Hindawi
Mobile Information Systems
Volume 2023, Article ID 9813794, 1 page
https://doi.org/10.1155/2023/9813794

Retraction

Retracted: Design of Comprehensive Evaluation System for College Sports Flipped Classroom Using AHP-fuzzy Matrix

Mobile Information Systems

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

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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.

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] M. Zhao, "Design of Comprehensive Evaluation System for College Sports Flipped Classroom Using AHP-fuzzy Matrix," *Mobile Information Systems*, vol. 2022, Article ID 8473317, 12 pages, 2022.

Hindawi
Mobile Information Systems
Volume 2022, Article ID 8473317, 12 pages
https://doi.org/10.1155/2022/8473317

Research Article

Design of Comprehensive Evaluation System for College Sports Flipped Classroom Using AHP-fuzzy Matrix

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Received 12 April 2022; Revised 22 May 2022; Accepted 27 May 2022; Published 23 June 2022

Academic Editor: M. Praveen Kumar Reddy

With the advancement of information technology, academics have steadily strengthened their research and creation of a complete assessment system for college sports flipped classrooms, so as to improve school education quality. Teachers can use classroom evaluations to quickly identify the flaws in their own teaching approaches and switch to a more effective teaching mode. The old paper assessment approach, on the other hand, is inefficient, which wastes time and money. This paper will look at how to use an AHP-fuzzy matrix to create a thorough assessment system for college athletics flipped classrooms. The main algorithm of the AHP-fuzzy matrix is proposed in this work, as well as the fuzzy comprehensive evaluation approach. The stability and operating efficiency of the system are constantly rising. Stability rose from 77% in the first experiment to 85% in the 10th experiment, an 8% increase. The operating efficiency has risen from 85% at the beginning to 87%. Although the rise is not large, it has been stable. This also shows that the system designed in this paper not only has strong stability but also has high operating efficiency.

1. Introduction

In sports, due to the lack of professional guidance of teachers, most students cannot understand the essence of sports technology, causing wrong sports, which are likely to affect educational goals. Therefore, it is necessary to combine the online learning of the network with the education of the physical classroom, that is, the "flipped classroom" education model. The flipped classroom can reverse the order of the granting of skill knowledge and the internalization of theoretical knowledge. It effectively combines online learning and offline practice, which keeps students active and productive throughout their learning of specific sports techniques. The flipped classroom teaching mode means that students watch the teacher's video explanation before or outside the class and learn independently. Teachers no longer occupy classroom time to teach knowledge, so as to achieve better educational effects.

Education is a social activity that helps people develop their skills. The direction of education, the quality of education, and the advantages of education all affect the quality of education, with the quality of education being the most important factor. Classroom teaching is the primary form of education in China, and the quality of classroom teaching has a direct impact on the level of school operation and the quality of staff training. How to develop high-quality talent and enhance vocational education teaching quality has become a major source of concern and research in the business. China has boosted its investment in education and teaching research in recent years, and it has accomplished specific research findings to address this issue. Establishing and improving a complete classroom evaluation are one of the most successful methods.

The innovations of this paper are as follows: (1) This paper offers the theoretical knowledge of AHP-fuzzy matrix and flipped classroom of college sports as novelties. It also examines how the fuzzy comprehensive evaluation approach, which is based on the AHP-fuzzy matrix, contributing to the creation of the comprehensive assessment system for college sports flipped classrooms. (2) To carry out the experiment and analysis of the complete assessment system of college sports flipped classroom, it uses the AHP-fuzzy matrix. It was well received by students.

2. Related Works

With the rise in popularity of flipped classes in recent years, there has been an increase in activity in college sports classrooms. Baytiyeh focused on the flipped classroom model's usefulness in teaching and learning, as well as the abilities students can get from exposure to this learning method. He investigatesd the opinions of 20 students on the flipped classroom. His findings suggested that flipped classroom teaching can enhance students' learning experiences, it also assisted them in developing some of the necessary abilities. The scholar recognized the flipped classroom as an effective teaching model for students, and he conducted an investigation. However, the object of his investigation is not very clear [1]. Mcnally et al. found that despite the popularity of the flipped classroom, there is a lack of substantial evidence to support whether it is actually effective in achieving greater engagement and learning outcomes. He investigated the learning in flipped classrooms of students at different educational levels. The results show that higher education students can improve their academic performance based on their acceptance of the flipped classroom, and he found that students who received the flipped classroom had more positive attitudes toward course activities. Through the actual investigation, the scholar found that the students in the flipped classroom are more motivated and came to the corresponding conclusion, but he did not compare the flipped classroom model with other teaching models [2]. The new flipped classroom teaching approach has been widely adopted to improve teaching practice in various subject areas and educational levels, according to Kostaris et al. with promising outcomes in terms of improving students' learning experiences. However, despite these encouraging studies, the subject area of flipped classrooms in teaching communication technology has not been clearly studied. This is a considerable flaw, and as such, his aim was primarily to design and implement an action study to examine the effects of a flipped classroom approach in teaching and learning with communications technology. The scholar wanted to prove whether the flipped classroom can achieve the same results in the teaching of communication technology, but he has no specific method to prove it [3]. Smallhorn found that fewer students attended lectures, forcing educators to re-evaluate their teaching methods and research new teaching models. However, the flipped classroom model based on active learning changes the traditional teaching method, and students prepare for the classroom by watching online videos and completing readings. The results show that under the flipped classroom model, students' participation and learning enthusiasm have been improved. However, students' academic performance has not improved. Then why the enthusiasm of the students has been improved, but the academic performance has not been improved, the scholar did not give an explanation [4]. Chi focused on the usage of flipped classrooms in physical education. What teachers think about the flipped classroom, how teachers transfer their flipped classroom experience to other courses, and what students think about the flipped classroom methodology are some of the questions he investigates. He polled 57 kids and two of their professors to answer these questions. The findings suggest that flipped classroom instruction can greatly boost students' knowledge levels. The scholar conducted experiments on the flipped classroom model, but he did not introduce how the flipped classroom improves students' knowledge level [5]. Blended learning settings enabled by the Flipped Classroom Model (FCM) have been iteratively practiced in research according to Gough et al. Its potential to increase students' cognitive learning outcomes and general motivation for the learning process is mostly demonstrated in this. Despite substantial research into these issues, there is currently very little information available [6].

3. Fuzzy Comprehensive Evaluation Algorithm Based on AHP-fuzzy Matrix

3.1. Necessity of the Comprehensive Evaluation System. Since the reform and opening up, the pace of China's higher education innovation has never stopped. The new curriculum teaching mode, teaching concept, teaching idea, teaching evaluation, and so on have formed a huge impact on the traditional teaching [7]. However, the classroom teaching mode of college physical education has basically not undergone essential changes. The traditional classroom teaching system is still the dominant teaching method, with teachers speaking, students listening, teachers demonstrating, and students practicing. This kind of indoctrination, which takes teachers as the center and ignores students as the main body, has not changed. Because the students' personalities, interests, hobbies and innovation abilities have not been properly developed, it leads to the phenomenon that students like sports but do not like physical education classes. It can be seen that the current traditional physical education model has been unable to meet the current requirements of China to cultivate comprehensive talents, and the drawbacks of the traditional physical education model are becoming more and more obvious [8].

At the moment, large schools and institutions primarily adopt an approach that combines student evaluation and school leaders' listening evaluation as the foundation for complete flipped classroom evaluation. Because students assess the evaluation method using a paper evaluation form, the efficiency is low, and the evaluation data are difficult to interpret. This style of evaluation makes teaching evaluation a tough, time-consuming, and inefficient project. It has a significant impact on the efficiency of schoolwork. Finally, teaching evaluation is merely a formality that has no bearing on the teaching effect. The paper evaluation should consider the number of participants, the time spent, the efficiency and effect, the efficiency of data retrieval, the effectiveness of data preservation, the immediacy of communication, and the impact of the communication results on tomorrow's work arrangements and the way they will be affected. As a result, the school wants to leverage current resources to develop an exceptional teaching assessment system, bolstering teaching quality management, and improving school education quality [9]. The flipped classroom teaching mode is shown in Figure 1.

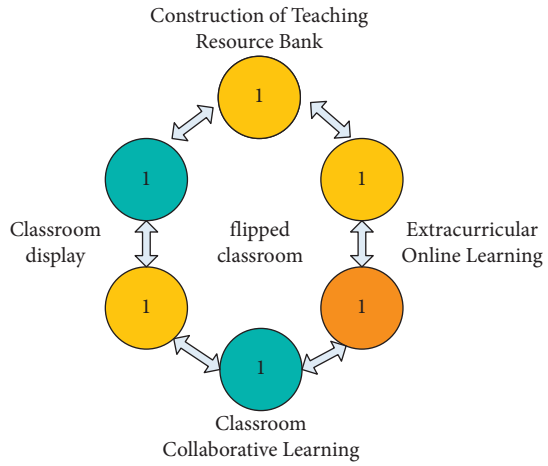

Figure 1: Flipped classroom teaching mode.

As shown in Figure 1, teaching evaluation is an activity to make value judgments on the teaching process and results according to the teaching objectives and serve for teaching decision-making. The teaching evaluation process is an important way to statistically analyze and improve factors such as students' learning effects and whether teachers' teaching is reasonable. If the teaching quality cannot be evaluated, it will be impossible to carry out effective management, and it will be impossible to improve the teaching quality. The teaching evaluation process can make teachers realize the problems existing in their own teaching. It also allows the school management to control the overall teaching quality of the school, and it can also grasp the learning status of students and improve student performance [10].

Therefore, teaching evaluation has extremely important practical significance for evaluation parties:

(1) It is helpful for teachers to recognize the problems in their own teaching process and improve their own teaching ability. The teaching evaluation process can make teachers realize the actual problems in the teaching process and understand the students' understanding level. Teachers can make adjustments in time according to the evaluation results, so as to form the effect of promoting teaching through evaluation [11].

(2) It is helpful for students to reflect the existing problems in the learning process. Students are the most important evaluation role in the whole teaching evaluation, and students' learning situation is the most concerned content. Through teaching evaluation, students can give feedback to teachers on key and difficult points that are not clear, so that teachers can understand the level of students, so as to better carry out educational work [12].

(3) It is helpful for the school management to give priority to the evaluation of school teachers. It is an essential condition for school management to understand the overall teaching situation of school teachers. In order to better serve the improvement of the quality of school teachers, school leaders need to give priority to teachers. The comprehensive evaluation results of the teaching evaluation system will be an important reference index for the school management.

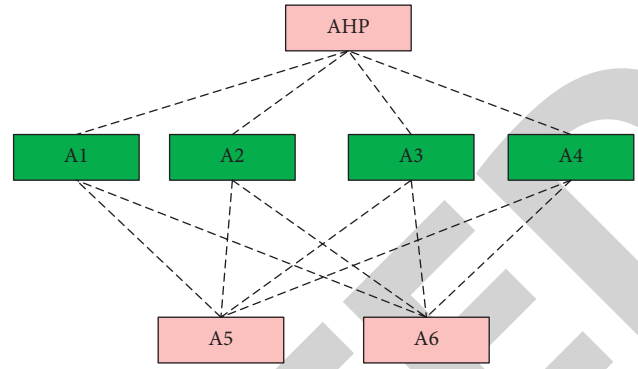

Figure 2: Structure diagram of fuzzy comprehensive evaluation method.

3.2. Fuzzy Comprehensive Evaluation Method Based on AHP-Fuzzy Matrix. As a typical comprehensive evaluation method, the fuzzy comprehensive evaluation method can be derived from fuzzy mathematics to convert qualitative evaluation into quantitative evaluation [13]. It has the characteristics of clear results and strong systematicness. It can better solve the fuzzy and difficult to quantify problems. It is suitable for solving various nondeterministic problems. The structure diagram of the fuzzy comprehensive evaluation method is shown in Figure 2.

As shown in Figure 2, fuzzy mathematics is a concept that is completely opposite to the precision of classical mathematics, and its value is concentrated in many fuzzy phenomena that actually exist, and in some respects it exceeds the precision of mathematics [14]. Fuzzy mathematics is also known as fragile mathematics or fuzzy mathematics. After 1965, it is a general term for mathematical fields such as fuzzy topology and fuzzy measure theory developed on the basis of fuzzy sets and fuzzy logic.

Considering the uncertainty, incompleteness, or mismatch of actual concepts, they can be classified as fuzzy properties. Various fuzzy characteristics can be dealt with by various fuzzy theories and methods. The main theories include fuzzy sets and fuzzy logic. The specific mathematical formula for defining fuzzy sets is

$$A = \left\{ \frac{\mu_A(\mu_1)}{\mu_1}, \frac{\mu_2(\mu_2)}{\mu_2}, \frac{\mu_A(\mu_3)}{\mu_3} \right\}. \quad (1)$$

For many limited domains of discourse, the fuzzy set can be expressed as

$$A = \{\mu_A(\mu_1), \mu_A(\mu_2), \ldots, \mu_A(\mu_n)\}. \quad (2)$$

The main function of the so-called fuzzy set is to express the degree to which the element belongs to a specific set when the attributes and classification of the element cannot be clearly defined. In this method, the object to be investigated and the fuzzy concept reflecting it are regarded as a certain fuzzy set, and an appropriate membership function is

established. It analyzes fuzzy objects through the relevant operations and transformations of fuzzy sets. Fuzzy set theory is based on fuzzy mathematics and studies the phenomenon of inexact. The closer the $\mu_A(\mu)$ of an element is to the value of 1, the higher the degree of belonging of the element to the set.

Membership functions are mathematical tools used to characterize fuzzy sets. Membership function is a very important concept in fuzzy mathematics, which is specifically expressed as

$$\mu_A(u) = \begin{cases} 1, \\ 0, 0 < \mu_A(u) < 1. \\ 0. \end{cases} \quad (3)$$

In fuzzy mathematics, membership functions are important tools. Any set is actually a generic subset.

3.3. Specific Method of Fuzzy Comprehensive Evaluation. The fuzzy transformation method is a fuzzy comprehensive evaluation method realized by matrix transformation. Usually, R is used to represent the fuzzy evaluation matrix, and A is used to represent the weighted vector. The main calculation formula of the evaluation result is as

$$y_j = \vee\left(a_i \wedge r_{ij}\right) \quad (j = 1, 2, 3 \ldots, m). \quad (4)$$

According to the above setting, the specific calculation formula of matrix transformation will be replaced by multiplication, such as

$$y_j = \vee\left(a_i r_{ij}\right) \quad (j = 1, 2, 3 \ldots, m). \quad (5)$$

The role of a_i here is different from the previous role and plays the role of actual weighting.

Similarly, the specific calculation formula of the weighted average is as

$$y_j = \sum_{i=1}^{n} \left(a_i \wedge r_{ij}\right) \quad (j = 1, 2, 3 \ldots, m). \quad (6)$$

This method uses the weighted average algorithm to evaluate the effect of all the elements contained in the result and has a strong comprehensiveness [15]. The weighted average method utilizes several past observations of the same variable arranged in chronological order and takes the chronological number as the weight. It calculates the weighted arithmetic mean of the observations. It uses this number as a trend forecasting method for predicting the predicted value of the variable in future periods.

3.4. Index Weight Division Based on Analytic Hierarchy Process (AHP). Indicator weight refers to the value and relative importance of each indicator of a measured object in the whole, as well as the quantified value of the proportion. The division of index weights is one of the important methods that need to be used in any quantitative evaluation process, which is caused by the complexity of the things to be evaluated and the inaccuracy of people's thinking in the evaluation process. In most evaluation processes, it is impossible to determine the specific value of a certain index, which requires the use of weight division. There are many ways to divide the index weights, among which the typical ones are AHP, Delphi method and entropy method [16]. Analytic hierarchy process, or AHP for short, refers to a decision-making method that decomposes the elements that are always related to decision-making into goals, criteria, programs, and other levels and then conducts qualitative and quantitative analysis on this basis.

Then, arrange all the values of the experts participating in the evaluation in a matrix, if the value of the expert is represented by a_{ij}, its matrix form can be expressed as

$$A = \left(a_{ij}\right)_{m \times n}. \quad (7)$$

Here, when a_{ij} is greater than 0 and $a_{ij} = 1$ meets this condition, the matrix is called a judgment matrix.

After the above judgment matrix is constructed, the relative weight v of each index can be further determined based on the n evaluation indicators that have been determined.

The first is to calculate the geometric mean of all elements of the judgment matrix, which is

$$\bar{v}_i = n\sqrt{\prod_{j=1}^{n} a_{ij}}, \quad (j = 1, 2, \ldots, n). \quad (8)$$

Different evaluation indicators often have different dimensions and dimension units. Such a situation will affect the results of the data analysis. In order to eliminate the dimensional influence between indicators, data standardization is required. The normalization calculation can solve this problem. The above geometric mean is normalized and calculated, and the specific formula is as

$$\bar{v}_i v_i = \frac{\bar{v}_i}{\sum_{i=1}^{n} \bar{v}_i} \quad (i = 1, 2, \ldots, n). \quad (9)$$

Judgment matrix means that any systematic analysis is based on certain information. The information base of analytic hierarchy process (AHP) is mainly the judgments given by people on the relative importance of each factor at each level. These judgments are expressed in numerical values and written as results in matrix form. This verification method is usually performed for random match rate values [17].

3.5. Constructing Teaching Fuzzy Comprehensive Evaluation Matrix. The fuzzy comprehensive evaluation method applied this time adopts multiple evaluation methods because of the diversity of teaching evaluation indicators [18].

When the individual effect of one factor varies with another factor, the single factor is to perform a single factor calculation evaluation matrix, such as

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ r_{m1} & r_{m2} & \cdots & r_{km} \end{bmatrix}. \quad (10)$$

Table 1: The importance evaluation of the four major indicators of flipped classroom teaching work.

Index	Very heavy	Very important	More important	Generally	Unimportant
Teaching content	0	4	4	2	0
Teaching attitude	0	2	3	1	0
Teaching management	3	4	3	0	0
Teaching effect	2	2	4	1	0

Table 2: Specific weights of the first layer indicators.

Index	Teaching content	Teaching attitude	Teaching management	Teaching effect
Teaching content (w_1)	1	1	1/2	1/2
Teaching attitude (w_2)	1	1	1/3	1/2
Teaching management (w_3)	2	3	1	1
Teaching effect (w_4)	2	2	1	1

On the basis of the above matrix, the comprehensive evaluation matrix of the single layer is obtained as

$$B = A * R = (V_1, V_2, V_3, \ldots, V_n) * \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ r_{m1} & r_{m2} & \cdots & r_{km} \end{bmatrix}. \tag{11}$$

Then combined with the membership principle, the final evaluation result can be obtained.

3.6. Construction of the Fuzzy Comprehensive Evaluation Index System. The evaluation index system refers to multiple indicators that characterize various aspects of the evaluation object and their interrelationships. It constitutes an organic whole with an internal structure. As mentioned in the previous design, the index system is constructed by determining the evaluation index, which is the most difficult part of fuzzy comprehensive evaluation [19]. The importance evaluation of the four major indicators of flipped classroom teaching work is shown in Table 1.

As shown in Table 1, it can be seen that the order of concentration of these four indicators is teaching management, teaching effect, teaching content, and teaching attitude, which is consistent with the judgment result of concentration. Therefore, these four indicators have high rationality for the comprehensive evaluation of college sports flipped classroom [20].

According to the classification of the above four indicators, the specific weights of the first-layer indicators can be known, as shown in Table 2.

As shown in Table 2, based on the relative importance,

$$M_i = \prod_{j=1}^{n} c_{ij}. \tag{12}$$

This results in

$$w_i = n\sqrt{M_i}. \tag{13}$$

Substituting the relative importance value of the table into the table to obtain the relative weight value of the corresponding indicator, such as

$$w_1 = \sqrt[4]{1 \times 1 \times \left(\frac{1}{2}\right) \times \left(\frac{1}{2}\right)} = 0.71, \tag{14}$$

$$w_2 = \sqrt[4]{1 \times 1 \times \left(\frac{1}{3}\right) \times \left(\frac{1}{2}\right)} = 0.064. \tag{15}$$

In the same way, $w_3 = \sqrt[4]{3 \times 2 \times 1 \times 1} = 1.57$ and $w_4 = \sqrt[4]{2 \times 2 \times 1 \times 1} = 1.41$ can be obtained, normalized, and the eigenvector of weight calculation can be obtained as

$$\sum_{i=1}^{4} w_i = 0.71 + 0.64 + 1.57 + 1.41 = 4.33. \tag{16}$$

This paper needs to test the consistency and rationality of the judgment matrix. First, calculating the largest one among the eigenvalues of the matrix, denoted by $\lambda_{\max}$, and the calculation formula is

$$\lambda_{\max} = \frac{1}{n} \sum_{i=1}^{n} \frac{(uW)_i}{W_i}. \tag{17}$$

And from the above actual weight value, formula (18) is obtained:

$$uW = \begin{bmatrix} 1 & 1 & \frac{1}{2} & \frac{1}{2} \\ 1 & 1 & \frac{1}{3} & \frac{1}{2} \\ 2 & 3 & 1 & 1 \\ 2 & 2 & 1 & 1 \end{bmatrix} \times \begin{bmatrix} 0.164 \\ 0.148 \\ 0.363 \\ 0.325 \end{bmatrix} = \begin{bmatrix} 0.656 \\ 0.595 \\ 1.46 \\ 1.312 \end{bmatrix}. \tag{18}$$

Thus, $\lambda_{max} = 4.02$ is obtained, and then the consistent CI index can be calculated according to λ_{max}, such as

$$CI = \frac{\lambda_{max} - n}{n - 1} = \frac{4.02 - 4}{3} = 0.007. \quad (19)$$

The judgment matrix consistency test index CR is further calculated as formula (20):

$$CR = \frac{CI}{RI} = \frac{0.007}{0.89} = 0.0079. \quad (20)$$

The above formula RI represents the average consistency index.

4. Design of the Comprehensive Evaluation System for College Sports Flipped Classroom Based on the Fuzzy Comprehensive Evaluation Method

4.1. Design of the Comprehensive Evaluation System. The fuzzy comprehensive evaluation system based on AHP adopts B/S (browser/server) structure. This structure is suitable for both the campus network and the Internet. Users can conduct comprehensive evaluation of the flipped classroom through the Internet anytime, anywhere. If the evaluation indicators need to be adjusted, the client can use it directly without any reset or programming, as shown in Figure 3.

As shown in Figure 3, some common auxiliary classes and methods, such as database access classes and transaction processing classes, are used in the development and design of the system. In the fuzzy comprehensive education evaluation system based on AHP, the application objects of the whole system are data tables and views in the database, which are abstracted as common entity class modules.

This system is a system for comprehensive evaluation of college sports flipped classroom teaching using the school campus network. Its network topology is shown in Figure 4.

As shown in Figure 4, each school's office, computer room, and student dormitory are equipped with terminal computers, connected to the campus network, and the teaching quality assessment system. In a web application, users can only evaluate the quality of education and send data through a user interface such as a web browser.

Design of evaluation plan management module: the basis of teacher teaching evaluation is the evaluation plan. The setting of the evaluation plan is related to the assessment results and the fairness of the assessment. The evaluation plan refers to the management and maintenance of various indicators. Completing the calculation through the indicators is the process of comprehensive evaluation of the flipped classroom.

Design of online scoring and evaluation module: online scoring and evaluation include two operations of students' online scoring and real-name message. Among them, students score online according to the evaluation plan and select scores for each evaluation index in the evaluation plan. The selection of scores is generally in the form of preset, and different score levels are given. The real-name message means that students can ask various questions online during the evaluation process, and teachers are responsible for answering them after logging in to the system.

Design of evaluation process management module: based on fuzzy comprehensive evaluation, each index is transformed into a specific evaluation index for evaluation. The comprehensive evaluation of teachers' teaching quality is completed through student evaluation and teaching supervision data. Teachers' teaching evaluation includes grade evaluation and grade inquiry. Among them, the grade evaluation is used to calculate the comprehensive grade through each weight, and the grade query is used to query the teacher's comprehensive evaluation grade, which is displayed in the form of a table. The table information includes the teacher's name, course name, and evaluation grades.

4.2. Realization of Specific Functions of the System

4.2.1. Selection of the System Mode. The B/S structure is a 3-layer architecture system based on the Internet. In the B/S structure, the user client only needs to use the web page of the reference system application. At present, B/S architecture is the mainstream architecture for system development. Large enterprise groups and customer-distributed application systems all use B/S architecture. Combined with the many advantages of B/S structure design, the B/S structure is adopted in this paper, as shown in Figure 5.

As shown in Figure 5, based on the analysis of the system development background and system design principles, the use of the school's existing network resources is fully considered. Taking into account the requirements of multiple users operating the system at the same time, the system decided to adopt the overall architecture based on the B/S mode. B/S structure is a network structure model after the rise of WEB. The WEB browser is the main application software of the client. This pattern unifies clients. It concentrates the core part of system function realization on the server. It simplifies the development, maintenance, and use of the system.

4.2.2. JSP Technology. The Java program segment of the JSP page can realize the function of database operation and Web page redirection, so it can realize the dynamic reading technology of the Web page. At present, in the theoretical system of the MVC 3-layer structure, JSP pages are no longer used for complex logical descriptions, but are only used to implement static pages. The MVC structure is shown in Figure 6.

As shown in Figure 6, MVC does not need to rewrite business logic while improving and customizing the

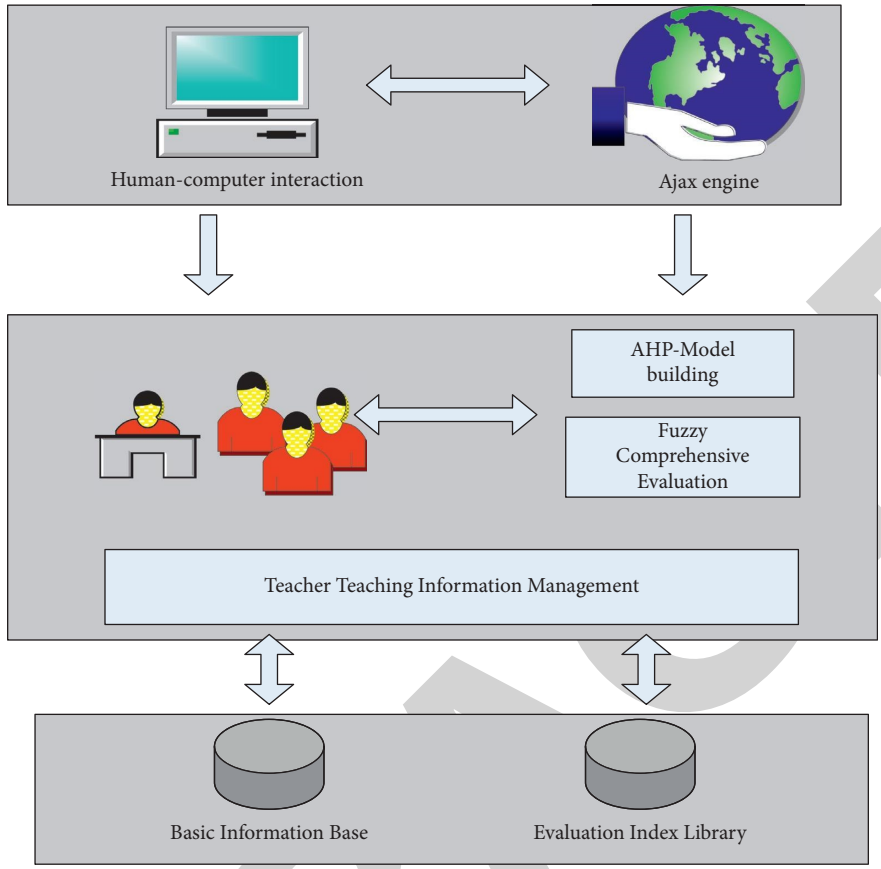

Figure 3: Comprehensive evaluation system of flipped classroom in college sports.

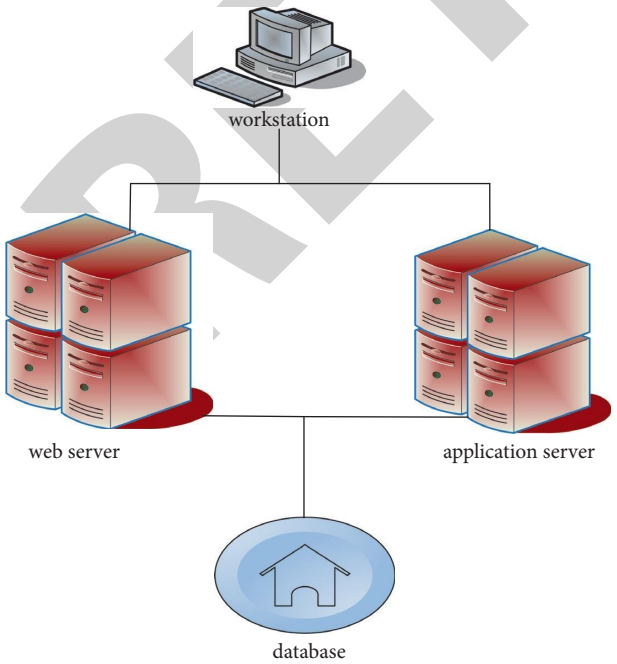

Figure 4: Network topology.

interface and user interaction. MVC was uniquely developed to map traditional input, processing and output functions in a logical graphical user interface structure. The final realization of this system is that the university provides a software system for evaluating the completion of teachers' teaching and related work. The results obtained by using this system can more accurately and objectively reflect the performance of teachers in the semester.

4.2.3. SQL Server 2000. A database is a collection of related data that organizes data according to a specific structure and stores the data and its relationships in a computer. Database technology is combined with network communication technology, object-oriented technology, multimedia technology, artificial intelligence technology, etc., which has become the main feature of modern database technology development. The commonly used databases include IBM's DB2, Oracle, SybaseSQLServer, MySQL, etc.

The system uses SQLServer2000, another version of the SQLServer database management system imported by Microsoft. This version is the successor of SQLServer7.0, and this version will add more advanced functions. SQLServer2000 can be used on multiple processing servers and other platforms such as Windows. It has the following advantages: high scalability and usability, simple installation and use, and enterprise-level database functions.

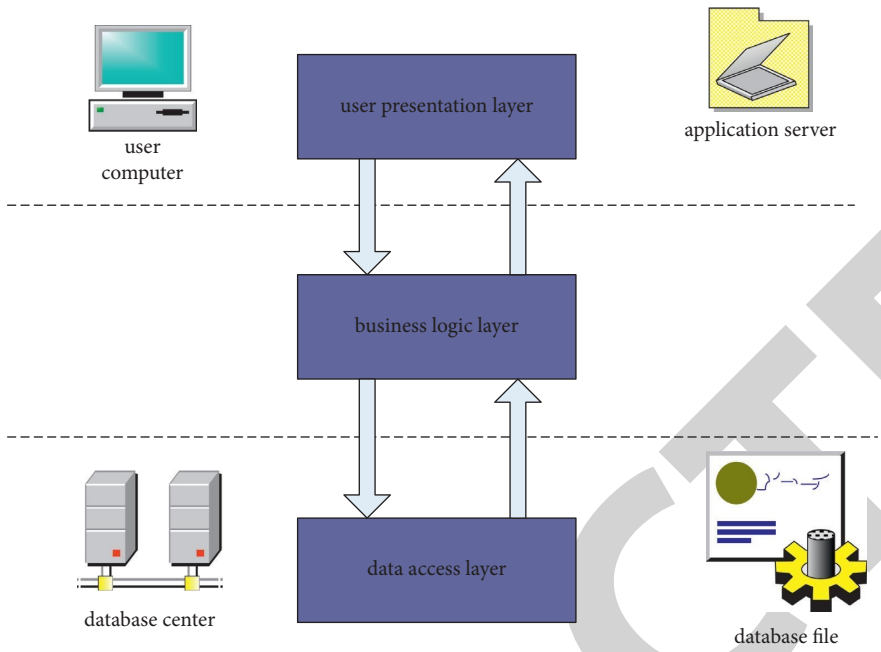

Figure 5: B/S mode structure diagram.

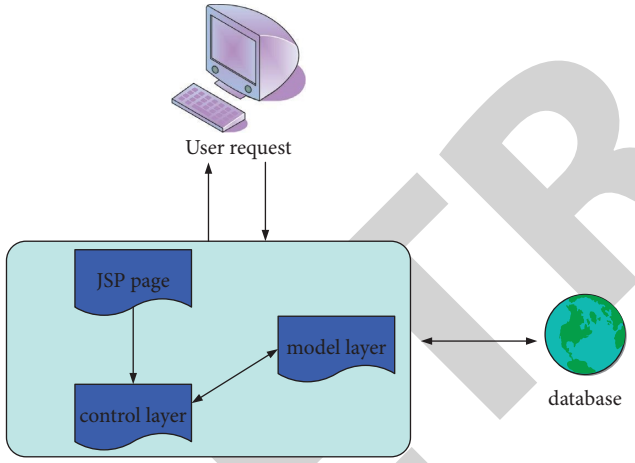

Figure 6: The structure of the flipped classroom evaluation system MVC structure schematic diagram.

In the testing process, it creates virtual users with LoadRunner for testing and conducts testing by selecting 5 typical test scenarios. In the load test scenario, it selects typical functions and operations by creating 30 virtual users in the test environment for simultaneous concurrent access. By monitoring the test results of the number of hits per second, it can understand the access frequency of the system client to the server and test the average transaction response time of concurrent users. Thirty concurrent users are running at the same time, and the average transaction response time under the condition of 30 concurrent users is shown in Figure 7.

As shown in Figure 7, after testing, most of the transaction response times are less than 2 seconds, which meets the system requirements.

5. Experiment and Comprehensive Evaluation System

5.1. Functional Test of the Comprehensive Evaluation System

5.1.1. Software Testing Environment. Operating system: it chooses the most commonly used WindowsXP/2000/NT as the operating platform, forms the Java environment, Tomcat server, sqlserver2000 database, and sets the environment parameters.

Hardware operating environment: the working environment of this system is that a microprocessor after the fourth generation of Intel Pentium is installed on the computer, or an Alpha processor that executes Microsoft Windows NT Workstation. It has a memory space of 512M or higher, and there must be a device to ensure network connectivity. The network protocol used is the TCP/IP protocol.

5.1.2. Software Function Test. Software functional testing adopts black-box testing, which mainly tests whether the software meets the functional requirements. The comprehensive test ensures the smooth flow of information between each module, and on this basis, software function test, program security test, and software performance test can be carried out. This paper conducts an experimental analysis on the security and error rate of the system, as shown in Figure 8.

As shown in Figure 8, from the user's point of view, the functions of the system meet the requirements. Since the modules are basically independent, the security of the system is relatively high. After many user tests, each functional block was tested, and the result basically realized all the functions of the system.

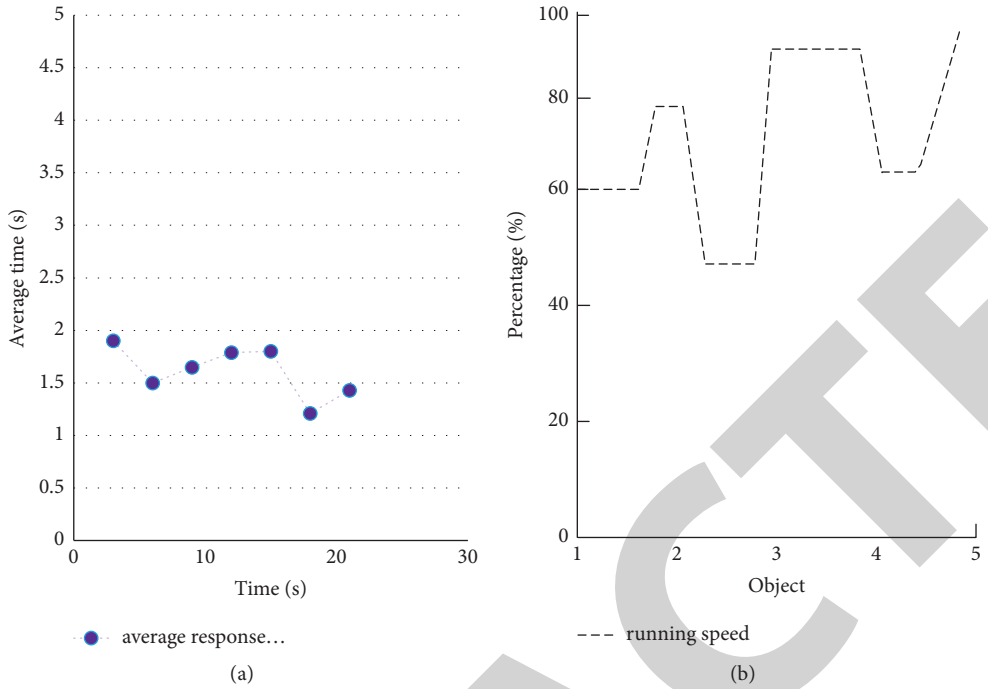

Figure 7: Average transaction response time and system speed for 30 concurrent users. (a) Average transaction response time for 30 concurrent users. (b) System running speed.

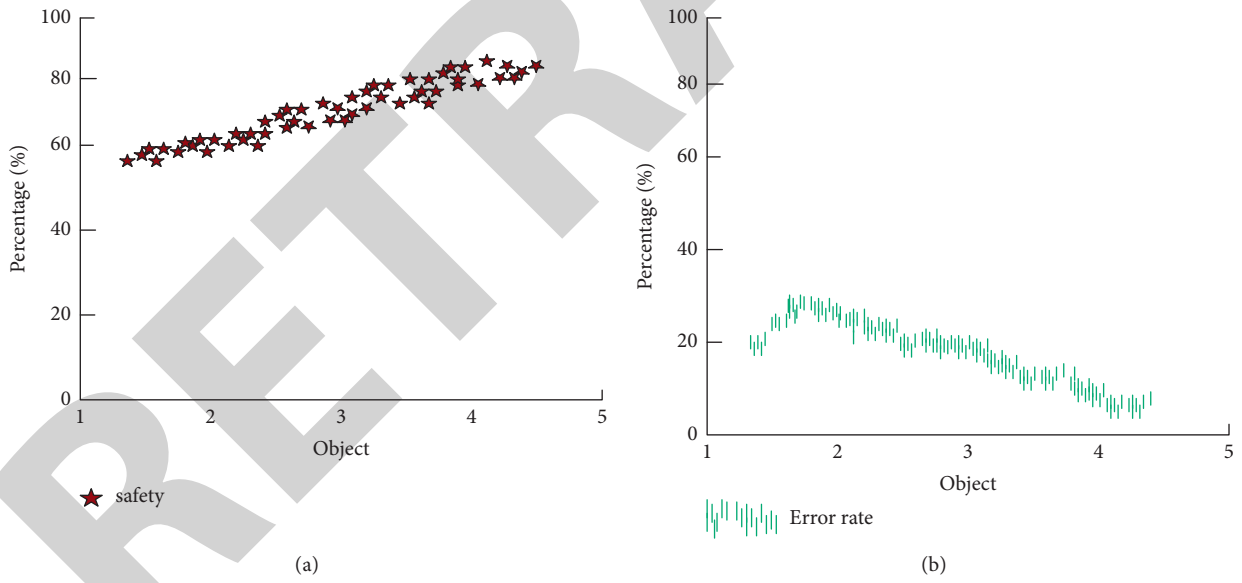

Figure 8: Security and error rate of our system. (a) Security of the system in this paper. (b) The error rate of the system in this paper.

Because most of the teaching evaluation systems are online at the same time and submit information at the same time, the system has relatively high requirements on the server. This puts forward higher requirements on the hardware configuration of the server. In particular, the configuration of the processor and memory should be improved accordingly, and the operating system should be as stable as possible. Therefore, this paper conducts experimental analysis on the stability and operation efficiency of the system through 10 tests, as shown in Figure 9.

As shown in Figure 9, with the continuous increase of data, the previous system will inevitably generate redundant data, the operating efficiency of the system will decrease, and the access speed will decrease. In order to solve this problem, it is recommended that system administrators regularly backup and clean up redundant data, which enables the system to work properly and efficiently.

This flipped classroom comprehensive evaluation system is designed through a centralized information database and standardized and comprehensive teaching evaluation links.

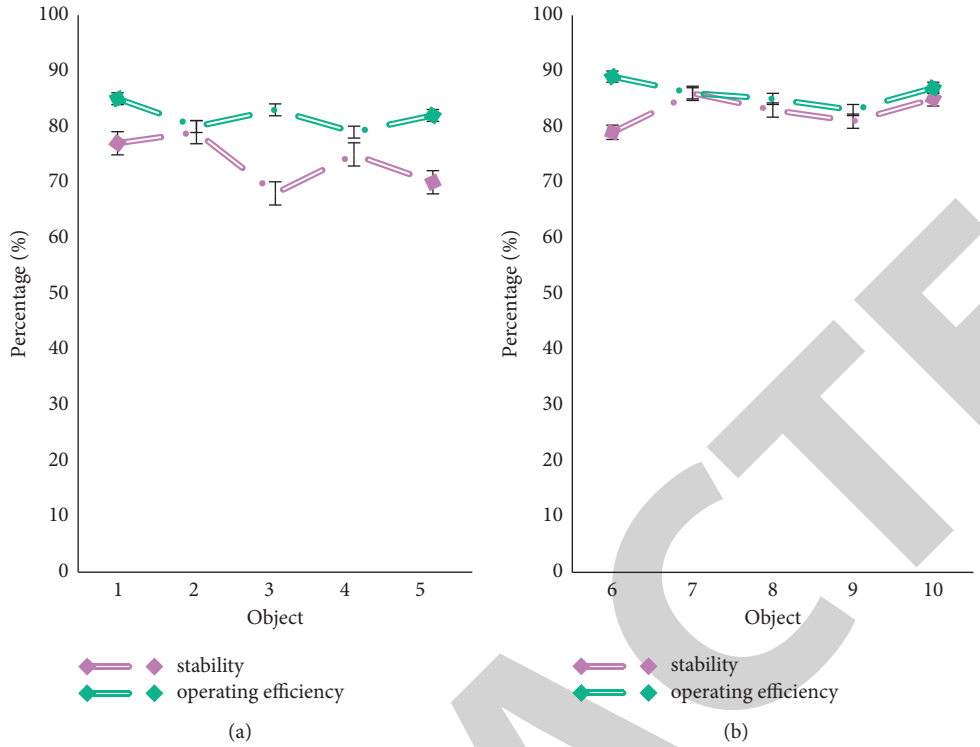

Figure 9: System stability and operating efficiency under 10 trials.

The scientific AHP-fuzzy matrix method and perfect system function design can meet the comprehensive evaluation requirements of general universities and vocational flipped classrooms. It can achieve the following goals: it can effectively maintain the system information. It automatically generates teacher evaluation information, and it gives appropriate comments according to the specific evaluation status. A student can only evaluate the same teacher once, and the average value of multiple evaluations is calculated. It relieves the work tasks of educational administrators, reduces staffing, and reduces management costs. The evaluation results are more objective and true.

5.2. Satisfaction Survey of the Comprehensive Evaluation System. This paper conducts a survey on the satisfaction of 50 students to fill in the traditional paper evaluation form and evaluate the comprehensive evaluation system of this paper, as shown in Tables 3 and 4.

As shown in Tables 3 and 4, among the 50 students surveyed, the satisfaction with the traditional paper evaluation of college sports flipped classroom is generally dissatisfied. Only 5 students were very satisfied, accounting for 10%, and 20 students were dissatisfied, accounting for 40%, ranking first. It can be seen that most students are very dissatisfied with the way of paper evaluation. In the satisfaction survey of the comprehensive evaluation system of this article, it was found that 32 people were very satisfied, accounting for 64%, ranking first, and only 1 person was dissatisfied, accounting for 2%. Therefore, the students are very satisfied with the comprehensive evaluation system designed in this paper.

Table 3: Satisfaction survey of traditional evaluation methods.

Satisfaction	Number of people	Percentage	Effective percentage
Very satisfied	5	10	10
Generally satisfied	7	14	14
Satisfy	10	20	20
Dissatisfied	20	40	40
Very dissatisfied	8	16	16

Table 4: Satisfaction survey of the comprehensive evaluation system in this paper.

Satisfaction	Number of people	Percentage	Effective percentage
Very satisfied	32	64	64
Generally satisfied	12	24	24
Satisfy	4	8	8
Dissatisfied	1	2	2
Very dissatisfied	1	2	2

This paper compares and analyzes the paper evaluation method and the efficiency of the comprehensive evaluation system in this paper, as shown in Figure 10.

The existing evaluation process of filling out a paper evaluation form is inefficient, as demonstrated in Figure 10. The use of computer systems to carry out instructional assessment can considerably minimize the workload of statistical engineers. It is easier and faster to analyze, and it is

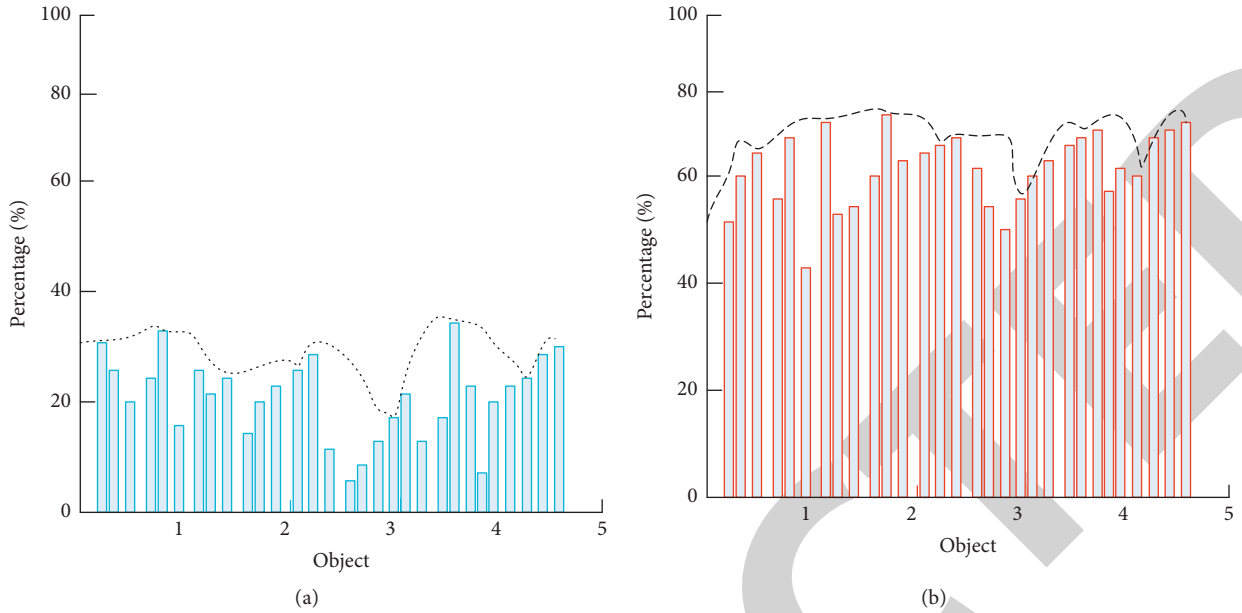

Figure 10: Comparison of paper evaluation methods and the efficiency of the comprehensive evaluation system in this paper. (a) Efficiency of paper-based evaluation methods. (b) Evaluation of the efficiency of the system.

appropriate for statistical analysis of big samples. In conjunction with the present outstanding computer system platform, the paper employs fuzzy mathematics theory to build and construct a fuzzy evaluation algorithm-based evaluation system, which has strong practical implications for the thorough evaluation of the current flipped classroom.

6. Conclusion

Evaluating educational quality is an important means of managing educational quality, providing a basis for teachers to improve educational work, implement educational reform, and educational quality management. It is an important aspect of education status analysis and comprehensive evaluation. As the scientific and technical era progresses, technologies such as the Internet, cloud computing, and resource construction continue to evolve, and an increasing number of students are willing to participate. Compared with the "indoctrination and sheep-herding" teaching methods in traditional physical education courses, students hope to learn the technical essentials of a certain sport through hands-on practice in self-study and master them. In recent years, the rapid development of flipped classroom has met the needs of many students for online self-learning by searching for excellent course resources on the Internet after class. This paper provides a comprehensive explanation around the basic concepts of AHP-fuzzy matrix and flipped classroom in college sports. In the method part, the basic algorithm based on AHP-fuzzy matrix is also described. Fuzzy comprehensive evaluation method can be beneficial to the design of comprehensive evaluation system. Based on AHP-fuzzy matrix, this paper designs a comprehensive evaluation system for college sports flipped classroom. And the function of the system is tested in this paper. Finally, this paper finds that the system not only has high security but also has high efficiency. However, the author's knowledge is not very broad, so there must be many problems, and the author will continue to correct them.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare no conflicts of interest.

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