Construction of a Balanced Development Evaluation Index System Based on Big Data Analysis and Clustering Extraction Algorithms

Liangbing Gong
Ministry of Public Education & Department of Physical Education, Jiangxi Vocational Technical College of Industry & Trade. Nanchang, 330038, China

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Abstract: There are unreasonable gaps in educational resources, teaching quality, educational results, etc. between urban and rural areas, between regions, and among schools at different levels in a region. The balanced growth of education needs constant decision-making and adjustment, and the assessment activity serves for decision-making. It can provide information and reflect the reality. As a part of education, school physical education (PE) should also take balanced development as its value orientation. Assessing the validity of clustering results is a complex problem. This article puts forward an assessment algorithm of PE based on clustering extraction algorithm, which provides technical support for the construction of assessment index system of balanced growth of sports. The experimental results show that the model has high recall and accuracy, and the accuracy is improved by 19.64% compared with the traditional assessment algorithm. Combining the fuzzy assessment model with qualitative assessment, the assessment of PE class teaching in universities can better reflect the situation of the assessd object, realize the unity of fuzziness and accuracy in the assessment process, and provide a meaningful reference for the construction of the assessment index system of balanced growth of sports.

1 INTRODUCTION

Promoting social justice is the essential task and core value of building a harmonious socialist society, and social justice contains fair contents in different fields (De-Kun, Memon et al. 2022). Among them, educational equity is the foundation of the social equity system. If educational equity can't be realized, social equity will lose its premise guarantee. Constantly promoting education equity is an important task of education in China at present. Education equity is the foundation and guarantee of social equity, which is in line with the overall interests of China society (Liu, 2020). Assessment comes into being with the growth of human social activities. In order to manage, a series of assessments should be conducted. Assessment widely exists in all fields of social life. Such as the performance appraisal of teachers' teaching and the appraisal of employees' working ability (Lee, Lee, et al. 2021). For a long time, assessment mainly depends on people's experience, which belongs to the category of experience assessment. PE assessment is an important link in PE, which is to make an objective and scientific judgment on the value of PE process and its effect based on the acquired PE information (Da-Wei Chao, et al. 2018). The current general mode of PE class teaching assessment in universities lags behind, which has become one of the main obstacles restricting the reform of PE in universities. The reform of teaching assessment in PE class is imperative (Chen, and Yu, 2022). Therefore, it is very important to construct a new teaching assessment system with strong operability and in line with the current growth of PE.

As an integral part of school education, school PE plays an important role in promoting teenagers' physical health, cultivating teenagers' good moral character and will quality, and helping teenagers to master sports knowledge and skills (Wang, 2019). Promoting educational equity is the foundation and premise of realizing social equity. If education, especially basic compulsory education, can't develop in a balanced way, the ideal of educational equity can only be a castle in the air, and social equity is even more impossible to talk about (Liu, 2021). What and how to assess PE is directly related to the realization of PE teaching objectives and the direction and idea

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of PE teaching (Han, 2022). The current teaching assessment model of PE class in universities has serious deviations from the assessment contents, objectives and ideas, and there are some problems, such as narrow assessment contents, single assessment methods and outdated assessment tools (Chen, 2018). It's inevitable that there will be major mistakes in the assessment based on one's knowledge, experience, wisdom and courage. This is mainly because the same thing has many attributes and is influenced by many factors (Kong, and Cao, 2017). With the deepening of science and technology, the research object is becoming more and more complex, and the complex things are difficult to express accurately. In order to assess things objectively and fairly, the fuzzy comprehensive assessment method appears. This article tries to put forward an assessment algorithm of PE teaching based on clustering extraction algorithm under the theoretical framework of educational equity, so as to provide technical support for the construction of assessment index system of balanced growth of PE.

2 METHODOLOGY

2.1 Assessment Significance of Balanced Growth of Sports

The mother of the balanced growth of school PE is the balanced growth of school education. The research on the balanced growth of school PE should belong to the theoretical research of the balanced growth of school education. The foundation and guarantee of the balanced growth of school PE is the balanced growth of school education. Assessment of the balanced growth of school education and assessment of the balanced growth of school PE are both related and subordinate, but also have great differences. In the field of natural science, equilibrium or balance is often used to describe the equal distribution of the basic quantity of a thing or system state in all parts of a thing. In philosophy and social sciences, balance is a category that represents the state of coordinated movement of differences between things. It is used to describe the state of mutual connection and restriction between things, and emphasizes the balance and coordination between the parts of things or systems. As a subsystem of school education, school PE should be more specific and closer to the actual operation (Gao, 2022). The main particularity of school PE is that it has more abundant physical activities, while PE activities are mainly carried out in the basic way. The more open nature of the course puts forward special requirements for the growth of the course. Educational equity can't be understood as the equality of educational opportunities, but it should also involve the equality of resources allocation, educational results and educational environment in the process of education. The law of material restriction of school PE development has never been well understood, which is one of the main reasons why school PE in China has not been greatly developed so far. Compared with other components of school education, school PE is much more restricted by material conditions. The basic system of PE assessment is shown in Figure 1.

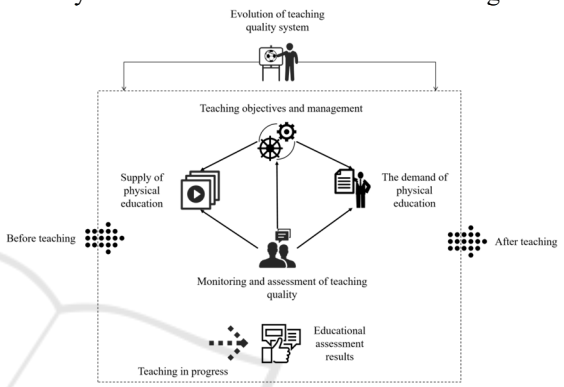

Figure 1: Basic system of PE teaching assessment

The assessment index should objectively reflect the concept and quantitative expression of a certain characteristic of the assessment object, which has both quantitative and qualitative manifestations. The assessment index can reflect the quantity of the assessment object and explain a certain characteristic of the assessment object. Depending on the purpose of assessment, a series of relatively complete and interrelated assessment indexes that can comprehensively and systematically reflect a specific assessment object are the assessment index system. The balanced growth of education refers to the balance between the supply and demand of education from the social level, the balance of the allocation of educational resources from the economic level, and the balance throughout the school education process from the inside of the education system, including the balance between different schools in terms of the allocation of teachers, educational results and educational assessment (Ou, and Tan, 2017). School PE assessment is not only the assessment of education, but also the assessment of sports field, and the assessment researchers in sports field should have a certain depth and breadth of relevant theoretical knowledge in education and sports field. Only by the perfect combination of the two can the structure of the assessment index system be clear and the logical

relationship of the assessment index system be scientific and reasonable.

2.2 Assessment Algorithm of PE Teaching

On the dimension of teachers, the degree of teachers' research on PE in universities, teachers' self-learning ability, lesson preparation degree, informatization degree and self-reflection ability all have important influences on the teaching quality itself. Besides, in other dimensions, the richness of teaching resources, the accuracy of teaching assessment, the adequacy of information equipment, and the readiness of PE equipment in universities have important influences on the teaching quality itself. Because there are many uncertain and complicated factors in the process of PE teaching assessment, the assessment method is a nonlinear problem. The assessment of PE teaching can be regarded as a nonlinear mapping from input to output. The assessment model of PE based on neural network and clustering extraction algorithm is shown in Figure 2.

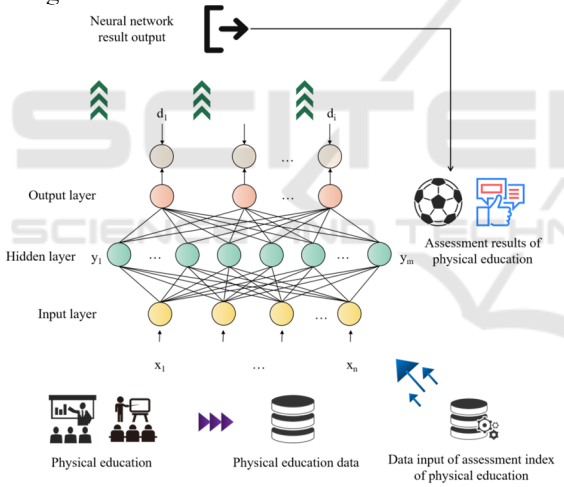

Figure 2: PE assessment model

The assessment indexes of PE in universities are divided into 6 first-class indexes and 10 second-class indexes. Because the magnitude of each component is very different, it needs normalization:

$$X = \frac{I - I_{\min}}{I_{\max} - I_{\min}} \tag{1}$$

Where X is the normalized neural network input value, I is the untreated neural network input value, and $I_{\max}$ is the minimum neural network input value.

In the application of data, it is necessary to further uphold diversified management measures to comprehensively promote the application and management of big data in PE. Teachers can provide all-round early warning for students with the help of teaching assessment system, monitor students' PE learning achievements and learning efficiency in real time, further improve teachers' classroom design with the help of big data information, and comprehensively improve the quality and efficiency of PE.

In the form of assessment of teaching quality, we should not only focus on teachers, but also assess the quality of classroom teaching from the perspective of the educated (Hu, 2021). The construction of big data assessment system for PE teaching can not only make teachers feel the charm and value of big data, but also play an important role in promoting the quality of PE teaching. Let an attribute A take v different values $\{a_i, a_2, \ldots, a_v\}$. S_j contains the data sample of attribute A taking a_j in the set. If attribute A is selected as the test attribute, let s_{ij} be the number of samples belonging to C_j category in subset S_j. Then the information entropy required to divide the current sample set by using the attribute A can be calculated as follows:

$$E(A) = \sum_{j=1}^{v} \frac{s_{1j} + s_{2j} + \ldots + s_{mj}}{s} I(s_{1j}, \ldots, s_{mj}) \tag{2}$$

Among them, the $\frac{s_{1j} + s_{2j} + \ldots + s_{mj}}{S}$ term is regarded as the weight of the j-th subset, which is the sum of the samples whose a_j values are taken by the attributes A in all subsets divided by the total number of samples in the set. The information for a given subset S_j is:

$$I(s_{1j}, s_{2j}, \ldots, s_{mj}) = -\sum_{i=1}^{m} p_{ij} \log(p_{ij}) \tag{3}$$

Among them:

$$p_{ij} = \frac{s_{ij}}{|S_j|} \tag{4}$$

The assessment index system is the most critical part of the whole assessment activity, and it is the yardstick for the actual operation of the assessment work. Therefore, whether the assessment can be carried out reasonably and effectively so as to achieve the assessment goal depends first on whether the assessment index system itself is scientific and reasonable. Only by using a relatively scientific and reasonable assessment index system can the assessment results be more accurate and effective.

3 RESULT ANALYSIS AND DISCUSSION

The assessment index system is the yardstick to measure the school PE work, so the scientificity of the assessment index system should be considered in the process of constructing the assessment index system. Only the data assessd by the scientific and reasonable assessment index system can be scientific and reasonable. The social environment in which school PE is carried out has a very important influence on school PE, so the difference of social environment in which school PE is carried out will inevitably be reflected in the effect of school PE. For example, the satisfaction of sports venues and equipment, students' sports interests, the implementation of PE and other indicators that involve subjective feelings or cannot be directly quantified. In the process of teaching assessment, the application of fuzzy mathematics assessment model has the advantages of reasonably quantifying the original assessment indexes which are difficult to quantify, and displaying the assessment results in numerical values. Its synthetic operation method can ensure the integrity of the new assessment information to the greatest extent, and make the assessment results more reasonable and fair. Figure 3 shows teachers' subjective rating data of different PE assessment methods.

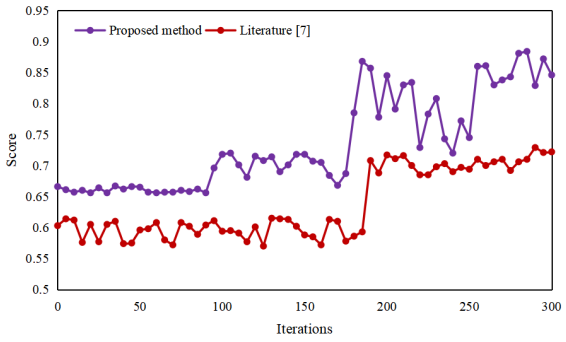

Figure 3: Teachers' subjective rating

Most teachers said that PE assessment based on data mining can effectively reflect the students' situation. The assessment index system should be predictable, that is, the indicators should reflect the future development direction of school PE, and play an early warning and guiding role in the growth of school PE. The fundamental purpose of assessment is to achieve a balanced growth of school PE, and it is necessary to find and solve the gaps in the assessment, so as to promote the growth of school PE. However, these variables have a certain dependence on each other, that is, there is often a certain degree of correlation between them, sometimes even quite high correlation, which makes the information in the observed data overlap to some extent.

Big data is introduced into the assessment system of higher education quality. By collecting, mining and analyzing the data of the whole teaching process, and using the results to provide rational basis and scientific decision-making for the improvement of higher education quality, the whole process, multi-level, multi-channel and multi-functional assessment of higher education quality can be realized. The framework of the assessment index system of PE in universities determines the specific content of teaching assessment. When using big data technology to construct the assessment system of PE, in the selection and framework of assessment indicators, we should not only follow some basic construction principles, but also strive to form a progressive, rigorous and orderly hierarchical structure within the assessment system. To realize the intelligent innovation of PE with the support of big data, teachers must learn to use data to analyze and solve problems. The assessment accuracy results of different models are shown in Figure 4. The recall rate of the algorithm is shown in Figure 5.

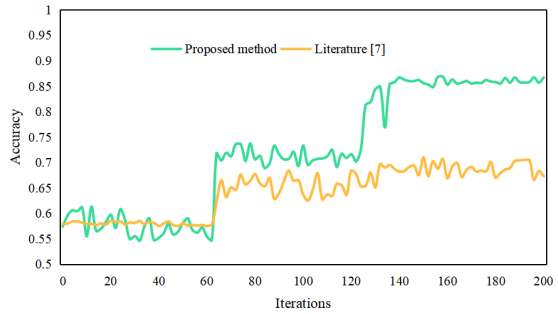

Figure 4: Assessment accuracy results of different models

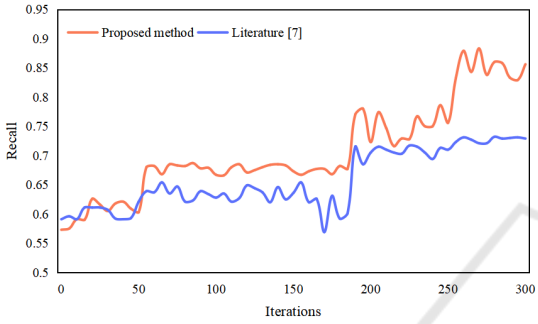

Figure 5: Recall results of different algorithms

The results show that the model has a high recall and accuracy, and the accuracy is increased by 19.64% compared with the traditional assessment algorithm. As for the assessment content of PE teaching quality, besides referring to the important data such as students' average PE score, the number of students' participation and the excellent rate of PE results as the basic basis for assessment, it is also necessary to comprehensively examine students' comprehensive qualities, such as teamwork spirit, class cohesion and collective sense of honor among students.

School PE is not only an important part of education, but also an integral part of PE. Therefore, the balanced development assessment of school PE is a comprehensive assessment, which includes not only the content of educational assessment, but also the assessment in the field of PE in terms of subject characteristics. On the whole, the index system should be able to reflect the four aspects of school PE resources, school PE process, school PE results and school PE social environment and the contents of its sub-indexes, so as to reflect the balanced level and degree of school PE development. Only in this way can we comprehensively and objectively assess the present situation of the balanced growth of school PE.

4 CONCLUSIONS

As an integral part of school education, school PE plays an important role in promoting teenagers' physical health, cultivating teenagers' good moral character and will quality, and helping teenagers to master sports knowledge and skills. PE assessment is an important link in PE, which is to make an objective and scientific judgment on the value of PE process and its effect based on the acquired PE information. This article tries to put forward an assessment algorithm of PE teaching based on clustering extraction algorithm under the theoretical framework of educational equity, so as to provide technical support for the construction of assessment index system of balanced growth of PE. The results show that the model has a high recall and accuracy, and the accuracy is increased by 19.64% compared with the traditional assessment algorithm. The assessment results of this algorithm are more in line with the actual situation and have good practicability. When there are many assessment indexes, this algorithm is more superior. What and how to assess PE is directly related to the realization of PE objectives and the direction and concept of PE. The ultimate goal of the assessment index system of balanced growth of school PE is to adjust and control the weak schools by government means after the assessment results come out, so as to ease the contradictions and reflect social equity and harmonious social development to the greatest extent.

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