Research on the Application of AHP Algorithm Based on Data Mining in Vocational Education Teaching Evaluation System

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Abstract. In order to explore how to combine data mining with teaching quality evaluation indicators, this paper takes current vocational school education and teaching as a platform for research. By drawing lessons from the effective mining of domestic and foreign vocational teachers' teaching quality evaluation index systems, it solves the irrationality of the current teaching quality evaluation index score ratio, designs a diversified evaluation index system, makes quantitative analysis of the index system by AHP, and designs and realizes a process evaluation system for teachers' teaching quality in higher vocational colleges, which makes the teaching quality evaluation fair, just, reasonable and efficient.

Keywords: data mining · AHP algorithm · Teaching quality evaluation index · Process evaluation system

1 Introduction

AHP (analytic hierarchy process) is a simple, flexible and practical multi-objective decision-making method for quantitative analysis of practical problems [1, 2]. It is characterized by a wide distribution of complex problems into interactions and levels to make them more efficient. It is based on certain objective and objective decision-making models (usually pairwise comparison), which directly and effectively combine expert opinion with expert decision-making theory, and quantitatively explain the importance of pairwise comparisons of products at the same level [3, 4]. Then, the weights which affect the values of the objects at each level are calculated by the mathematical model, and the weights of the objects at each level are calculated according to the overall order of the levels. This method has the characteristics of high efficiency, high judgment efficiency, adaptability and accuracy. It has been paid attention to and widely used in China's energy analysis, urban planning, industrial management, scientific evaluation and other social and economic activities. As an important way of performance evaluation and teaching improvement, teacher evaluation has been carried out in vocational high schools. Teaching evaluation: it refers to the process of preparing some teaching methods and objectives, evaluating teachers' teaching quality, evaluating their importance, advantages and disadvantages, and improving teaching quality. Teaching evaluation plays an important

role in establishing quality teaching supervision system, promoting vocational teaching, promoting the reform of educational content in middle schools, developing modern educational content, strengthening vocational teaching, implementing the main function of vocational education, improving school performance, coordinating teaching, and improving quality of education. Through the past analysis, our teaching management system is not standardized and loose. In some schools, students go through production practices and even "flocks", which are also associated with a lack of rigorous research and management.

2 Application of Teaching Evaluation System of Vocational Education Based on AHP

Teaching evaluation refers to the application of various methods and means to provide basis for macro-control to improve management and decision-making of departments under the guidance of teachers (teaching design, teaching process, teaching process, teaching and quality education). The evaluation of teachers' professional development mainly refers to the application of evaluation system to determine the value of the school's teaching objectives and principles, so as to provide information for the development of teaching and to make some necessary references for the evaluation objects. Teachers' professional development often turns to various aspects in the teaching process and the links between the vocational education [5, 6].

The evaluation of teaching work is a process of evaluating and determining teaching work with scientific methods according to teaching objectives. It is the core of teaching quality, the basis of school education evaluation, and the important link of teaching quality management. The main purpose of teaching evaluation is to provide the basis for understanding the reality of teaching, to strengthen teaching management, to carry out teaching reform and teaching. It can be seen that the essence of teaching evaluation is the value judgment, and the relationship between teaching evaluation and the evaluation index should be solved, rather than describing the purpose and attributes of teaching work by means of evaluation index. The analysis here is the organizer and leader of this evaluation, that is, the main educational management department of secondary vocational education in China at present.

The improvement of teaching quality is inseparable from scientific and strict management. First of all, we should establish and improve the administrative rules and regulations of the school, and promote the vocational training model. Through the past analysis, our teaching management system is not standardized and rigorous. For example, many indicators of college graduation evaluation are poor, which are associated with poor school performance or inadequate employment; and Some schools even "flock sheep", which is also associated with the lack of scientific and strict management system. Of course, this is not only a question of management, but also a question of understanding and investment. By using the teaching measures, we can establish and improve the rules and regulations of the teaching management and make full use of them, so as to guarantee and improve the guarantee of the teaching quality and make the teaching work have the rights to follow. Establish and improve the school curriculum quality, and guide teachers to lay the foundation for running schools. We should establish and improve

incentives and restraints to promote teaching, promote teachers' interest in teaching, and give students a first-class lesson. We should stimulate students' interest in learning, create a good learning environment, and foster new talents to emancipate. Carrying out evaluation is an important measure to implement Educational Scientific Outlook and improve the quality of education and teaching. It should be recognized that achieving comprehensive measures is the need for the government to change its functions and strengthen macro-control.

The principle of evaluating the evaluation index is mainly determined by the following factors:

Principle: quality evaluation is different from the first kind of evaluation. Higher standards are low in population, so the proportion of the most standardized standards is lower than 20%. Generally speaking, the results of teaching quality evaluation should be qualified by the majority of the people, so that the majority people have the vision and the minority have the power. This can achieve the goal of preparing teachers' satisfaction through evaluation.

Object of purpose: This is the basic principle about whether the evaluation is accurate and accurate. First of all, the performance of the evaluation system and the necessity of its weight should be considered when designing the evaluation system. The composition is incomplete and unreasonable, that is, the self- evaluation does not accord with the objective teaching reality, which is doomed to affect the purpose of the performance evaluation. Secondly, the monitoring data, database and data collected in the same period should be stable and non-sliding. In the event of a cancellation in operation, which should not be inspected, collected or held directly, the primary equipment will become secondary and tertiary equipment, which will have no effect on the purpose of the assessment. It is also important to check whether the working state after entering the assessment system is accurate, rigorous and scientific. We believe that the evaluation of teachers' work is often inaccurate. Therefore, it should be emphasized that the teaching management should exist in the same period; and At the same time, we also believe that the operation of the state of self-assessment is also very important. In the absence of objectivity, relevance and scientificity, it would also be excluded from the principle of objectivity, which was not permitted in the performance evaluation.

Management principle: the principle of rational management is embodied in the following aspects: using people-oriented principle and protecting seeing things and seeing people. All activities of the school should be based on life and work to plan people's interests. In system management, there is often the phenomenon of emphasizing too many factors on people, which is negative. We can't ignore that the system should include human's function theory. Only by respecting and understanding people can we control people and organize their interests. In the evaluation of teaching quality, we should attach importance to people's thought, respect people's idea and work well. These "external" operations will be more than just the direct operation of the test. Only when these tasks and evaluations are carried out smoothly at the same time can the teachers' satisfaction be improved. This kind of people-oriented management and rational management with a view and foresight.

Table 1. Scale Meaning Table

scale	meaning
1	This means that these two things are important too.
3	Compared with these two aspects, the former is a little more important than the latter
5	Compared with these two aspects, the former is more important than the latter.
7	Compared with these two aspects, the former is more important than the latter.
9	Compared with these two aspects, the former is more important than the latter
2, 4, 6, 8	Represents the average value of the adjacent decision set above.
reciprocal	If the importance ratio of factor i to factor j is a_{ij}, then the importance ratio of factor j to factor i is $a_{ij} = \frac{1}{a_{ij}}$

2.1 Establish a Hierarchy of Problems

This is the most important step in the analytic hierarchy process. It decomposes the complex problems into several components called objects, and creates different levels according to the interaction and function of the objects. As a process element, the content of the same layer supports the content of the next layer, while being controlled by the content of the previous layer. The highest level has only one, which represents the overall objective of the problem; The secondary level is usually the level of indicators [7, 8].

2.2 Construct Pairwise Comparison Judgment Matrix

Assume that the Bk element of the above layer is a process, which is the next layer of elements C1, C2, … Cn. Our aim is to give weight of C1, C2, … under the Bk level system according to their Cn values. In this step, we need to answer which of the C1 and C2 contents of Bk is more important and how important it is. We must give the price a priority. Here, the proportion shown in Table 1 is used.

The weight coefficient is calculated according to the judgment matrix. The judgment matrix is given by a group of experts by making $\frac{n(n-1)}{2}$ pairwise comparisons according to the importance of multiple factors.

2.3 Hierarchical Single Sorting and Consistency Inspection

If the comparison results are completely consistent, the elements of matrix A should also satisfy:

$$a_{ij}a_{jk} = a_{ik}, \quad \forall i, j, k = 1, 2, ..., n \tag{1}$$

The consistency test of the judgment matrix includes the following steps:
Calculate consistency index CI

$$CI = \frac{\lambda_{\max} - n}{n - 1} \tag{2}$$

Table 2. Values of RI

n	1	2	3	4	5	6	7	8	9
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45

Find the corresponding average random consistency index RI [9]. For n = 1, …, 9, Saaty gives the RI value, as shown in Table 2.

The value of RI is obtained by constructing 500 standard matrices: automatically extracting the matrices and their values from 1–9 to construct the optimal matrix, and calculating the average value λ_{max} of the largest characteristic root, and defining: $RI = \frac{\lambda_{max} - n}{n - 1}$.

Calculate the consistency ratio CR:

$$CR = \frac{CI}{RI} \tag{3}$$

During CRlt; At 0.10, the nature of the decision is considered acceptable; otherwise, the decision matrix must be adjusted appropriately [10].

2.4   General Ranking of Levels and Consistency Inspection

The above is the weight vector of a group of objects to their highest level. Finally, we should get the ranking weight of each season, especially all the ranking of the low level, so that we can choose the plan. Overall weight is very important. The weight in an instrument is synthesized from top to bottom. The layered general ranking also needs to be tested consistently, and tests are also conducted layer by layer from high to low according to the ranking process. This is because even if each level has passed the corresponding hierarchical parameter one option, each comparison judgment matrix pair has a similar satisfaction. However, when doing the comprehensive investigation, the discrepancy of each level will also increase, which leads to serious conflicts in the final evaluation results.

AHP (analytic hierarchy process) is a hierarchical decision process for multi-parameter identification of evaluation models. It models and evaluates the decision-making process of decision makers in complex system. Using this method, the decision makers can decompose the complex problems into several levels and varieties, compare and sum up the basic concepts, and get the weight of different plans, thus providing the basis for selecting the best plan. AHP method can be divided into the following three steps: firstly, analyze the relation of the status in the system, compare the values of each of the same level with the method of the previous level, and make decision for comparison; Step 2: Calculate the weight of the comparison object for the process by the decision matrix, and investigate the consistency of the decision matrix; Step 3: Calculate all partition weights at all levels of the system and sort them out. Finally, the total order of each scheme to the whole scheme is obtained. After the whole process is finished, we get the weight of each index. In the test maintenance module, we can rent the weight.
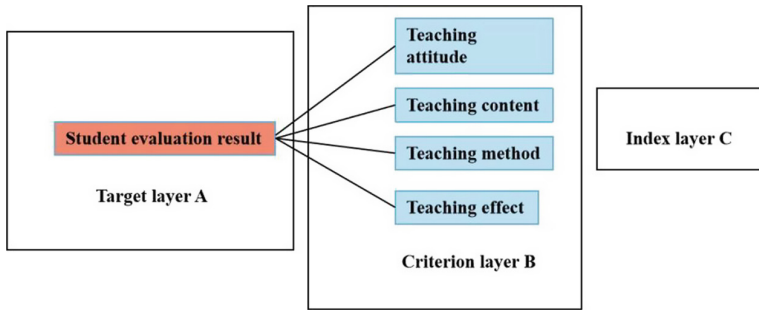
Fig. 1. Student evaluation index system diagram

First, take the student's evaluation index as an example to make a quantitative analysis. The range of processes of other measures is identical. The student evaluations are shown in Fig. 1.

3   Conclusion

By using the public data collection technology for the integrated management platform of digital campus in colleges and universities, this system not only realizes the basic functional requirements such as standardization and networking of teaching quality evaluation process, but also has the characteristics of adaptability and foresight for the construction of integrated management platform of digital campus. It can solve the problem of integration between this system and business systems such as personnel and educational administration, and as a subsystem of comprehensive management platform of digital campus.

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