Research on the Construction of College Physical Education Evaluation System Based on Analytic Hierarchy Process

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Abstract: This paper aims to build a hierarchical analysis model of PE teachers' teaching evaluation system. According to the degree of influence of various indexes on the quality of PE teaching, a comprehensive evaluation system of multi-factor weights is established, and the weights corresponding to the corresponding factors are calculated. A simple and reliable evaluation calculation method is established. And the logical analysis method initially constructs the evaluation index system of teaching ability of PE teachers in ordinary colleges and universities, and makes it concrete and operable, so as to scientifically evaluate the teaching ability of PE teachers in ordinary colleges and universities. The results show that the weight of teaching effect has the greatest influence on the evaluation results of physical education, while the influence of teaching content and scientific research ability is relatively small.

1. Introduction

Physical education teaching evaluation system is an important method and means to measure the comprehensive level of physical education teachers' teaching work, and is also an important way to scientifically manage physical education teaching [1]. As an important part of physical education activities, physical education evaluation plays an important role in the process of carrying out quality education and promoting healthy development. After the new curriculum reform, the curriculum standard puts forward higher requirements for the teaching ability of physical education teachers, so its importance is self-evident. Practice has proved that the subjective arbitrariness of evaluation is very large, and the evaluation results are inevitably different from the actual situation, which reduces the accuracy and authenticity of the evaluation price and hardly reflects the fairness and justice of the evaluation [2]. Physical education is a process of individual creation, but the evaluation of its teaching quality is a norm that reflects the common character. There are many methods to evaluate teachers' teaching quality, but many methods can achieve certain results, but there are also some limitations. Therefore, it is difficult to determine the factors in the teaching evaluation. After determining the factors, it is not realistic to quantify all of them. The method of combining qualitative and quantitative methods should be adopted in the teaching of physical education.

2. Establishment of PE Teaching Evaluation System Based on Analytic Hierarchy Process

When analytic hierarchy process is used to analyze decision-making problems, first of all, the problems should be organized and hierarchized to construct a hierarchical structural model. Under this model, complex problems are decomposed into components of elements [3]. These elements form several levels according to their attributes and relationships. The elements of the previous level are used as criteria to dominate the relevant elements of the next level [4]. This paper simplifies the number of teaching evaluation indexes in actual cases and reduces the number of teachers participating in the evaluation, but this does not affect the feasibility, practicability and accuracy of the evaluation method. The calculation in this paper is completed by a special calculation program developed based on MATLAB.
2.1. Selection of Evaluation Indexes

In order to be able to more comprehensively, more systematically and more scientifically select each index of the college physical education teaching evaluation system and improve the accuracy of the system evaluation, the selected indexes should be scientific and practical. Only by designing the index system from multiple angles and levels can the teaching quality of teachers be accurately reflected [5]. Therefore, in order to ensure the objectivity and accuracy of the evaluation results, the design of the teaching evaluation index system for PE teachers must have the basic principles of scientificity, comparability, completeness, fairness and openness. According to the actual situation of physical education in institutions of higher learning and the internal evaluation of physical education in institutions of higher learning, the factors influencing the evaluation system of physical education in institutions of higher learning are initially selected as indicators from the aspects of teacher teaching, teacher professional ability, student learning and teaching effect. According to the principles determined by the evaluation index system, this case comprehensively selects 6 indexes of teaching content, teaching method, scientific research level, teaching attitude, professional and technical level and teaching effect as the evaluation indexes of teaching quality from two aspects of teachers' teaching and students' acceptance. From this, we can see that we need to seek new evaluation methods to improve this situation and make the evaluation of teachers' teaching quality more scientific, objective and comprehensive. According to this, the evaluation hierarchy system of PE teachers' teaching quality is constructed (see fig. 1).

![Figure 1 Level system of teaching quality evaluation for physical education teachers](image)

2.2. Establish a Judgment Matrix

To determine the index weight, this paper mainly adopts T. L. stahl analytic hierarchy process (AHP) [6], and invites coaches and experts to construct objective comparison values between the indexes according to the proportion scale (table 1), and correspondingly gives the relative importance of each index, then establishes a mathematical model, calculates the weight of the relative importance of all factors at each level, and sorts them. Then the index weight is determined by synthesizing the judgment results.

<table>
<thead>
<tr>
<th>Weight of relative importance</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equally important</td>
</tr>
<tr>
<td>3</td>
<td>Slightly important</td>
</tr>
<tr>
<td>5</td>
<td>Obviously important</td>
</tr>
<tr>
<td>7</td>
<td>Strong importance</td>
</tr>
<tr>
<td>9</td>
<td>Extremely important</td>
</tr>
<tr>
<td>2, 4, 6, 8 reciprocal of the above non-zero number</td>
<td>Between the intermediate values of the above two adjacent scales</td>
</tr>
</tbody>
</table>

Table 1 The scale of relative importance of T. L. starr

On the basis of not losing the principle of comprehensiveness and objectivity, the primary selection indexes are optimized and integrated through further consultation with relevant experts in
school physical education. For the evaluation indexes at the expert level, the key indexes are collected and selected through consultation and supervision of experts, teaching masters, etc. The evaluation index at the management level is based on the important evaluation index for teachers’ teaching quality evaluation by departments such as teaching quality monitoring and teaching evaluation. Experts are asked to score the primary indicators, the experts are asked to score by issuing questionnaires, the collected data are counted, and the weighted average of each indicator is calculated. According to the scoring standard of Saatv's weight method, a judgment matrix is established as follows [7]:

\[
B = \begin{bmatrix}
1 & 5 & 7 & \frac{1}{7} & 1 & \frac{1}{7} \\
\frac{1}{5} & 1 & 6 & \frac{1}{5} & 4 & \frac{1}{3} \\
\frac{1}{7} & \frac{1}{6} & 1 & \frac{1}{9} & \frac{1}{8} & 1 \\
7 & 5 & 9 & 1 & 1 & \frac{1}{5} \\
1 & \frac{1}{4} & 8 & 1 & 1 & \frac{1}{2} \\
7 & 3 & 1 & 5 & 2 & 1
\end{bmatrix}
\]

(1)

2.3. Carry out Consistency Check

In the evaluation method of teachers' teaching quality, AHP is selected to determine the weight of teaching quality index. Analytic Hierarchy Process (AHP) is a multi-objective decision analysis method. The core principle of this method is to compare the indexes in each level of the index system, evaluate the importance of each index, calculate the weight of each index in each level according to the evaluation results, and finally calculate and obtain the comprehensive weight of each index [8]. When the matrix order \( n \) of the primary index of the physical education teacher's teaching ability evaluation index system is \( n = 4 \), the random consistency index \( CI = 0.08 \) is less than 0.1, and there is no logical error. It shows that the judgement matrix of the first-level indicators of physical education teachers' evaluation indicators has high consistency. Therefore, the weight setting of the indicators is reasonable and the hierarchical ranking is effective.

2.4. Seek Weight

The operating scale of the evaluation index system for the teaching ability of PE teachers in ordinary colleges and universities was developed on the premise of the completion of its evaluation index system. Through comparing the importance degree with each other, the judgment score is carried out layer by layer, and the contribution degree of the lower index to the upper index is determined by calculating the feature vector of the judgment matrix, so as to obtain the ranking result of the importance of the basic index to the overall target or the comprehensive evaluation index. From the perspective of teaching, teachers should design their teaching ideas so that each class can be explained clearly and methodically, and students can accept and understand it more easily. Therefore, in the implementation process of inquiry teaching, teachers should embody the characteristics of openness, special topics and cooperation in classroom teaching. According to the teaching purpose and teaching content, teachers should put stimulating students' interest in learning and creation in the first place in teaching activities, and implement inquiry teaching that starts from problems, is based on practice and embodies creation as a prominent theme in the process of students' classroom teaching. It can be seen from the table that the teaching effect, teaching method and teaching attitude have important influence on the evaluation of physical education, while the scientific research ability of physical education teachers has little influence on the evaluation of physical education.

Table 2 Weight table of each evaluation index

<table>
<thead>
<tr>
<th>Teaching content C1</th>
<th>Teaching method C2</th>
<th>Scientific research ability C3</th>
<th>Teaching attitude C4</th>
<th>Professional competence C5</th>
<th>Teaching effect C6</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.11</td>
<td>0.21</td>
<td>0.13</td>
<td>0.22</td>
<td>0.15</td>
<td>0.20</td>
</tr>
</tbody>
</table>

In the process of physical education teaching, the teaching effect is the most important. For
example, a physical education teacher teaches students to learn young long boxing. The best effect is that students can learn basic movements in class, and students should be able to practice frequently after class. After determining the evaluation index and calculating its weight, the construction of the evaluation index system for the teaching ability of physical education teachers in ordinary universities has been preliminarily completed. The main purpose of developing the evaluation scale is to make the secondary index of the evaluation index system concrete and operable. The teaching method effectively combines the elements such as teachers, students, teaching contents and teaching methods, so as to make these elements exert their respective functions and functions as much as possible, thus realizing the teaching purpose through the generated teaching effect. The teaching attitude reflects the teachers' professional dedication. If the PE teachers are not serious in class or teach in a coping style, the teaching effect in this case will definitely be very poor. Therefore, the PE teachers should correct their teaching attitude and devote themselves to the PE teaching work so as to achieve good results. There are some deep and cutting-edge problems. By creating problem situations and focusing on students' suggestions, we can create a good atmosphere for exploration, provide sufficient opportunities for students to freely express, question, explore, discuss and cooperate, and thus produce positive exploration effects.

Through the operation process of the evaluation scale of the evaluation index system for the teaching ability of college PE teachers, a percentile scoring method is adopted to evaluate the teaching ability of college PE teachers [9]. In order to better verify the implementation effect of inquiry-based classroom teaching, it is necessary to design the inquiry-based teaching effect according to certain research main line, aiming at the core knowledge and latest development of a certain academic, technical, engineering and other thematic direction, taking problem-based, project-based, case-based and practice-based as the main carriers. Only by adopting good teaching methods can we have a good classroom atmosphere. Only by having a good classroom atmosphere can students have a pleasant feeling in learning activities and can they arouse and develop their intelligence. Teacher's teaching method is also very important. The same content is taught by different methods. The final learning effect of students is different. If the teaching method is preferred and accepted by students, they can learn the content taught by the teacher faster and better. The teaching design ability, teaching implementation ability, teaching evaluation ability and teaching expansion ability of ordinary college physical education in the first-level index can be scientifically and reasonably converted into quantitative analysis, which is not only conducive to a reasonable and fair evaluation of teachers, but also conducive to the ranking of evaluation results.

3. Conclusion

The physical education teaching system in colleges and universities can be divided into three levels, from high to low is the target level, the criterion level and the plan level respectively; Each index in the second-level index criterion layer has different weights, and each variable in the third-level index scheme layer also has different weights. The weights of emotion regulation, participation attitude and participation behavior are higher than those of other indicators. Due to the use of MATLAB calculation program, this method is more simple and feasible, fast to operate, and easy to be mastered and applied by physical education teachers. During the operation, the evaluator only needs to input the determined weight values of various evaluation indexes into the calculation program, so as to evaluate and sort the evaluated persons. From the results of the model, we can see that the teaching effect, teaching method and teaching attitude have important influence on the evaluation of physical education, while the scientific research ability of physical education teachers has little influence on the evaluation of physical education. The weight distribution of each index in this evaluation index system has been proved to be reasonable by theoretical analysis and practical tests. After a preliminary small-scale practical test on this evaluation index system, the test results show that this evaluation index system can effectively measure the differences between physical education teachers' teaching abilities, can comprehensively evaluate the teaching abilities of physical education teachers in ordinary universities, and has certain feasibility.
References


