



# Big Data Analysis for Physical Education Teaching Evaluation

Huarong Deng<sup>(✉)</sup>

Heyuan Polytechnic, Heyuan 517000, Guangdong Province, China

**Abstract.** In view of the absoluteness of Traditional P.E. teaching evaluation and the inconsistency of multiple evaluation conclusions, this paper constructs an independent advantage evaluation method that highlights its own advantages. In the evaluation, we use big data analysis to evaluate the advantages and disadvantages of the evaluation objects. By calculating the advantages and disadvantages of each evaluation object, we get the evaluation conclusion with probability information.

**Keywords:** Sports · Big data analysis · Education evaluation

## 1 Introduction

The theory of physical education teaching evaluation has been developed for many years in China. In view of this specific evaluation problem, even though the mechanism of the methods are different and the ways to solve them are not the same, most of the conclusions are determined in the same form, which is shown as “the absoluteness of distinguishing the advantages and disadvantages” and “the strictness of difference transmission”. Generally, different evaluation methods will produce different evaluation conclusions for the same evaluation problem, at present, it is generally believed that “combination evaluation” is an effective way to solve the problem, but in fact, it is only a compromise, and does not solve the essence of the problem from the root. Therefore, this paper constructs an “independent advantage evaluation method highlighting its own advantages”, in which a probability based random simulation algorithm is used, This method can produce the evaluation conclusion in the form of probability (reliability) and has stronger interpretability for practical problems [1]. From the perspective of innovation, this method puts forward the comprehensive evaluation method of “from the base to the top”, which has high independence and joins the evaluation link in the form of “component”, the effectiveness of the method is verified by an example.

## 2 The Main Evaluation Components of Physical Education Teaching Evaluation

Physical education teaching evaluation is an important part of physical education teaching, which plays an important role in the process of physical education teaching. Our

country attaches great importance to teaching evaluation. In the “undergraduate teaching level evaluation program of ordinary colleges and universities (Trial)”, it is clearly proposed that the state should further strengthen the macro management and guidance of the teaching work of colleges and universities through the level evaluation, urge the education authorities at all levels to attach importance to and support the teaching work of colleges and universities, and promote the colleges and universities to consciously implement the national policy, According to the law of education, we should further clarify the guiding ideology of running a school, improve the conditions of running a school, strengthen the basic construction of teaching, strengthen the teaching management, deepen the teaching reform, and comprehensively improve the teaching quality and learning efficiency. “Its purpose is to promote reform by evaluation, promote construction by evaluation, promote management by evaluation, combine evaluation with construction, and focus on construction” to achieve the purpose of improving teaching quality [2–5]. The idea of physical education teaching evaluation has been deeply rooted in the hearts of the people, and various evaluation methods have been widely used, but the scientific nature of evaluation methods needs to be studied. At present, the evaluation research mainly focuses on the theory of the macro evaluation method and the application steps of the micro evaluation method, and fails to discuss the limitations of the evaluation method in the application process. From the micro level, this paper studies the construction of indicators, the screening and testing of weights, the limitations of common evaluation methods and the problems that need to be paid attention to in the application. Its purpose is to improve the accuracy, objectivity and effectiveness of physical education evaluation, so as to provide theoretical and practical basis for improving the quality of physical education and the sustainable development of physical education.

### 3 The Design of P.E. Teaching Evaluation Scheme

The P.E. teaching evaluation scheme is the overall arrangement of the evaluation work. The advantages and disadvantages of the evaluation scheme are related to the success or failure of the evaluation work. In the process of implementation, improper selection of indicators, fuzzy evaluation criteria and unreasonable weight distribution will inevitably lead to one-sided evaluation conclusion, which cannot reflect the overall situation of the evaluated object, thus directly or indirectly causing adverse effects on the improvement and improvement of physical education teaching quality. In the procedure of design scheme, we must make clear the evaluation purpose, evaluation target and evaluation object, design and screen the evaluation index system, assign the weight of the index, formulate the evaluation standard, and demonstrate the evaluation scheme. Among them, the most important and key is the selection of evaluation index and the determination of index weight. From the perspective of the thinking mode in the process of putting forward the index and establishing the index system, it can be roughly summarized into two ways: the divergent construction method and the convergent construction method. The task of screening primary selection indicators is to merge those with the same connotation, remove the redundant indicators and find the missing important indicators. The main methods are Delphi method, brainstorming method, anti brainstorming method and counter acting method [6]. Since the traditional correlation coefficient screening

method only represents the degree of linear correlation, but there may be nonlinear factors among indicators, a dynamic indicator selection method can be used. The weight of an index is a value to measure the importance and role of an index in the whole evaluation index, which has an important impact on the evaluation results. There are many methods to determine the weight of the existing, but each method has a certain scope of application and limitations, according to the specific situation of the actual problem to choose different methods, the author recommends the use of analytic hierarchy process.

## **4 Diagnosis and Detection of Common Evaluation Methods of Physical Education**

### **4.1 Fuzzy Comprehensive Evaluation Method**

In the application process of physical education teaching evaluation, users often ignore the fact that there is “this and that” in the teaching phenomenon, but “either this or that” binary logic method to give evaluation. The fuzzy comprehensive evaluation method adopts the evaluation method of multi valued logic, which can have different degrees of membership for different grades. There are different degrees of fuzziness in the subject’s understanding of the evaluation criteria and the nature of the evaluation object. In order to better deal with these fuzzy phenomena, to make a realistic evaluation of the various phenomena in the process of physical education teaching, and to improve the accuracy of the evaluation, the fuzzy comprehensive evaluation method has its unique application value. The selection of fuzzy operation model is the most important problem in the application of fuzzy comprehensive evaluation [7–10]. Different mathematical models of fuzzy comprehensive evaluation can be obtained by different definitions of “operation”. Different mathematical models have different outstanding factors and different consideration of weight coefficient. Therefore, in the evaluation of physical education teaching, different models should be selected according to the evaluation purpose to be achieved in the teaching process. Due to the defects of understanding the essence of fuzzy comprehensive evaluation model, it leads to the abuse of the model in some literatures, resulting in the phenomenon of inconsistent evaluation.

### **4.2 Markov Chain Analysis**

The advantage of Markov chain analysis in the evaluation of physical education teaching is that it considers the elimination of basic differences in the evaluation. For example, when evaluating the teaching effect of different teachers, the evaluation is always based on the final results of students taught by teachers. In fact, the differences in the original level of students in different teachers’ classes affect the final examination results of students. If we simply evaluate the teaching effect according to the students’ final scores without considering the students’ basic differences, the conclusion does not necessarily reflect the actual situation, which is not convincing. Markov chain analysis considers the students’ original state, and divides the students’ original scores into the same level under the same standard, that is, to determine the state space [11]. Then the one-step transfer matrix is obtained. Finally, the limit vector is obtained according to the stationarity

and ergodicity of Markov chain, and the comparison is made according to the limit vector. There are two problems here. One is that in the process of physical education teaching evaluation practice, we usually use the connection between two successive value states (such as two examination results) to describe the transition probability matrix, and then evaluate the practice that the evaluation object reaches the current state. However, whether the value scales used before and after the two times are consistent, and whether the evaluation scenarios used before and after the two times are consistent will affect the determined state matrix. Second, the process described by Markov chain is to use the transverse form of Markov chain to evaluate when  $k$  tends to infinity and the probability distribution of each state is stable. When using the obtained probability vector to solve the equations, the eigenvalue  $\lambda$  of the vector is artificially determined to be 1, and then the evaluation standard is established. As for whether each state is stable or not, the user should verify it by solving it. This condition has an important influence on the construction of stable probability distribution.

## 5 Basic description of physical education teaching evaluation

The evaluation process of physical education is described as a general transformation:

$$y_i = f(x_{i1}, x_{i2}, \dots, x_{in}), i \in N \quad (1)$$

where  $f$  is a positive transformation function [12].

The purpose of evaluation is to promote the all-round development of students and fully reflect the educational policy. The traditional evaluation of physical education attaches importance to selection and results, pays attention to the evaluation of students' physical fitness and sports skills, and relatively ignores students' learning attitude, will quality, cooperation spirit and individual differences, and ignores the subjectivity of students' evaluation. In the process of teaching experiment, we use the evaluation method of combining quantitative and qualitative, self-evaluation and mutual evaluation, which makes the evaluation of students more reasonable and scientific.

Students' self-evaluation and mutual evaluation are not only a difficult point in teaching evaluation, but also a difficult link in PE teaching evaluation. There are many methods for students' self-evaluation and mutual evaluation. We try to use the "six step evaluation method". The "six step evaluation method" is a comprehensive evaluation combining students' self-evaluation, group evaluation, students' mutual evaluation and teachers' evaluation, which can better reflect the fairness and objectivity of the evaluation. Before the evaluation, according to the semester teaching plan, the evaluation content is classified and clearly listed, and each item is specific and clear. For example, the extent of learning progress, whether to participate in physical exercise frequently, the enthusiasm to participate in sports, the cooperation between students in the activities, etc. at the same time, it explains the requirements and standards, such as the implementation scale, defining the scope that should be concerned, and emphasizes the discipline and requirements in the evaluation. For individual students' technical confusion and subjective intentional violations, teachers should clearly and repeatedly emphasize the explanation [13, 14]. Then set up the evaluation team, give full play to the students' democracy, let the students elect the members of the evaluation team, the number of general control in about 20%.

## 6 Evaluation and description of independent advantage

Hypothesis 1: any evaluated object has the dual goals of “opening the gap between competitors” and “developing their own strengths”, so as to comprehensively highlight their own advantages [15].

The quantitative description of the independent advantage evaluation thought in hypothesis 1.

The first step of the “six step evaluation method” is to send the form to the students, so that the students can give themselves a brief evaluation, and give them a grade, which is divided into four grades: A, B, C and D. Self evaluation is also a process for other students to understand (the one who knows the students most is the student himself, so he has the right to speak). Self evaluation of students is also helpful to mutual evaluation among students, because only by fully understanding the evaluated can the participants have the right to speak, so that they can really have the basis and substance.

As for whether to use big data or data mining algorithm, because these two algorithms involve many algorithms, when evaluating their data, which algorithm to choose will determine the timeliness of the algorithm.

Self evaluation or everyone’s evaluation is something that many experts don’t want to see, but for some experts, quantification is the best method, so we have a lot to consider when quantifying it [16], as shown in Fig. 1. For example, in machine learning, we can quantify these parameters, in data mining, we can also quantify other parameters, which requires which evaluation method is used at the end of the evaluation.

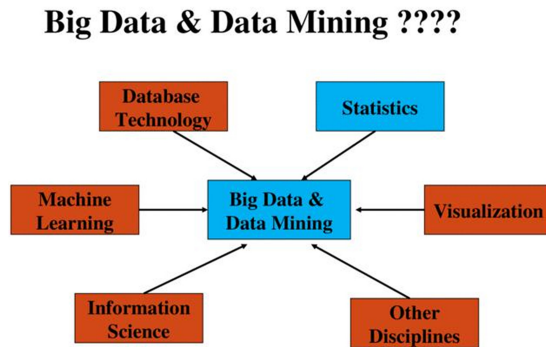


Fig. 1. Algorithm choice

## 7 Program implementation process

Before doing the technical support action, present the rubric to the students. Before presenting the rubric, the teacher first introduces the rubric evaluation concept and evaluation method, so that the students can have a correct and comprehensive understanding of the evaluation. Then bring the rubric to the classroom, let the students browse and

communicate with each other, let the students express their own views and put forward some suggestions for revision in the discussion, the teacher combined with the suggestions put forward by the students to revise the rubric, and told the students where they have revised, and combined with the rubric to explain the specific requirements of learning and the final evaluation standard. From the effect of implementation, the process of students' participation can help students understand the requirements of the gauge, and greatly improve their learning enthusiasm and interest.

Provide action examples. The teacher will bring some videos of previous students' technical actions to the classroom, or put them on the teaching website. Let the students evaluate these technical actions according to the gauge. In the evaluation process, let the students experience and understand the requirements of the gauge, and think about how to achieve the excellent standard of the technical actions they will complete [14–18]. Action examples give students a visual learning goal, make the standard more specific, and improve the efficiency of learning. Practice shows that this link is very important. On the one hand, it can play the role of goal visualization, and let students use it as a reference and standard when they conceive their own learning actions. As shown in Fig. 2. On the other hand, it can help students understand the content of the gauge by evaluating other students' actions, reducing the time for teachers to explain the gauge and action requirements to students. Third, it can develop students' evaluation ability.

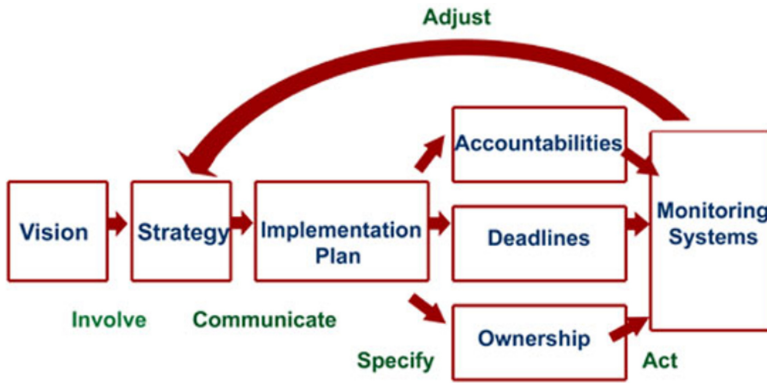


Fig. 2. Program implementation process

## 8 Stochastic simulation algorithm

Definition for any two evaluated objects, there are:

$$s(u'_i > u''_i) = p(f(u'_i) > f(u''_i)) + 0.5p(f(u'_i) = f(u''_i)) \tag{2}$$

Where, the set function represents the event probability:

$$f(u'_i) = \sum_{j=1}^m \lambda'_i \omega_j^*(i', i'') \tag{3}$$

Students evaluate each other. Is to let all the students to evaluate the students, the mutual evaluation of the students a level. Students' mutual evaluation is the process of helping the evaluated to "know themselves" correctly, so that the evaluated can "wake up" in front of this "mirror", so that the students can clearly understand their strengths and weaknesses, and constantly improve themselves in the future learning activities.

The teacher makes an evaluation on the evaluated person according to all aspects of the situation. As a promoter, teachers should reasonably use the "authority" effect to put forward positive opinions to students. On the one hand, teachers should objectively give students a "exercise prescription" so that students can express their opinions along the correct track [19, 20]. On the other hand, teachers should avoid students' attachment and authority psychology when they finally express their opinions, so that students can fully express their opinions.

According to the actual situation, teachers, assessment teams and students should consider whether to modify the assessment for students with large gap in assessment, so as to fully promote democracy. In the process of evaluation, we have always grasped that giving priority to encouragement and promoting development by evaluation is not only the process of students' self-awareness and self-development, but also the process of promoting teaching.

Let the students to be evaluated talk about their satisfaction and feelings, as well as their own shining point, expertise, etc. for each level, several students can be selected for criticism and self-criticism. Changing bad habits through evaluation is conducive to the development of students.

## 9 Evaluation and Simulation

In the evaluation, teachers should pay attention to the phenomenon of "following the crowd", which is a psychological phenomenon caused by the pressure of different opinions of groups or most people in mutual evaluation or self-evaluation [21]. There is also "group phenomenon", which is an informal group with strong cohesion formed among teenagers. It has a great influence on students. It can not only change teenagers' external behavior, but also change their internal attitude and cognition, resulting in only starting from feelings, ignoring the objective situation, and one-sided exaggeration of their central position, blind self expansion and over emphasis on self, Attacking and retaliating against the students who put forward their opinions will lead to extreme evaluation, which is not conducive to students' objective and fair evaluation of themselves and others.

In addition, in the process of evaluation, we should adhere to the basic principles of seeking truth from facts and being objective and fair. Teachers should play the role of guidance and guidance, guide students where they don't know clearly, put aside personal emotional factors in the evaluation, and avoid making their own evaluation into a criticism meeting [22–24]. As shown in Fig. 3. We should be good at guiding students to pay attention to individual differences, attach importance to process, learning attitude and progress, so that every student has the feeling and joy of success. We should explain the reasons for the large gap in students' evaluation, avoid the phenomenon of students' groups, respect students' self-esteem and personality, fully affirm the progress

and advantages of the evaluated, encourage and spur them, and truly embody everything for students' independent development in teaching.

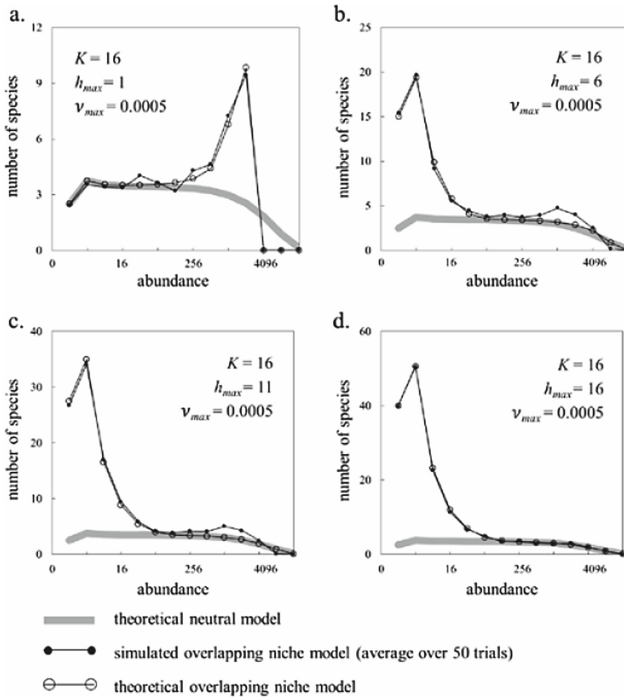


Fig. 3. The role of mathematical statistics in teaching evaluation

## 10 Conclusion

Teaching evaluation is a necessary link in school teaching activities. It is generally a comprehensive evaluation of teachers, students, teaching content, teaching methods, teaching environment, teaching management and other factors in the teaching process.

Teaching evaluation is an important way to understand the teaching situation and improve the teaching quality.

Teaching evaluation should not only provide feedback for teachers, but also provide feedback for students to understand their own learning situation, so that students can clearly understand the advantages and disadvantages of their own learning. Positive and positive evaluation can stimulate students' learning passion and build their self-confidence.

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