A Study on PE Evaluation Model Based on Fuzzy Mathematics Method

Xiaoyan Han

Department of P.E., Xi’an University of Architecture & Technology, Xi’an 710055, China

Abstract

Educational evaluation refers to the process of evaluating the teaching activities carried out over a period of time and their achievements by various means with the ultimate goal of education at the core under the guidance of certain ideas and concepts. In educational evaluation, it can intuitively reflect the effectiveness and deficiency of the teaching work carried out in the past, expand the use of the correct education method and correct the shortcomings in the teaching work, which is of great significance to the improvement of the overall education quality. With the continuous development of quality-oriented education, PE (physical education) has played an irreplaceable role in China's education because it can enhance students' physical fitness and promote the all-round development of students' physical and mental health. It is also imminent to evaluate the quality of PE. However, there are some differences between the evaluation of PE and other subjects, which involves more factors, including not only the scores of physical examination but also physical health and psychological quality, causing certain difficulties in PE quality evaluation. Therefore, in this paper, the author constructs the evaluation model of PE quality by using the fuzzy mathematics method, which provides a reference in promoting the quality of PE in China.

Keywords: Fuzzy Mathematics Method, Pe (Physical Education), Quality Evaluation Model.

1. SUMMARY OF RESEARCH

1.1 Background

Educational evaluation originated in the middle of 19th century. In the middle of 19th century and 1930s, educational evaluation enters into the psychological test period, when mainly by the evaluation system, it used quantitative indicators to assess students' learning situation in a period and made some progress in quantitative, objective and standardized evaluation. Subsequently, from the 1930s to the 1950s, the educational evaluation entered the target center period. The basic connotation of educational evaluation was put forward by Taylor's principle. The distinction between educational measurement and educational evaluation was made for the first time, which effectively solved the defect of educational evaluation in the period of psychological measurement and established the foundation of modern educational evaluation. Since the 1960s, educational evaluation entered a period of standard development. A large number of experts and scholars began to pay attention to and carry out in-depth study of educational evaluation, showing a leaping development in terms of educational objectives, evaluation methods and evaluation principles. After 1970s, educational evaluation entered a period of result identification. During this period, educational evaluation was believed to play an important role in promoting students' individual development and gives students the possibility of being recognized at the same time.

1.2 Literature review

Modern educational evaluation has a history of more than a hundred years of development. Up to now, educational evaluation has been mainly carried out in the following aspects: The first is the change of the evaluation goal. The traditional educational evaluation mainly evaluates the students, while the modern educational evaluation evaluates the education. The second is the increase of objects of evaluation. The traditional objects of educational evaluation are mainly reflected in the academic achievements, while the modern educational evaluation places emphasis on all aspects of education. The third is the change of forms of evaluation results. The traditional educational evaluation is mainly by the quantitative indicators, while the modern educational evaluation is through mainly aspects including quantity, language, process and description. The final is changes in the participation of
In the traditional educational evaluation, students passively accept the evaluation, while in the modern educational evaluation, students act as the subject of evaluation (Wang, 2011). Educational evaluation mainly has the following several functions: The first is the guiding function. Educational evaluation results can play a guiding role in educational work in the future. The second is the diagnostic function. Through the analysis of the results of educational evaluation, it can reflect the problems existing in teaching work and solve them. The third is the appraisal function. Through educational evaluation, teachers' performance level and students' learning attitude can be reflected, which plays a role in appraisal for teachers' promotion, rating and student's further studies. The fourth is the educational function. On the one hand, it can effectively improve students' learning ability; on the other hand, it can promote teachers' self-development (Zhang and Shu, 2015). There are some differences between the evaluation of PE and that of other subjects. The evaluation model in other subjects is often not applicable in that of PE, which leads to the following problems: Firstly, the understanding of PE evaluation is not clear enough, leading to a high degree of examination-oriented PE; Secondly, the PE evaluation is incomplete in contents, which still uses the results of the sports test as the only criteria of evaluation and not reflect the quality of PE; Thirdly, the evaluation method of PE is not scientific enough, which puts more emphasis on the evaluation of the results and it is difficult to feedback students physical training process, with a high degree of one-sidedness (Li and Ou, 2015).

2. PE QUALITY EVALUATION MODEL BASED ON FUZZY COMPREHENSIVE EVALUATION METHOD

Comprehensive evaluation refers to the overall evaluation and analysis of a problem, give corresponding evaluation indicators to each of the objects according to the given conditions, and sort out according to a certain order to get the most influential evaluation indicators. There are many factors involved in the evaluation of PE, such as the students' psychology of competition, enthusiasm for training and so on, which are difficult to be expressed by quantitative indicators. It is difficult to draw accurate conclusions by using traditional evaluation and analysis methods (Xu, 2015). While the comprehensive evaluation takes PE evaluation as a whole for judgment. Combined with fuzzy mathematics, it can effectively solve the problems in PE evaluation. Assuming that the set of evaluation factors for PE evaluation is \( U = \{u_1, u_2, u_3, \ldots, u_n\} \), and the set of reviews can be set as \( V = \{v_1, v_2, v_3, \ldots, v_m\} \) (Lv and Zhang, 2014). Since both sets are finite ones, the fuzzy subset \( R \) can be expressed as the fuzzy relation between the set of evaluation factors and set of reviews. \( R(V, U) \) can be obtained through the membership function.

The values of the above elements lie in the interval \([0,1]\), which is actually evaluated separately for each evaluation element \( u_1, u_2, u_3, \ldots, u_n \) of PE quality (Liang, 2014). After the calculation process, a series of values between \([0,1]\) can be drawn. Therefore, the fuzzy subset \( R \) can also be referred to as a one-factor evaluation matrix to a certain extent. In addition, as for the set of evaluation factors \( U \), there is still a fuzzy relation in PE quality evaluation, so it can be expressed by membership degree \( a_i \). \( A = (a_1, a_2, a_3, \ldots, a_n) \) (Li, 2014). In general, \( \sum_{i=1}^{n} a_i = 1 \), and \( 0 \leq a_i \leq 1 \). Because of the ambiguous relation between the two fuzzy subset pairs and PE quality evaluation, we can obtain \( B = A \times R \), that is, \( B \) is a fuzzy subset of \( V \) (Quan and Wang, 2014). At the same time, we can obtain a formula as follows:

\[
B = A \times R = (a_1, a_2, a_3, \ldots, a_n) \times \begin{pmatrix}
r_{11} & r_{12} & \cdots & r_{1m} \\
r_{21} & r_{22} & \cdots & r_{2m} \\
\vdots & \vdots & \ddots & \vdots \\
r_{n1} & r_{n2} & \cdots & r_{nm}
\end{pmatrix}
\]

(1)

The results obtained are normalized, and the formula is as follows:

\[
\left\{ \frac{c_1}{\sum c_i}, \frac{c_2}{\sum c_i}, \frac{c_3}{\sum c_i}, \ldots, \frac{c_m}{\sum c_i} \right\} = i = 1, 2, 3, \ldots, m
\]

(2)

3. CURRENT SITUATION OF PE QUALITY EVALUATION IN CHINA

3.1 The understanding of PE quality is not deep enough

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At present, there is no correct understanding of PE quality evaluation in most schools in China. PE quality evaluation mainly has two functions: on the one hand, it can effectively test the results of the teaching methods used by PE teachers in a period of time and help them to make adjustment according to problems so as to improve the teaching ability of PE teachers (Chen et al., 2012). On the other hand, it can intuitively reflect the students’ sports learning and training situation, and provide a reference for helping PE teachers to adjust curriculum progress and teaching methods. However, in the actual evaluation, the evaluation of PE quality is too superficial, and the understanding of evaluation objectives is not clear enough, so the evaluation of PE quality has not come to its full play (Yang, 2015).

3.2 The contents of evaluation are not comprehensive enough

At present, the evaluation of PE quality in schools is mainly reflected in the evaluation of students' PE skills and physical fitness. These factors are only part of PE objectives and do not reflect the cultivation of students' lifelong sports awareness, nor do they reflect changes in students' mental health. Therefore, the evaluation of PE quality should focus on the overall goal of PE designated by the education authority, and carry out diversified and multi-directional evaluation on PE so as to evaluate PE more accurately and comprehensively (Yao and Li, 2016).

3.3 The evaluation methods are unscientific

The PE quality evaluation methods currently used are mainly to test changes in sports scores of students in a period of time through the way of sport examination. Although the summative evaluation method is rather simple and intuitive, there is also a great defects, which lies in the fact that the contents of evaluation are not comprehensive enough, and there is no feedback in teaching work for a period of time. The existing problems and solutions lead to the PE quality evaluation not playing its due role, which is contrary to the notion that the international educational circles pays more attention to process evaluation (Zhang and Li, 2015). At the same time, the evaluation methods tend to pay more attention to the evaluation given by others but do not reflect the importance of self-evaluation, which leads to the fact that even if there are problems in PE, it cannot be analyzed through self-evaluation to find out what the problems are, how to solve them and what is the level of students' improvement. It is not conducive to arousing the enthusiasm of teachers and students in PE, nor has it an impact on the comprehensive development of students' physical and mental health based on the PE quality.

4. Optimization Measure of PE Quality Evaluation Methods

4.1 Use a variety of PE quality evaluation methods

There are summative, diagnostic and formative methods of PE quality evaluation. Among them, the summative evaluation is most commonly used in China, which mainly evaluates the students' test scores. This method has the characteristics of intuition and simplicity. However, it is too one-sided and difficult to feedback problems in teaching (Chen, 2015). Therefore, it is necessary to adapt the traditional summative evaluation methods to combine it with diagnostic and formative evaluation methods. On the one hand, combining it with formative evaluation, we can analyze the teaching work in detail and diagnose the problems existing in the teaching work and put forward the solutions to the problems. On the other hand, combining it with diagnostic evaluation, we can adjust teaching objectives, methods and progress, and effectively improve the teaching level according to the actual situation of students.

4.2 Qualitative and quantitative evaluation of PE quality

The quantitative analysis method is often more accurate and its evaluation is more scientific because it uses accurate data in analysis. However, due to the fact that many factors in the evaluation of PE quality cannot be expressed by quantitative indicators, therefore, quantitative analysis merely will inevitably result in incomplete and inaccurate results. Therefore, in the evaluation of PE quality, it is necessary to combine quantitative and qualitative analysis to reflect the humanistic elements such as personality, psychological quality and lifelong sports awareness in PE so as to analyze PE quality more comprehensively and accurately (Wu and Jun, 2016).

4.3 Put emphasis on self-evaluation

The traditional PE quality evaluation methods are mainly based on others' evaluation. This method can evaluate PE quality more objectively. However, depending entirely on others' evaluation, it is often impossible to point out
the problems and propose solutions through PE quality evaluation. Therefore, while carrying out the evaluation by others, it is also necessary to have self-evaluation. From the teacher's point of view, it can evaluate whether the class preparation during a period is sufficient, whether the teaching situation is active, whether the students are conscientious and responsible, whether the teaching methods and progress conform to the needs of students as a whole, and from the student's point of view, it can evaluate whether he or she takes the initiative to do physical exercise, whether he or she is conscientious in class learning, and whether there are changes in his or her physical quality, psychology and will in a period of time. Through self-evaluation, it is more intuitive to show the problems that cannot be reflected in evaluation given by others and it is of great significance to the PE quality of students (Ni and Yan, 2013).

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