculated according to:

$$\begin{aligned}
 W_i &= \frac{A_i}{B_i}, \\
 C_i &= \frac{1}{n} \sum_{i=1}^n X_i, \\
 D_i &= \sqrt{\frac{1}{n-1} \sum_{i=1}^n (X_i - C_i)^2}.
 \end{aligned} \tag{1}$$

Among the above equations, W_i represents the coefficient of variation, C_i denotes the mean value, and D_i refers to the standard deviation.

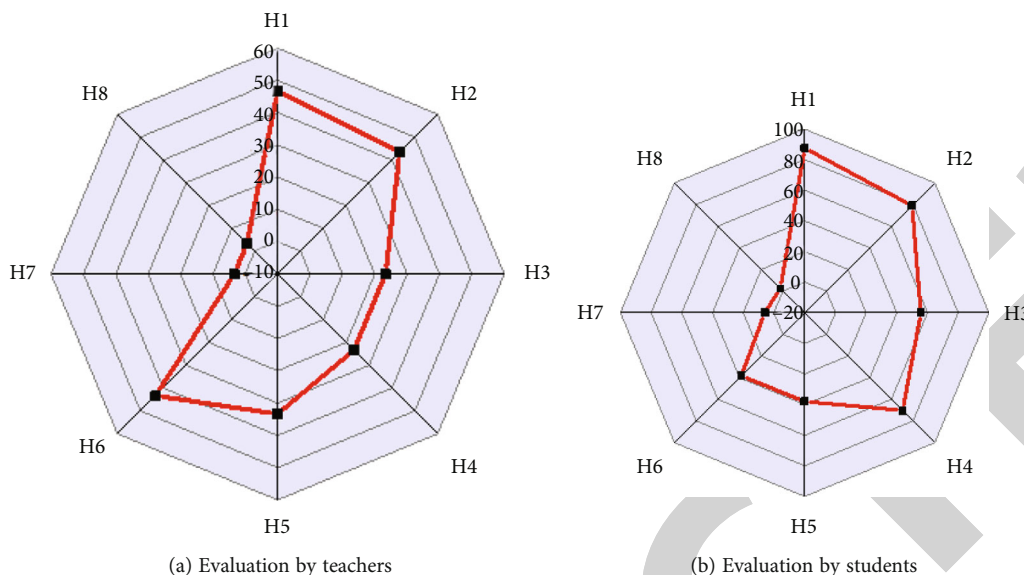


FIGURE 5: Evaluation results.

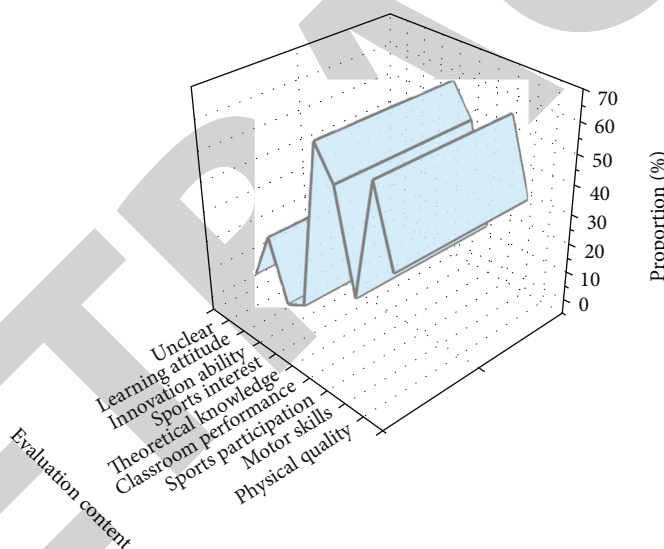


FIGURE 6: Evaluation results of PE teaching for students.

3.2. Calculation Method of the Weight of Indicators. Analytic hierarchy process (AHP) is used to calculate and determine the weight coefficient of evaluation indicators. AHP makes pairwise comparison on the correlation between the evaluation indexes, quantifies the final results, and finally obtains the weight coefficient of each layer of indicators. The AHP method is used to determine the weight of indicator, which ensures the rationality and scientific of the weight determination of indicator.

The steps of AHP method are as follows: First, build evaluation system. Second, establish a hierarchical structure model. Relevant indicators are divided into different levels from top to bottom according to different attributes and

importance. Third, construct the corresponding judgment matrix. The judgment matrix is formed by pairwise comparison of all evaluation indexes at the same level. 1-9 scaling method of Satty is generally applied, and A and B two indicators are compared, as Figure 2.

Equation (2) displays the judging matrix.

$$A = \begin{bmatrix} a_1 & a_2 & \cdots & a_n \\ a_{11} & a_{12} & \cdots & a_{1n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{nm} \end{bmatrix} \quad (2)$$

The weight vectors are calculated, and consistency check is made. The maximum eigenvalue of the matrix is λ_{\max} , and Equations (3)–(5) are the specific calculations.

$$\lambda_{\max} = \frac{1}{n} \sum_i \frac{(Aw)_i}{wi}, \quad (3)$$

$$CI = \lambda_{\max} - \frac{n}{n-1}, \quad (4)$$

$$CR = \frac{CI}{RI}. \quad (5)$$

CR represents consistency ratio, CI refers to consistency index, and AW is the product of judgment matrix and feature vector. RI stands for the average random consistency index.

3.3. Reliability Analysis of the Results of Questionnaire. The questionnaire survey results are tested from aspects of reliability and validity. Reliability means that when the research method does not change, the same event is analyzed, and the results do not change, which indicates that the survey results have high reliability, so it can be called reliability analysis. The commonly used reliability measurement index is the Cronbach's. Equation (6) shows its calculation.

$$\alpha = \frac{K}{K-1} \left(1 - \frac{\sum_{i=1}^K \sigma_{Y_i}^2}{\sigma_X^2} \right). \quad (6)$$

K is total number of questions in the questionnaire. $\sigma^2 X$ refers to variance of the total sample. $\sigma^2 Y_i$ stands for the variance of the sample. SPSS25.0 is used to analyze the data obtained from the questionnaire survey. The value of Cronbach's α is in the range of 0–1, if Cronbach's $\alpha > 1$, it indicates that the survey results have high credibility. If $0.8 < \text{Cronbach's } \alpha < 0.9$, it means that the findings can be used for research analysis. If $0.7 < \text{Cronbach's } \alpha < 0.8$, it shows that the reliability of the survey results is low; it needs to be modified accordingly.

Validity characterizes how valid the research results are. Researchers can use relevant measurement tools and means to express the degree of the survey content. If the survey content can be consistent with the results, it indicates that the survey results have high validity. Kaiser-Meyer-Olkin (KMO) value is usually used to express the validity of the survey results. The simple correlation coefficient and partial correlation coefficient of variables are two relatively important variables in KMO. The sum of squares of partial correlation coefficients of all variables is calculated. If the value is far less than the sum of squares of simple correlation coefficients, the KMO value will be closer to 1, indicating that there is a strong correlation between variables.

The sample (X_i, Y_i) ($i = 1, 2, 3, \dots, N$) is extracted from the total sample, and its partial correlation coefficient square sum R and simple correlation coefficient square sum P are

calculated. Equations (9)–(12) display the specific calculation.

$$\begin{cases} r_{xy,z_1} = \frac{r_{xy} - r_{xz_1} r_{yz_1}}{\sqrt{(1-r_{xz_1}^2)(1-r_{yz_1}^2)}}, (h=1), \\ r_{xy,z_1 z_2 z_3 \dots z_h} = \frac{r_{xy,z_1 z_2 z_3 \dots z_{h-1}} - r_{xz_1 z_2 z_3 \dots z_{h-1}} r_{yz_1 z_2 z_3 \dots z_{h-1}}}{\sqrt{(1-r_{xz_1 z_2 z_3 \dots z_{h-1}}^2)(1-r_{yz_1 z_2 z_3 \dots z_{h-1}}^2)}} (h \geq 2), \\ \rho = \frac{\sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^n (X_i - \bar{X})^2} \sqrt{\sum_{i=1}^n (Y_i - \bar{Y})^2}}, \\ \bar{X} = \frac{1}{n} \sum_{i=1}^n X_i, \\ \bar{Y} = \frac{1}{n} \sum_{i=1}^n Y_i. \end{cases} \quad (7)$$

Equation (8) is the calculation of KMO.

$$M = \frac{P}{P+R}. \quad (8)$$

The calculated KMO value is closer to 1, indicating that the validity of the survey results is higher, the correlation between variables is stronger, and it is more suitable for factor analysis.

4. Construction of College PE Teaching Evaluation System Based on Big Data

4.1. Reliability Analysis of Results of Questionnaire Survey. Based on the reliability analysis of questionnaire survey results, SPSS25.0 is used to analyze. Figure 3 presents the results.

Figure 3 shows that the Cronbach's α and KMO value of the teachers' and students' papers are at a satisfactory level, indicating that the questionnaire survey results can be used for PE teachers' teaching evaluation analysis.

4.2. Evaluation Analysis of PE Teachers Teaching. Before analyzing the teaching evaluation of PE teachers, it is necessary to calculate the weight coefficient of the teaching evaluation index of PE teachers in advance. First of all, the teaching evaluation index system of PE teachers is implemented at all levels of judgment moment, and then according to the judgment, matrix data are calculated within the trip, n square, weight value W , λ_{\max} , CI, and CR. Figure 4 shows the final weight of PE teachers' teaching evaluation index system.

From the overall survey results, 50% of the PE teachers and 44.2% of the students think that the current evaluation system of PE teaching is unreasonable, and only 16.67% of the PE teachers and 24.2% of the students think that it is reasonable, but 90% of the PE teachers and 90.4% of the students think that the evaluation of school PE teaching is important. In the meanwhile, 63.33% of the PE teachers think that the current evaluation system of college PE

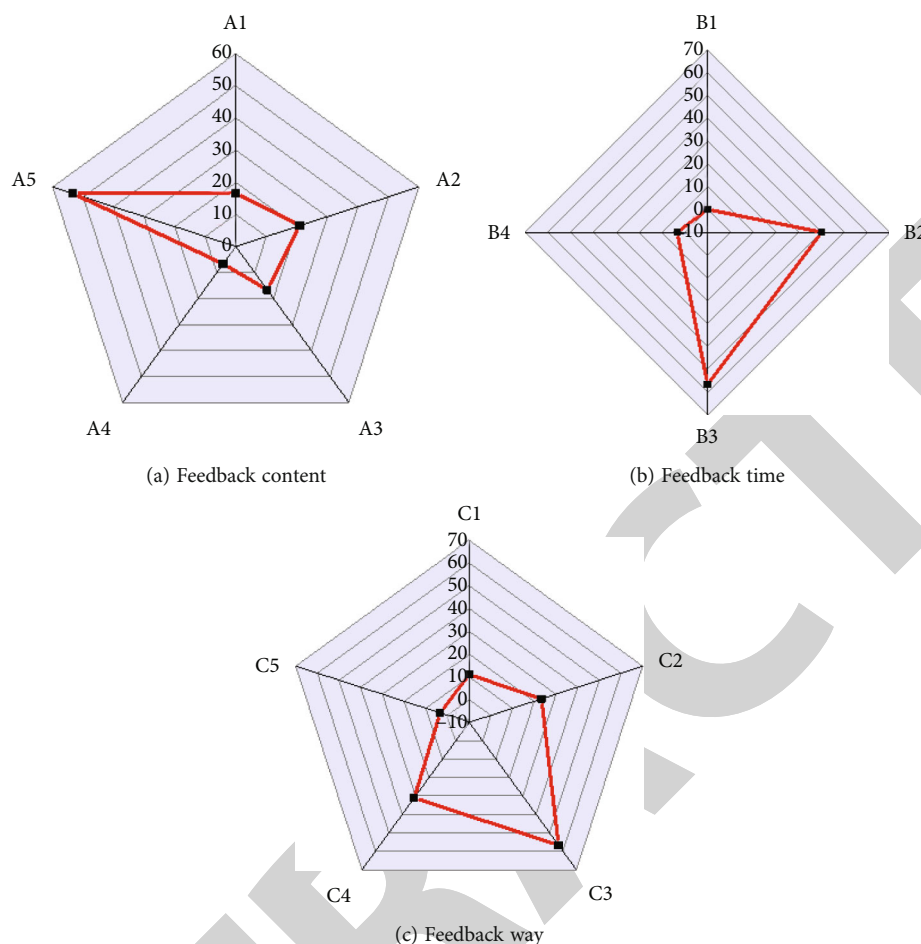


FIGURE 7: Evaluation feedback.

teaching is poor and lack of security system. Therefore, the current implementation of PE teaching evaluation in colleges and universities is analyzed from the two subjects of physical education teachers and students.

4.3. Analysis of the Teaching Evaluation of PE Teachers. The teaching evaluation of PE teachers primarily considers teaching methods, teaching attitude, teaching effect, teaching ability, innovation ability, classroom atmosphere, moral level, and student participation. The evaluation is performed by teachers and students, and Figure 5 reveals the evaluation results.

H1-H18 in Figure 6 represent teaching attitude, teaching methods, teaching effectiveness, teachers' own ability, creativity, moral level, classroom atmosphere, and students' participation, respectively. From Figure 5, the evaluation of PE teachers is mainly based on the teaching ability, teaching methods, teaching effect, and moral level of teachers. Specifically, every index, respectively, occupies 23.34%, 43.34%, 43.34%, and 43.34% in the evolution result by teachers, while 70.3%, 78.9%, 55.7%, and 38.3% in the evolution result by students. This demonstrates that PE teachers usually ignore the degree of students' participation in the classroom and the classroom atmosphere, and the evaluation content

ignores the innovation ability of PE teachers. It can be concluded that college PE teacher pays more attention to the design and teaching methods of PE but ignore the substantive content, i.e., students' learning state and learning effects.

Figure 7 shows the feedback after the content evaluation.

A1-A5 in Figure 7 refer to classroom performance, advantages and disadvantages, improvement suggestions, expectations and encouragement, and unclear. B1-B4 represent immediate feedback, time-varying feedback, new term feedback, and unclear. C1-C5, respectively, stand for network feedback, writing feedback, communication feedback, bulletin board feedback, and unclear. The survey results of PE teachers show that the evaluation results are conveyed after the evaluation. As for the feedback content, 53.34% of the PE teachers do not know the specific content of the feedback. This indicates that more than half of the teachers do not know the result feedback, evaluation and feedback content is relatively simple, and the feedback perspective is single. The feedback to teachers at the beginning of the new semester accounts for 56.68%, while the feedback given to the teachers over a period of time accounts for 40%. In general, the evaluation feedback is not timely, so most PE teachers do not consider the feedback of the results.

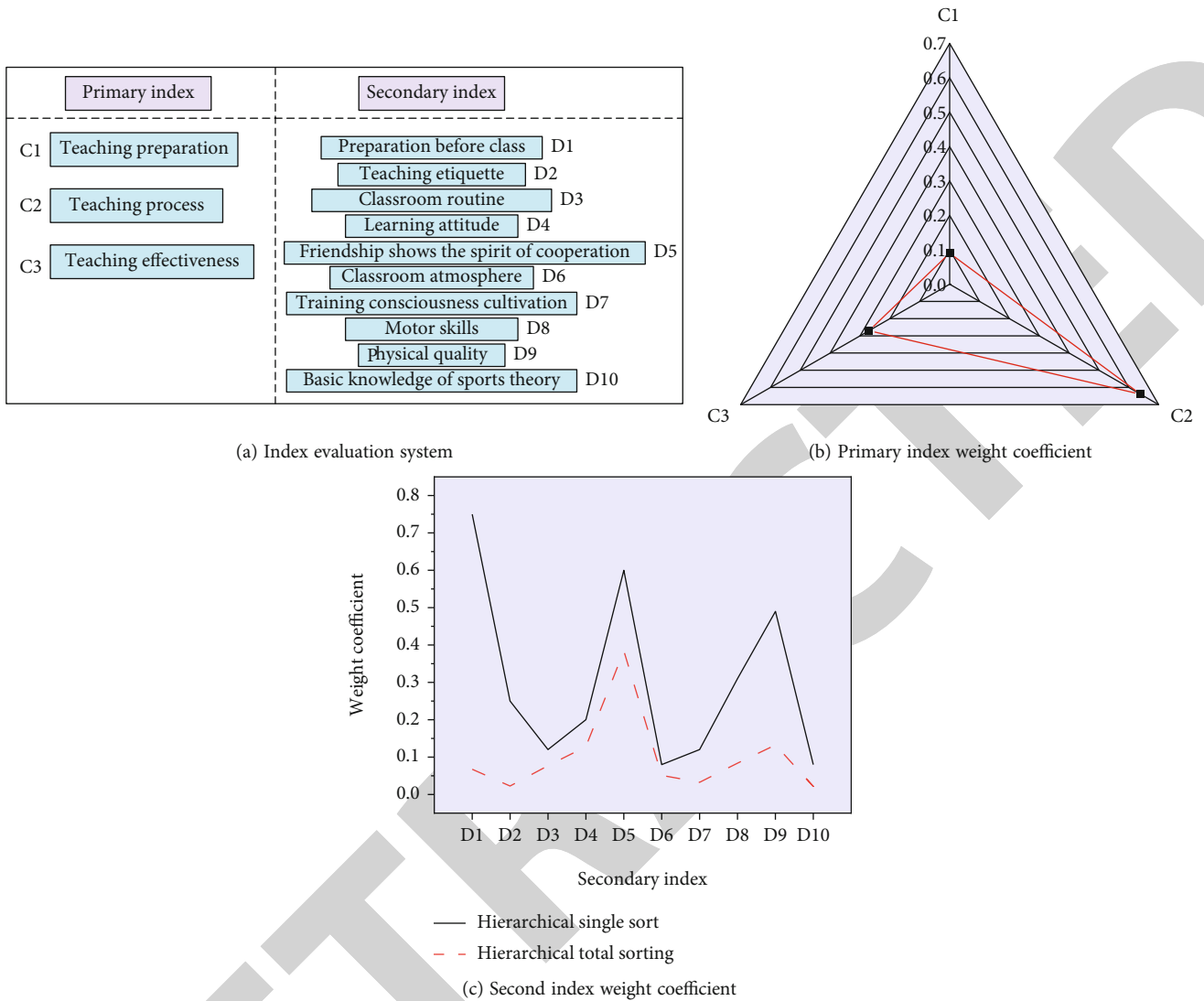


FIGURE 8: Weight of evaluation index system for students' PE.

The main methods of feedback are private conversation, accounting for 56.68%, followed by the bulletin display and written feedback. This result proves that the feedback method is outdated and lacks openness. Therefore, the method of feedback should be updated over time, such as feedback on the Internet, and feedback should be more open, so that PE teachers can notice the results of feedback.

4.4. Analysis of the Teaching Evaluation of Students. The above method is applied to calculate the weight coefficient of students' PE teaching evaluation index. Figure 8 shows the results.

Figure 6 provides the evaluation results of PE teaching for students.

According to Figure 6, the PE teaching evaluation for students mainly focuses on theoretical knowledge, sports ability, classroom performance, and physical quality, accounting for 63.34%, 61%, 53.34%, and 36.68%, respectively. The evaluation ignores students' innovative ability, sports interest, and other aspects, paying too much attention

to some common content but ignoring the individual differences of students.

Figure 9 signifies the evaluation methods of PE teaching for students.

According to Figure 9, the evaluation method of PE teaching extremely highlights the summary evaluation with the proportion of 73.34%, while ignoring the progress of everyone at each stage of learning. Moreover, it emphasizes quantitative evaluation, accounting for 66.8%, while ignoring qualitative evaluation. Therefore, the evaluation process is very closed, static, lack of dynamic, and achieving limited promotion effects on student development.

Figure 10 displays the feedback on students' PE teaching evaluation.

The survey results in Figure 10 show that after the PE teaching evaluation for students, the school commented on the evaluation results. The feedback content is mainly for students' sports performance, including physical fitness tests, skill tests, theoretical knowledge tests, and normal classroom performance. Therefore, the feedback content is

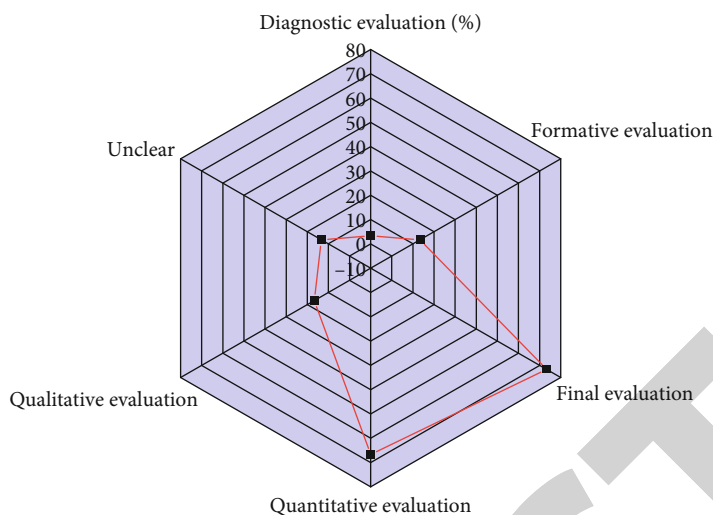


FIGURE 9: Evaluation method.

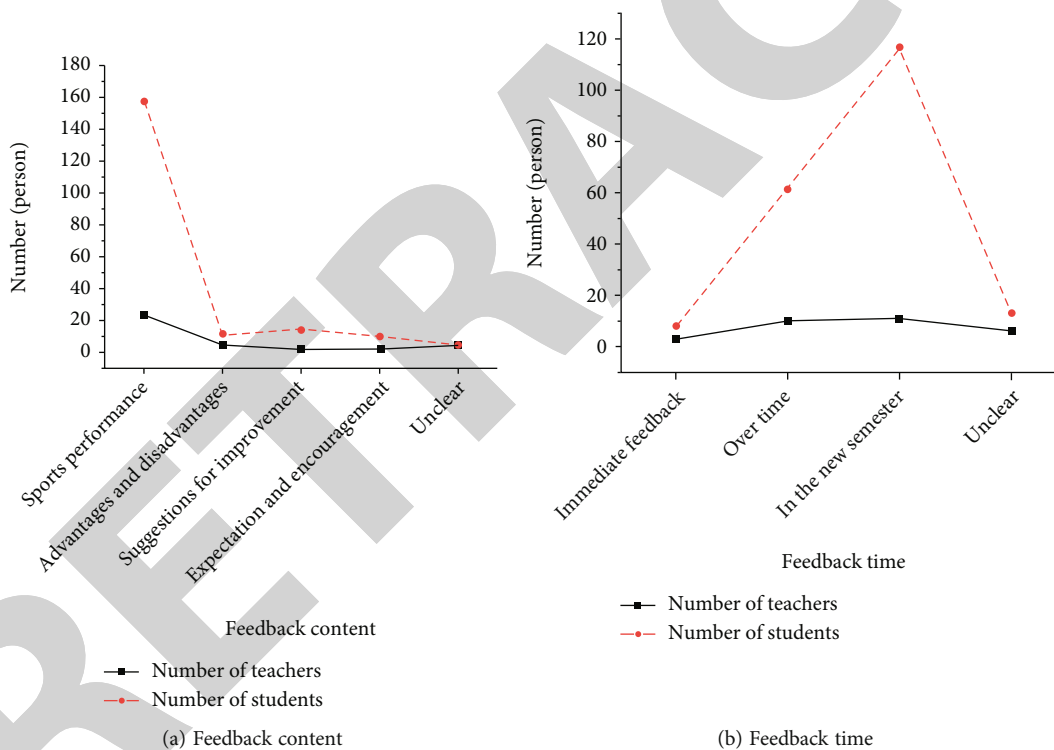


FIGURE 10: Feedback.

relatively simple, so it is difficult to define their advantages and disadvantages in the feedback of students, and students only focus on their own results. From the perspective of feedback time, the feedback is mainly conveyed to students after a long period of time or at the beginning of the new semester, so the feedback is not timely. Furthermore, students mainly obtain the feedback of the evaluation results of PE teaching through network.

4.5. Construction of Evaluation System of College PE. In the activities of evaluating students' PE teaching, PE teachers

are the subject of evaluation, and students are the object of evaluation. The evaluation of students by PE teachers is the most real, direct, and persuasive. PE teachers are the most vocal on the situation of students' PE learning. So, when evaluating students' PE teaching, the evaluation of PE teachers is the main part. PE teachers can login the teacher system to evaluate the PE teaching of students in the class.

According to the analysis of the current situation of college PE teaching evaluation and the principle of evaluation system design, combined with the characteristics of

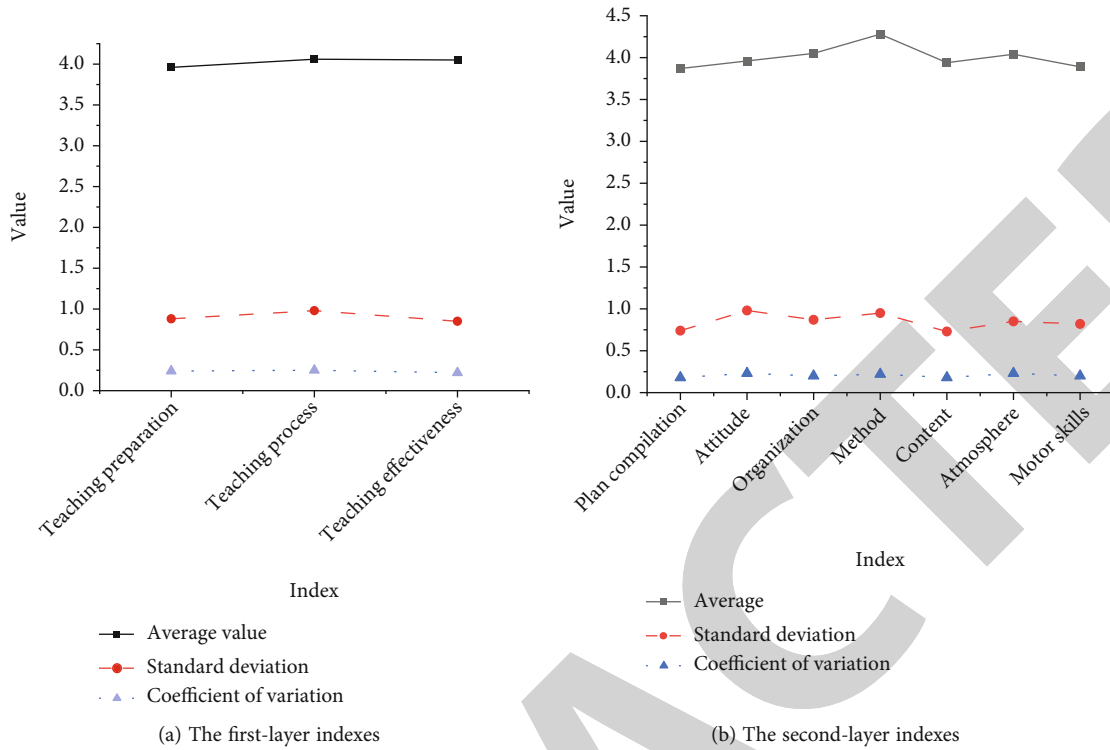


FIGURE 11: The first-round analysis of the PE teaching evaluation indexes for PE teachers.

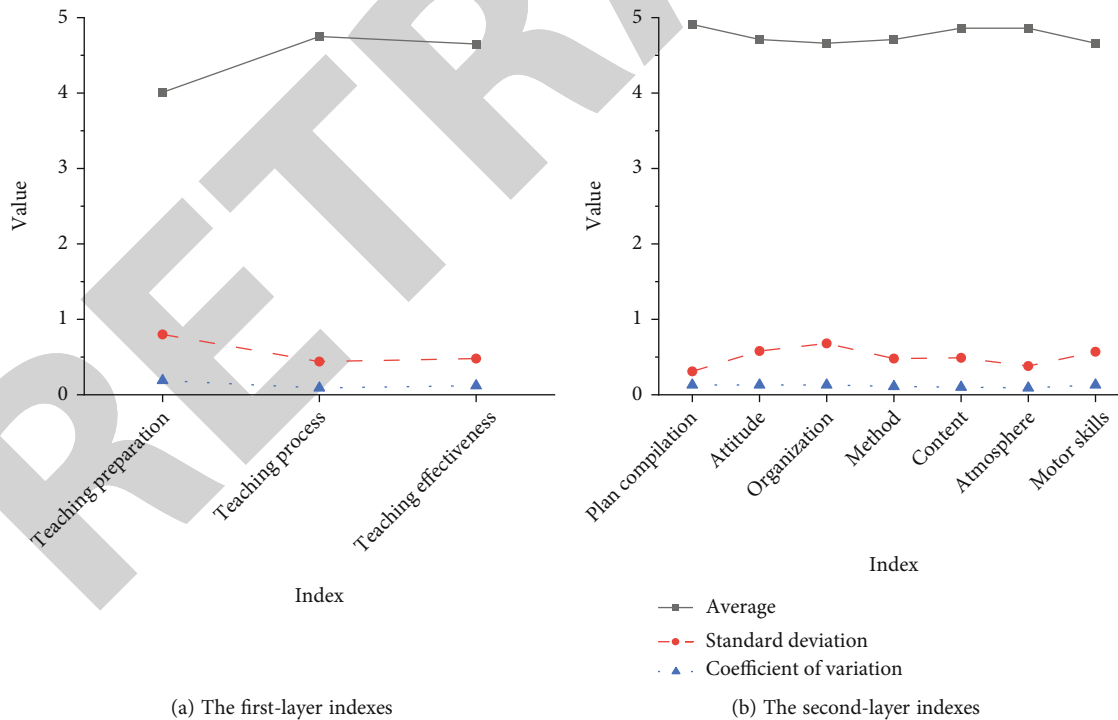
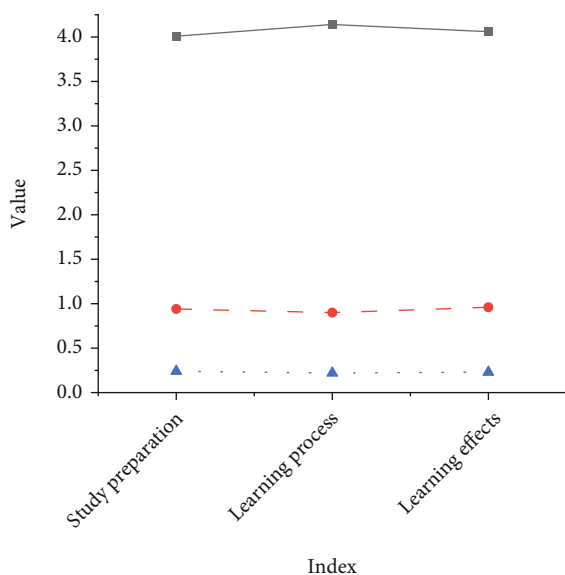


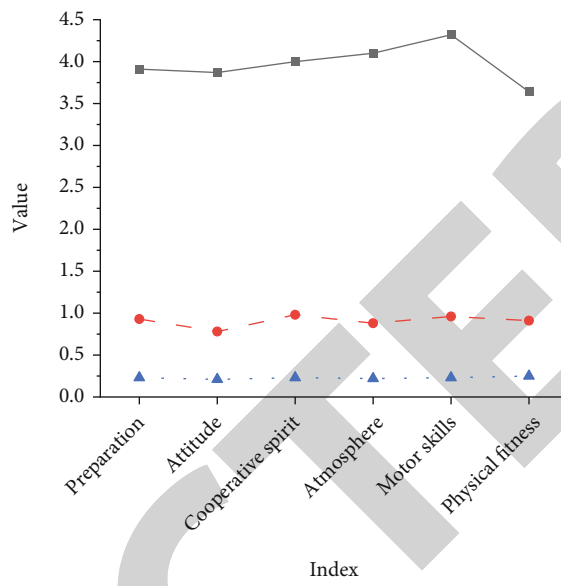
FIGURE 12: The second-round analysis of the PE teaching evaluation indexes for PE teachers.

big data information fusion and data mining technology, the evaluation index system of students' PE teaching and PE teachers' teaching evaluation index system are designed. The evaluation index system includes two parts,

the first layer index and the second layer index. The specific indicators are as follows. Firstly, Figure 11 displays the first round of analysis on the teaching evaluation index of sports teachers.

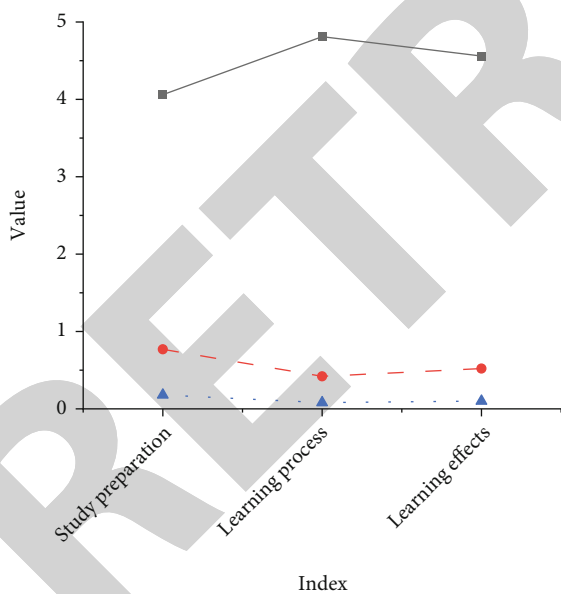


(a) The first-layer indexes

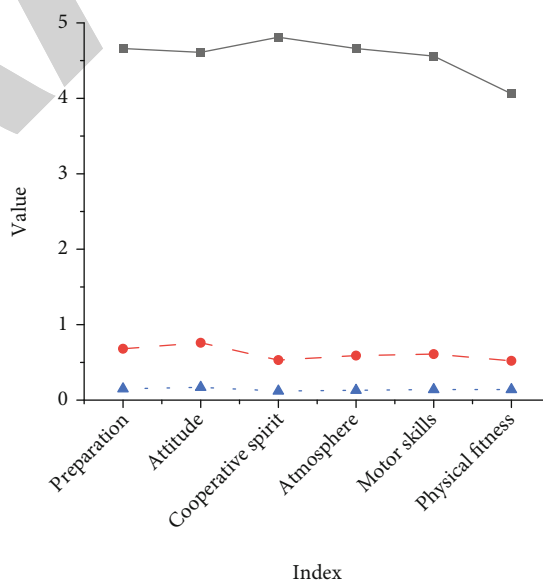


(b) The second-layer indexes

FIGURE 13: The first-round analysis of the PE teaching evaluation indexes for students.



(a) The first-layer indexes



(b) The second-layer indexes

FIGURE 14: The second-round analysis of the PE teaching evaluation indexes for students.

According to Figure 11, the coefficients of variation of three first-layer indexes are all below 0.25, and the average is above 3.9, so it is reasonable. In addition, the average score of teaching preparation is the smallest, and the coefficient of

variation of teaching process is the largest, indicating that corresponding improvements should be made in teaching preparation and teaching process. The mean value of the second-layer indexes is greater than 3.8, and the coefficient

of variation is less than 0.25, demonstrating that the second-layer index setting is reasonable. The second-round analysis of the PE teaching evaluation indexes is obtained by adjusting the teaching preparation and teaching process, as Figure 12 shows.

Figure 12 shows that compared with the first round, the indexes of the second round have changed significantly. The mean value of the first-layer indexes is greater than 4, and the coefficient of variation is close to 0.2, which again verifies that the indexes of the second layer are set reasonably. Therefore, the first-layer indexes of the college PE teaching evaluation system for teachers based on big data technology are ultimately determined as teaching preparation, teaching process, and teaching results. Besides, the second-layer indexes include the preparation before class, teaching attitude, teaching organization, teaching methods, teaching content, classroom atmosphere, and sports ability of PE teachers.

Figure 13 presents the first-round analysis of the PE teaching evaluation indexes for student.

Figure 13 concludes that the coefficient of variation of the three first-layer indexes is less than 0.25, and the mean value is more than 4, so the first-layer indexes of the PE teaching evaluation for students are reasonable. Among the second-layer indexes, the mean value of physical quality is smaller than evaluation indexes, which requires reasonable adjustment. Moreover, the coefficient of variation of physical quality is equal to 0.25. Experts pointed out that physical fitness index includes physical quality, so these two items should not exist in parallel. In summary, the physical quality of the second-layer indexes needs to be improved. Figure 14 signifies the second-round analysis of the PE teaching evaluation indexes for students after adjustment.

According to Figure 14, compared with the first round, the indexes of the second round have changed significantly. The mean value of the first-layer indexes is greater than 4, and the coefficient of variation changes smaller, which again verifies the reasonable setting of the first-layer indexes. Therefore, the first-layer indexes of the PE teaching evaluation system for college students based on big data technology are finally defined as learning preparation, learning process, and learning effects. Meanwhile, the second-layer evaluation index system includes preparation before class, learning attitude, classroom atmosphere, sports ability, and physical quality.

5. Conclusion

Under the background of big data information fusion and data mining technology, the definition of sports evaluation index is put forward by analyzing the principles and characteristics of the construction of sports teaching evaluation system in colleges and universities. Based on the questionnaire survey, analyzation is made the evaluation content and evaluation system of college PE. Big data information fusion and data mining knowledge are combined to determine the evaluation index, which essentially reflects the various elements of PE teaching process. The distribution of index weight is more scientific and reasonable, and the

evaluation system of PE teaching in colleges and universities is constructed. Colleges and universities are more objective and scientific than the existing system. The application of big data information fusion and data mining in college PE teaching evaluation is proved to be possible. The evaluation process includes data collection, data analysis, result generation, and feedback. The evaluation results should be accurate, and the feedback on the evaluation results should be timely and open. Each section in the whole process is an indispensable part. The results show that the average values of the first-level indicators are above 4, and the coefficient of variation is less than 0.2, which can basically reflect the content of PE teaching evaluation and provide some reference for the research of PE teaching evaluation. Due to the influence of the actual experimental conditions, the selected research samples are limited and not enough to cover the subject comprehensively. In the later study, the samples will continue to be expanded and analyzed, and more factors will be considered in the follow-up.

Data Availability

The labeled datasets used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no competing interests.

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