Construction of Fuzzy Comprehensive Evaluation Model of Physical Education Teaching Based on Short Video

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Abstract. This paper draws on related teaching methods and designs a fuzzy evaluation index system for physical education quality based on short videos. On this basis, the maximum frequency interval method is used to determine the weights of the primary and secondary indicators. In view of the many factors affecting the quality of outdoor teaching of physical education teachers in colleges and universities, which are difficult to express and calculate with precise mathematics, the Fuzzy comprehensive evaluation model is used to deal with the qualitative factors among them, and with the help of case studies, designs are designed to affect the quality of physical education teaching. Several evaluation indicators, using fuzzy comprehensive scoring method, formulate a comprehensive evaluation table and calculation formula for physical education teaching, so as to realize the quantitative evaluation of physical education teaching. Case studies have shown that the use of fuzzy teaching methods to evaluate practical course teaching can effectively reduce the influence of subjective factors, the calculation method is simple and practical, and the evaluation results are accurate and reliable.

Keywords: Short video · Physical education · Fuzzy comprehensive evaluation · Model construction

1 Introduction

Physical education is an important part of school quality education. How to comprehensively evaluate the quality of physical education is related to discipline construction and reform and development [1]. Therefore, the use of scientific and reasonable multi-level evaluation is an effective way to standardize the evaluation of physical education teaching quality. Through student evaluation of teacher performance, we can clearly know the relationship between physical education teachers and students in teaching activities and their own shortcomings in the teaching process, so as to make up for the shortcomings in a targeted manner to improve physical education teachers' own comprehensive teaching ability [2].

At present, domestic and foreign scholars' research in the field of physical education mainly focuses on the following aspects. Some researchers mentioned that the current

M. A. Jan and F. Khan (Eds.): BigIoT-EDU 2021, LNICST 391, pp. 59–66, 2021.
https://doi.org/10.1007/978-3-030-87900-6_8

evaluation model of physical education teaching quality in ordinary colleges and universities has serious deviations from the content of the evaluation, the goal of the evaluation, and the concept of the evaluation [3]. Some researchers also believe that the purpose, content, standards, and methods of the new curriculum standard sports evaluation have changed, and the original evaluation indicators cannot be used [4]. In the current situation and reform trend of physical education evaluation, some researchers mentioned that teaching evaluation should be a combination of summative evaluation and formative evaluation, and a combination of qualitative evaluation and quantitative evaluation [5]. Although these studies have conducted various analyses on the evaluation of the teaching quality of physical education courses in colleges and universities, most of them have raised questions and analyzed the reasons, and have not established an evaluation index system and calculation method [6]. In the evaluation of physical education, due to the wide range of evaluation indicators, there are more reasons to be considered [7]. Some evaluation indicators can be evaluated using traditional methods, while some indicators have a certain degree of ambiguity and cannot be evaluated using traditional quantitative methods. It requires a combination of qualitative and quantitative evaluation [8].

In view of the fact that the quality of physical education is inherently vague, based on short videos, this article uses Fuzzy mathematics to evaluate the quality of physical education has a theoretical basis. The fuzzy comprehensive evaluation method is a combination of qualitative and quantitative methods based on fuzzy mathematics, and is especially suitable for evaluation methods with certain fuzzy indicators in the evaluation indicators. Therefore, this article discusses how to apply the fuzzy comprehensive evaluation method to comprehensively evaluate the quality of physical education. Through the use of logical analysis, based on the study of the development history and status quot of mobile short video, a teaching model of college physical education based on this is proposed. In practice, the Fuzzy comprehensive evaluation multi-level model has indeed broadened the evaluation thinking, expanded the evaluation scope, turned qualitative analysis into quantitative analysis, and promoted a more systematic physical education evaluation system.

2 Construction of Physical Education Teaching Model Based on Short Video

2.1 Principle of Fuzzy Comprehensive Evaluation

The basic idea of the fuzzy comprehensive evaluation method is: on the basis of determining the evaluation factors, the evaluation grade standards and weights of the factors, the fuzzy set transformation principle is used to describe the membership degree of each factor and the fuzzy boundary of the factor to construct a fuzzy evaluation matrix. The composite operation of the layers finally determines the level of the evaluation object. Based on fuzzy mathematics, aiming at the qualitative and quantitative ambiguities of the evaluation object, applying the principle of fuzzy relationship synthesis, according to multiple evaluation factors, comprehensive evaluation of the status of the research target is carried out. The framework is shown in Fig. 1. Considering the intricacies of the internal relations of objective things and the ambiguity of the entire system, this method

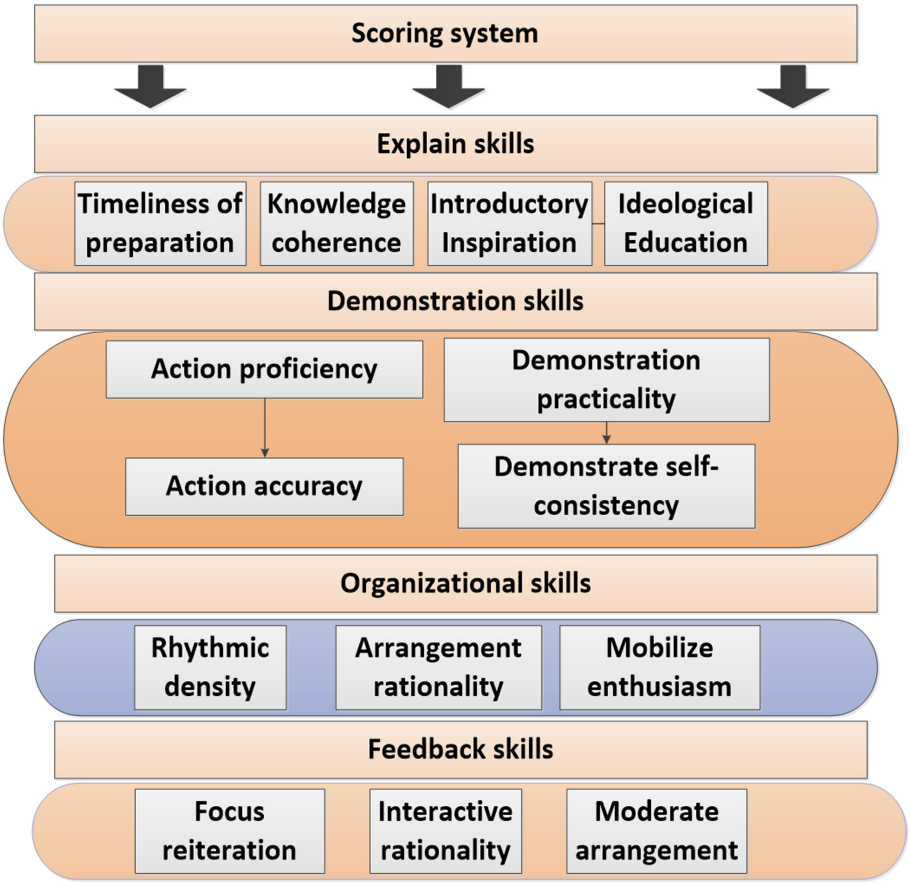

Fig. 1. Fuzzy comprehensive evaluation framework

can be used for the comprehensive evaluation of subjective indicators and objective indicators, especially the comprehensive evaluation of subjective indicators. The main steps are as follows:

There are two finite domains:

$$u = \{x1, x2, l, xn\} \tag{1}$$

$$v = \{y1, y2, l, yn\} \tag{2}$$

Among them: u represents the set of multiple factors of comprehensive evaluation, called the factor set; v is the set of multiple decisions, called the judgment set or comment set. Generally, the influence of each factor on the judged object is not consistent in the general factor concentration. Therefore, the weight distribution of the factor is a fuzzy vector on U. In addition, m comments are not absolutely positive or negative. Therefore, the comprehensive judgment can be regarded as a fuzzy set on y, which represents the

position of the nth comment in the overall judgment y. Among them, T is the fuzzy relationship matrix from u to y, and the three elements constitute a mathematical model of fuzzy comprehensive evaluation. At this point, if you enter a weight distribution A, you can get a comprehensive judgment B.

2.2 Model Index System Optimization

Aiming at the comprehensive evaluation index system for the teaching quality of physical education curriculum designed earlier, we must first compare the importance of each quality factor at the first index level to the teaching quality of the physical education curriculum. The pairwise importance comparison matrix of, that is, construct the judgment matrix. Experts are asked to give subjective judgments based on the mutual importance of various factors at each level, quantify these judgments, and express them in the form of a matrix to show the relative importance of the factors at the previous level to the relevant factors at this level, Set the judgment value of the importance of the factor. Evaluation index The selection is based on the Delphi method and the inside and outside method. By using the quantitative and qualitative information of the expert consultation form to carry out statistical analysis, if more than one-third of the experts believe that an indicator is general or unimportant, the indicator will be eliminated soon. In addition, for indicators with small weights, they will be incorporated into Similar indicators. After 3 rounds of expert consultation, it was not included in the index system until more than 70% of the experts agreed to form an evaluation index. The methods for determining the weight of evaluation indicators mainly include Delphi method, AHP method, PAH-Delphi method, power gradient method and maximum entropy maximum variance method.

$$c = \frac{\sum_{i=1}^{m} Ni(xi + 1 - xi)}{\sum_{i=1}^{m} Ni} \tag{3}$$

$$[x, y] = \begin{cases} [x_m, y_m], m > n \\ [x_n, y_n], m < n \end{cases} \tag{4}$$

$$T = \begin{bmatrix} t_{11} & t_{1n} \\ t_{n1} & t_{nm} \end{bmatrix} \tag{5}$$

$$W = \sum T \bullet x = (w_{11}, w_{12}, \cdots, w_{1m}) \tag{6}$$

Set the weight distribution matrix of each index in the first-level index set as c, and the weight distribution matrix of each index in the first-level index set as E. The weights of the above indicators can be determined according to the Fuzzy statistical method: in the solicitation of the weight interval, n experts ($n \geq 10$) are asked to give a weight interval for each first-level indicator and second-level indicator. In the maximum membership frequency interval, find the maximum value of the left end of the weight interval [x, y] (i = I, 2,…, n). If the evaluation result is not applicable, the result will be normalized. The single-level fuzzy comprehensive evaluation method is used for problems with relatively

few factors. If it is said that in a more complex system, there are more various factors that need to be considered, and there are often hierarchical divisions in each factor. You should consider dividing the set of factors U into several categories according to certain attributes. Make a comprehensive evaluation, and then conduct a high-level comprehensive evaluation between the "categories" of the evaluation results. At the same time, it is necessary to use a multi-user fuzzy comprehensive evaluation method in a complex system.

3 Application and Analysis of Physical Education Model Based on Short Video

3.1 Determination of Teaching Quality Evaluation Index and Weight Distribution

According to existing data and information, it is generally believed that the evaluation of physical education quality mainly includes four aspects: a teaching ability, b teaching effect, c teaching exercise volume, and d other ancillary factors. And each aspect contains several subsets, so that we can draw a relationship diagram based on these evaluation contents to clarify the relationship between the evaluation factors. The evaluation content of each subset has its evaluation language. The evaluation language is divided into four grades: excellent, good, medium, and poor, which constitutes the evaluation domain v: excellent, good, medium, and poor. For a certain physical education teacher to be evaluated, each factor can be estimated by the method of scoring by experts. If one item is prepared beforehand, if 40% of all experts think it is excellent. Then choose the weighted average operator, the main factor determining operator, the main factor prominent operator, etc. to calculate the teacher's evaluation results more objectively. The evaluation language has its own degree of membership, and the degree of membership can be obtained through investigation, that is, a certain number of questionnaires are issued, according to the four levels, the teaching of physical education teachers is evaluated according to the content of the evaluation, and the four levels of evaluation are carried out. There is a certain percentage, and its value is the membership degree mapping of the evaluation content, in which the weight distribution of indicators is shown in Fig. 2..

Since the evaluation factors in each subset have different effects on the quality of physical education, that is to say, the evaluation factors in each subset have different weights or weights, which means that in physical education, each evaluation factor cannot be completely equal. There is a difference in the number distribution. The weights assigned to the elements with greater influence are more important, and vice verse. But the total weight must meet the requirements of normalization. Then, using the "Delphi" method, the opinions of professors, senior teachers, and teaching management cadres were consulted in turn, and the factors with a concentration rate of more than 80% were analyzed and clustered regression. Finally, the correctness of the evaluation results was considered. The evaluation index system is determined by several factors, and the first and second index systems are obtained, and the weight coefficient is calculated according to the contribution rate of each factor in the evaluation.

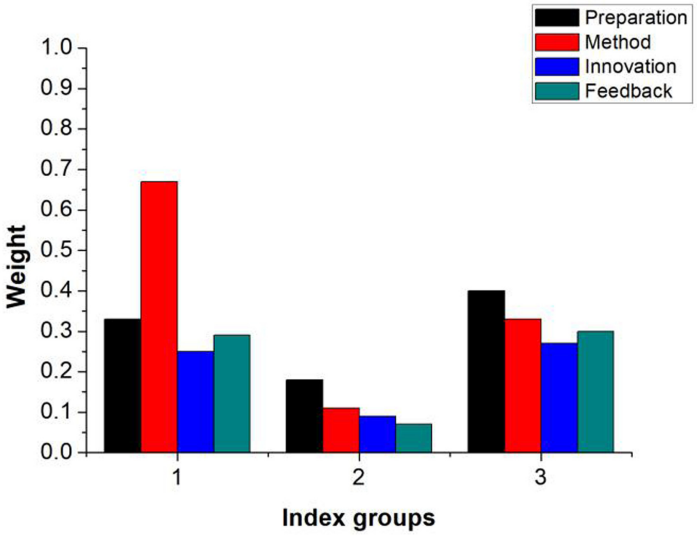

Fig. 2. The weight distribution of teaching quality evaluation index

3.2 Example Results and Analysis

The online short video media teaching quality evaluation was conducted for college physical education teachers participating in the "High School Sports Quality Class Competition" activity in a certain province, and the teacher numbered 9 was used as the evaluation object for a case study. Weight calculation: Use the maximum membership frequency interval method to determine the index weights at all levels. Data collection: Invite n($n \geq 10$) experts to score several indicators of the evaluation object ("very strong", "strong", "strong", "average", "bad"), and find out each teacher The proportion of the seed value is a 21×5 matrix. Matrix block: According to the division of the secondary index, the obtained matrix is divided into 5 corresponding sub-matrices. Second-level index score calculation: According to the second-level index weights obtained in advance, the corresponding sub-matrices are respectively multiplied to obtain the corresponding second-level index scores. The first-level index score calculation: multiply the first-level index weight obtained in advance and the obtained second-level index score to obtain the first-level index score. Fuzzy analysis of physical education teaching scoring in specific short videos is shown in Fig. 3, Most of the samples performed well, showing the practicality of this fuzzy comprehensive physical education system.

At the same time, in the 42 questionnaires recovered, 62% of the students' scores were in the excellent range, and 29% of the students' scores were in the good range. Within, 9% of the students' scores are within the general range. In Fig. 4, we can see the satisfaction of the physical education model under the short video, and the vast majority of people surveyed expressed satisfaction. Obtain the evaluation vector, teaching ability: (0.62, 0.29, 0.09); similarly, the teaching effect can be obtained: (0.71, 0.26, 0.03); the amount of teaching exercise: (0.65, 0.26, 0.09); professional ethics: (0.48, 0.38, 0.14); other ancillary factors: (0.57, 0.30, 0.13). Normalized to obtain the evaluation result

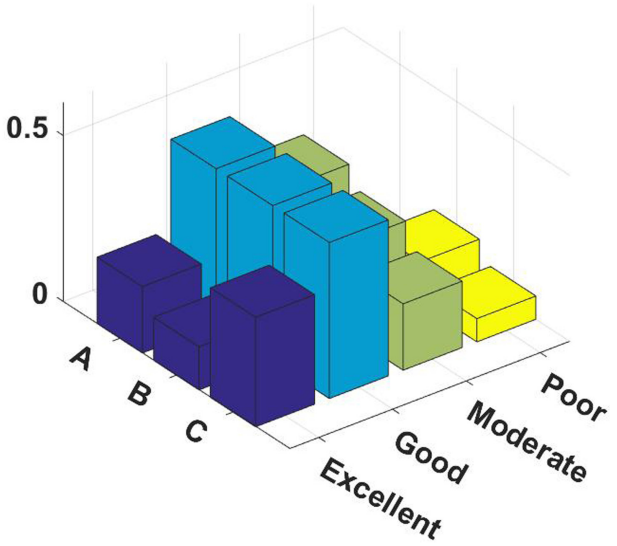

Fig. 3. Physical education teaching scoring results based on short videos

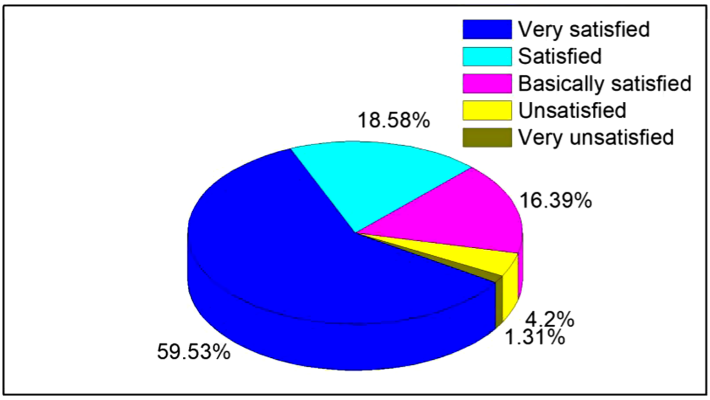

Fig. 4. A survey of satisfaction of physical education teaching model based on short video

description, and identify according to the principle of membership degree, the teacher's performance is: "excellent".

4 Conclusion

Based on the multi-user comprehensive evaluation method of Fuzzy mathematics under the short video, this paper designs a comprehensive evaluation model, which can integrate the opinions of various judges to the greatest extent, and more comprehensively reflect the quality of the teaching quality of the judged objects, thus increasing Judging the credibility and effectiveness of the results. In addition, this paper uses the analytic

hierarchy process to determine the weights of various indicators, which has a scientific basis and reduces the influence of subjective factors; compared with previous methods, not only the influence of teachers' teaching factors is considered, but also the student learning system is included in the evaluation system. Factors are more comprehensive. The Fuzzy formula method can not only be applied to the evaluation of the teaching quality of physical education courses, but also can be applied to the scientific quantification of the group, training, competition, management of school physical education, and the comprehensive evaluation of related personnel. It is better than qualitative evaluation of experience and other comprehensive evaluations. The evaluation is easier to operate; the example also proves that the fuzzy comprehensive evaluation of the teaching quality of physical education teachers using the fuzzy set theory can obtain accurate evaluation results and has broad application prospects.

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