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Optimization Algorithm of Fuzzy Index Evaluation System of Ideological and Political Teaching in Course Based on Human-Computer Interaction Emotion Recognition

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Abstract: Teaching reform is ultimately achieved through teachers' course teaching. Only in the process of curriculum teaching implementation can the superior teaching resources such as excellent courses be transformed into students' own knowledge, ability and skills, and the teaching mode and the value of excellent courses can be reflected in the students. Therefore, curriculum ideological and political teaching occupies a very important position in teaching. By studying the application status of the curriculum teaching evaluation system at home and abroad, combined with the education's target requirements for talent training, this paper found many deficiencies and areas that need to be improved through an in-depth analysis of the current application status of the curriculum teaching evaluation system in China. Therefore, a set of classroom teaching evaluation system based on FAHP was designed and developed, and FAHP was used to determine the evaluation indicators and the weights of various evaluators. Through the application of the system in classroom teaching, the data of students' classroom teaching status were collected, and the value of learning evaluation teaching was optimized. Through the application of the system, the data of various aspects in the classroom teaching process were collected, and the data were analyzed and integrated. Based on the data analyzed by the system, the actual evaluation was carried out to improve the teaching level of teachers. Through this system, the ideological and political teaching efficiency of the course was improved by 5.6%.

1. Introduction

At present, the development of education is extremely rapid, but in the process of development, there is still a mismatch between the scale of development and the quality of students. The reason is that in the classroom teaching, the classroom is the determinant of the quality of students' class. Therefore, the effective improvement of teachers' classroom teaching is the top priority, and the first step is to know the problem that teachers' classroom teaching efficiency is not high. Through the evaluation of classroom teaching, the deficiencies of teachers' teaching can be effectively solved, the quality of teaching can be improved, and the overall employment quality of students can be finally realized. Although the classroom teaching evaluation system has been widely used, it has not been deeply researched and analyzed due to the short application time. Therefore, there are still some problems. For example, there is still a big gap with the requirements of the current classroom teaching evaluation system, and it cannot reflect the real level and ability of teachers' classroom teaching. Therefore, it is necessary to research and develop a set of classroom teaching evaluation system. Classroom teaching is the most important part of the whole teaching process. Correct and objective evaluation of classroom teaching is an important means to ensure and improve classroom teaching. The same is true of the ingenious design of the classroom assessment systems that most colleges and universities already use. Therefore, it is necessary to learn from the advantages of the evaluation systems of these colleges and universities, and to solve the existing problems one by one.

Emotion recognition refers to the individual's recognition of the emotions of others. Jenke R investigated many feature extraction methods, and the selection of appropriate features and electrode locations was often based on neuroscientific findings [1]. The purpose of Schuller B W's study was to estimate the height of a smartphone's carrier by using a single three-axis accelerometer signal, and he found that the accelerometer signal collected while the carrier was going up stairs contained features related to the height of the carrier [2]. Menezes M used EEG as a biosignal sensor, which could model the user's emotional state and then exploit it to realize a system that could recognize and react to the user's emotions [3]. Zheng W started a new research method commonly applied to EEG channel selection and emotion recognition, and this new method was able to select group features from raw features [4]. Although these literatures have done research and analysis on emotion recognition, they have not been specifically combined with human-computer interaction and course evaluation, and lack pertinence.

Human-computer interaction is the interaction between the user and the research system. Computer vision recognition was very important for human-computer interaction, and Chakraborty BK research investigated various vision-based gesture recognition problems that arise in recognition [5]. Modern consumer electronic devices are already evolving. This makes human-machine interaction more natural and effective. Michalakis K was about to deploy IoT on the existing Internet infrastructure, which was expected to expand human-computer interaction to integrate applications and services customized for the automation of daily life [6]. Recent research has demonstrated the use of approximations in human-computer interaction to support explicit and implicit user interactions across a range of uses. This has been widely pursued. However, many research questions remain unanswered. With growing interests, Greenberg S organized a workshop on this topic to study [7]. The field of HCI for development emerges at the intersection of the fields of ICT for development and HCI. Biljon J V offered four guidelines to inform researchers of this challenge. Main specific topics were firstly identified, followed by a systematic literature review of the literature to build a corpus to support the analysis [8]. Although the research on human-computer interaction has been thorough, the evaluation of ideological and political courses still needs to be further studied.

Establishing a complete set of classroom teaching evaluation index system is the key to comprehensive evaluation of teachers' teaching. The reasonable formulation of classroom teaching evaluation indicators can not only make a comprehensive evaluation of teachers' teaching quality, but also provide an important theoretical basis for the implementation of teachers' teaching quality assessment. The innovation point of this paper: It introduces the sorting formulas of various fuzzy consistent matrices, and chooses one of them to apply to classroom teaching evaluation, obtains the final evaluation index weight, and completes the analysis results of classroom teaching evaluation. It provides an important theoretical basis for the implementation of teaching evaluation.

2. Machine Learning Methods

2.1 Multilayer Perceptron

A multi-layer perceptron consists of three parts: an input layer, one or more hidden layers, and an output layer. When there are more than 2 hidden layers, it is also called a deep neural network.

The loss function is:

$$-\frac{1}{\|\varepsilon\|}\sum_{x_{j\in N}} y_j(\varepsilon x_i + a) \tag{1}$$

The MLP is trained with a feed-back training algorithm, and MLP is actually an algorithm in a neural network, that is, a multilayer perceptron. The output error of the network and the contribution of each layer of neurons to the error are calculated until the input layer of the algorithm. Since this experiment is facing the problem of three classifications, the softmax activation function is used in the output layer instead.

2.2 Support Vector Machine

For the known data that has been labeled, the support vector machine algorithm finds a classification hyperplane $\gamma^e x + a$ that satisfies these conditions:

$$y_j(\gamma^e x_j + a) \geq 1 \tag{2}$$

If the linear classifier cannot be used to classify x_j, the classification hyperplane to look for is:

$$y_j(\gamma^e x_j + a) \geq 1 - \eta_j \tag{3}$$

η_j is the slack variable, which represents the departure from the ideal linear separable condition. Finding the optimal classification hyperplane can be equivalently understood as: under the constraints, the cost function is minimized. C is a constant, which represents the penalty degree of the wrongly classified samples [9]. The constraint is:

$$y_j(\gamma^e x_j + a) \geq 1 - \mu_j \tag{4}$$

The minimization of the cost function has the same constraints as maximizing the classification boundary and minimizing the classification error. The constrained optimization problem is solved using the Lagrange multiplier method.

$$P(\beta_1, \beta_2, \dots \beta_n) = \sum_{j=1}^{N} \beta_j - \frac{1}{2}\sum_{j=1}^{N}\sum_{j=1}^{N} \beta_j \beta_i y_j y_i x_j x_i \tag{5}$$

The binary tree sentiment classification model is shown in Figure 1. In the figure, classifier 1 divides the input samples into excited groups, frustrated and bored groups according to the positive and negative emotions, and then distinguishes the frustrated and bored groups through classifier 2.

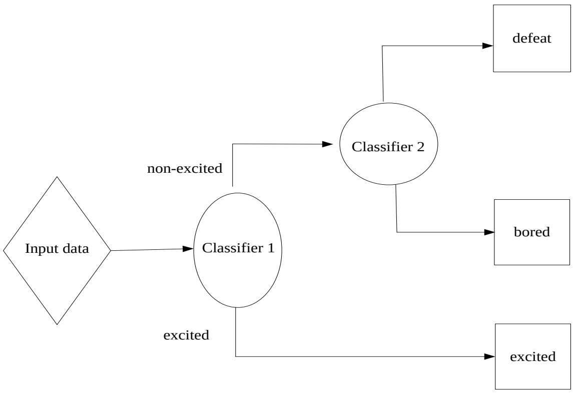

Figure 1: Binary tree sentiment classification model

2.3 K-Nearest Neighbor Node Algorithm

For points in n-dimensional space, the formula for calculating the distance n_{12} between them is:

$$n_{12} = \sqrt{\sum_{l=k}^{m} (x_{1l} - x_{2l})^2} \tag{6}$$

This distance is also known as the Euclidean distance. The general process of the algorithm is: firstly, the Euclidean distance between other points in the feature space and the predicted point is calculated by formula 7. Then the distances are sorted from small to large and saved. The top K points are selected, and see which category the top K points belong to. Finally, this category is determined as the final category [10]. Figure 2 shows the error rate of the validation set for different values of K.

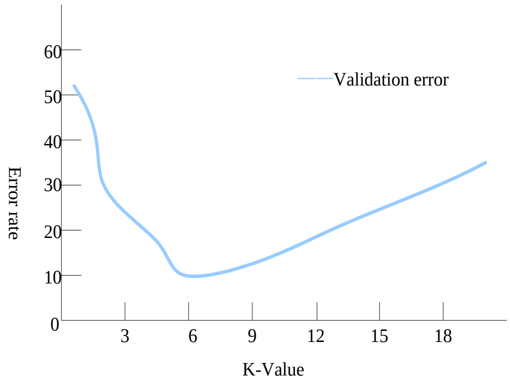

Figure 2: Error rates for different K values

2.4 M-V Mean Variance Model

If the investor chooses m risk assets to build a portfolio, the return of the nth asset is k_n, and the return of asset n is k_{nl}, then the expectation and variance of k_n are:

$$k_n^0 = E(k_n) \tag{7}$$

$$\beta^2 = E[k_n - E(k_n)]^2 \tag{8}$$

The covariance of k_n and k_u is expressed as:

$$\beta_{nu} = E[(k_n - E(k_n))(k_u - E(k_u))] \tag{9}$$

2.5 Fuzzy Possibilities Theory

It is assumed that the set of real numbers is R, A is a fuzzy set defined on it, and its membership function has the properties of convex set, continuous and bounded.

$$[B]^{\chi} = \{n \in P \mid B(n) \geq \chi\} \tag{10}$$

The fuzzy upper probability mean is expressed as the weighted average of the expected value of the fuzzy number at the right endpoint, and the fuzzy lower probability mean is expressed as the weighted average of the expected value of the fuzzy number at the left endpoint. And the fuzzy number likelihood mean is the average of the two of them as described in the formula.

$$\overline{N}(B) = \frac{N*(B) + N*(B)}{2} \tag{11}$$

Fuzzy mean and variance have these properties:

$$\overline{N}(B+D) = \overline{N}(B) + \overline{N}(D) \tag{12}$$

$$\overline{N}(fB) = f\,\overline{N}(B) \tag{13}$$

f is a non-negative real number.

3. Fuzzy Index Evaluation System of Ideological and Political Teaching in Courses Based on FAHP

3.1 Overview of Ideological and Political Teaching in Courses

(1) Fuzzy layer analysis method

The fuzzy analytic hierarchy process provides the basis for the quantitative evaluation index and the selection of the optimal scheme, and has been widely used. The establishment of the evaluation index system is the key first step [11-12]. The purpose of fuzzy analytic hierarchy process is to achieve a certain goal, in the absence of a clear qualitative or quantitative premise, it is necessary to choose an optimal solution. However, there are many factors that affect these programs, so it is necessary to analyze in advance how many related factors are related to the realization of this purpose, and list these factors one by one. Then these influencing factors are classified, and the classification needs to follow certain principles. The classification is reasonable and scientific only if it follows these principles.

(2) Principles of the indicators of the curriculum evaluation system

The first principle is accuracy. The meaning and extension of evaluation indicators are required to be described accurately. There is no ambiguity in the evaluation caliber, and the upstream evaluation index data must have a high degree of consistency.

The second principle is normative, and there must be systematic regulations in the classification, calculation and measurement of evaluation indicators.

The third principle is comparability. The evaluation index should satisfy the mutual comparison between different types or the same type in different states, and should have certain guiding significance.

The fourth principle is reliability. The data source in the evaluation index is completely reliable, which is not only convenient to operate, but also can be marked and set in advance for some data that cannot be counted at present, but is more important, and will be further counted with the improvement of the system in the future.

The fifth principle is comprehensiveness. The system structure composed of evaluation indicators must cover all aspects of evaluation, to ensure that the range to be expressed by a single indicator and the overall indicator system is fully covered, and fully reflect the characteristics of the evaluation object.

(3) Evaluation indicators of course teaching strategies

In the whole process of classroom teaching, teaching requirements and teaching content can be referenced and referenced in the course group. Especially for some teachers who have just entered the school, most of the teaching content is still provided by the curriculum group or old teachers. But there is one thing that cannot be replicated, and that is teaching strategies. The so-called teaching strategies are some teaching skills and teaching methods. The purpose may not be to let students know how much knowledge, but to make students interested in this class and increase their attention [13-14].

3.2 Design of Teaching Evaluation System for Ideological and Political Courses

(1) System frame design

The course teaching evaluation system uses PHP as the development platform and adopts the classic three-tier architecture model, as shown in Figure 3.

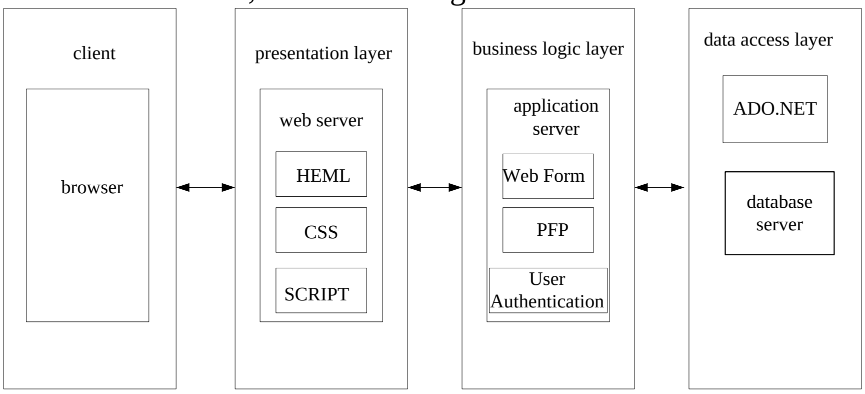

Figure 3: Framework diagram of course teaching evaluation system

The three-tier system model is not the three-tier on the physical level, nor the concept of three machines, but refers to the three-tier logically. The application part of the so-called three-tier architecture places business rules, data access and legal verification into the middle layer for processing [15].

(2) System personnel framework design

The evaluation personnel of the classroom teaching evaluation system mainly include enterprise technical experts, school supervision offices, school teachers, course members and students. The purpose is to improve teachers' classroom teaching effect by completing classroom teaching evaluation. There are many different users in this system. Therefore, it also provides several human-computer interaction interfaces, enterprise technical experts, school supervision offices, school teachers, course team members and students' evaluation data collection, students' classroom status data collection and teachers' classroom teaching resource data collection, etc.

(3) Overall frame design of the system

On the basis of the campus network, five types of evaluators, including enterprise technical experts, school supervision offices, school teachers, course team members, and students, log in to the system through browsers, and complete different functions according to their corresponding roles. It mainly includes evaluation and data collection of students' classroom status.

3.3 Trial Effect of Course Teaching Evaluation System

Firstly, the teaching content gradually tends to be applicable and reasonable. According to the results of the survey, most students and supervisors basically recognized the development and use of this system, which made the classroom teaching content basically tend to be applicable and reasonable. 25% of the investigators believe that the system plays a guiding role in the control of classroom teaching content. 67% of the investigators believe that the system has certain guidance and help in the control of classroom teaching content. Only 7% of the investigators believe that the system's control of teaching content is not in place.

Secondly, the basic skills of teaching have been effectively improved. Using this system, in the questionnaire survey of 55 teachers and supervisors, 88% of the evaluators have listened to the same teacher more than 3 times. The other 12% of the evaluators listen to the same teacher twice. It means that 100% of the evaluators have attended and evaluated the same teacher more than twice. Regarding the evaluation of teachers' basic skills, 70% of the evaluators affirm the improvement of teachers' basic skills, and say that the improvement is more obvious. 12% of the evaluators indicate that the ability of teachers in basic skills has improved, but it is not obvious. 18% of the evaluators believe that the basic skills of teachers have not been improved and improved.

Thirdly, the choice of teaching methods is flexible and diverse. In the questionnaire survey of the students of this major, 70% of the students believe that the teaching methods of the teachers are not only diverse, but also very suitable for their learning, and can effectively grasp the knowledge of classroom teaching. 20% of the students think that the teaching methods and methods of the teachers are good, which is improved compared with the previous ones. Only 10% of students feel that there is no improvement in classroom teachers.

Fourthly, the effect of classroom teaching can be evaluated and improved in real time. The positive performance of learning has been fully mobilized; the students with good, middle, and poor foundations can make the best of their wisdom and gain their own way, and improve them in a balanced manner.

3.4 Results of Teachers' Teaching Evaluation

The comprehensive membership values of students' teaching evaluation of teacher 1 on the four evaluation levels are {excellent, good, fair, bad}={0.6, 0.3, 0.06, 0.01}. The result of students' evaluation of teachers' teaching is "good". As can be seen in the table, there are more good ratings, roughly 25% average ratings and fewer bad ratings, indicating that students are relatively satisfied with their teachers, as shown in Table 1.

Table 1: Comprehensive membership table of teacher evaluation grades

Membership	teacher 1	teacher 2
Student Evaluation Affiliation	{0.6,0.3,0.06,0.01}	{0.2,0.5,0.12,0.13}
Peer Review Affiliation	{0.4,0.3,0.2,0.05}	{0.2,0.6,0.17,0.02}
Expert evaluation affiliation	{0.5,0.2,0.15,0.12}	{0.2,0.6,0.12,0.09}

In the teacher evaluation management system, teacher 1 and teacher 2 are selected respectively, and the final evaluation score of the teacher can be seen. For teacher 1, students score higher than peers and experts. This shows that the teaching ability of teacher 1 has been highly recognized by the students. Teacher 2's student scoring, peer scoring, expert scoring, and comprehensive scoring results are 84, 86, 84, and 83, respectively. For teacher 2, peer and expert ratings are higher than student ratings. This shows that the professionalism of Teacher 2 is recognized by peers and experts. However, it is not possible to see the specific situation of teacher 1 and teacher 2 in the six major factors of teaching evaluation. Therefore, it is necessary to analyze the six factors of teachers' teaching in detail. The six basic factors of teacher 1's teaching account for the proportion of the total teaching score, as shown in Figure 4.

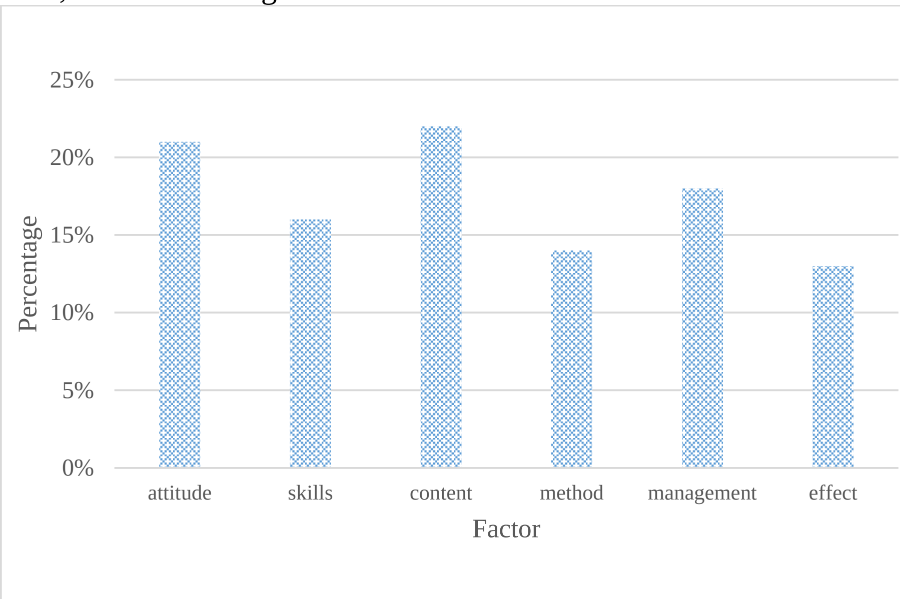

Figure 4: Six basic factors of teaching evaluation

From the figure of the proportion of the six basic factors of teacher 1's teaching to the total teaching score, the six basic factors are clearly compared. From the comparison results, the teaching effect of teacher 1 is generally higher than the other five factors, and the teaching attitude of teacher 1 is lower than the other five factors. Teacher 1's teaching can achieve a good teaching effect, but in teaching, attention should be paid to the cultivation of teaching attitude.

However, the teacher evaluation scores and the proportion of the six major factors in the total score cannot be seen in what specific aspects are the differences between the evaluation results of teacher 1 and teacher 2. It does not reflect the differences in the teaching of teacher 1 and teacher 2 in the six major factors of specific teaching. Therefore, the scores of the two teachers and the six basic factors of teaching evaluation are compared, as shown in Figure 5.

From Figure 5, it can be concluded that teacher 1 and teacher 2 are compared, and teacher 2 is significantly better than teacher 1 in terms of teaching attitude and teaching content. Teacher 1 is better than teacher 2 in terms of basic teaching skills, teaching methods and teaching effects. In teaching, teacher 1 and teacher 2 should learn from each other, take advantage of their strengths, and make up for their weaknesses. The study has found that the results of students-peers-experts' evaluation of teachers' teaching are generally consistent with the situation of teachers 1 and 2 in real teaching. This shows that the evaluation system has certain applicability and scientificity.

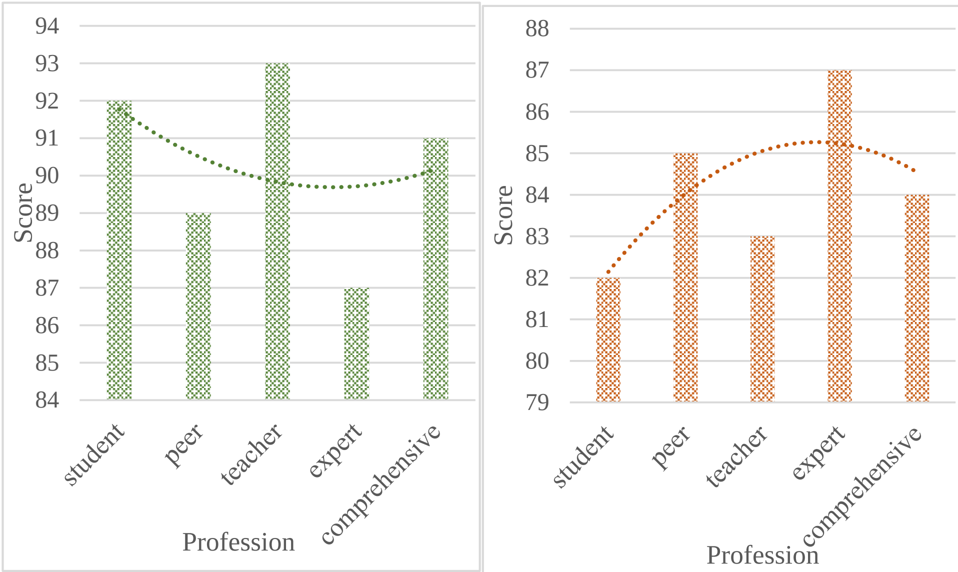

Figure 5: Comparison of comprehensive scores of teacher 1 (left) and teacher 2 (right)

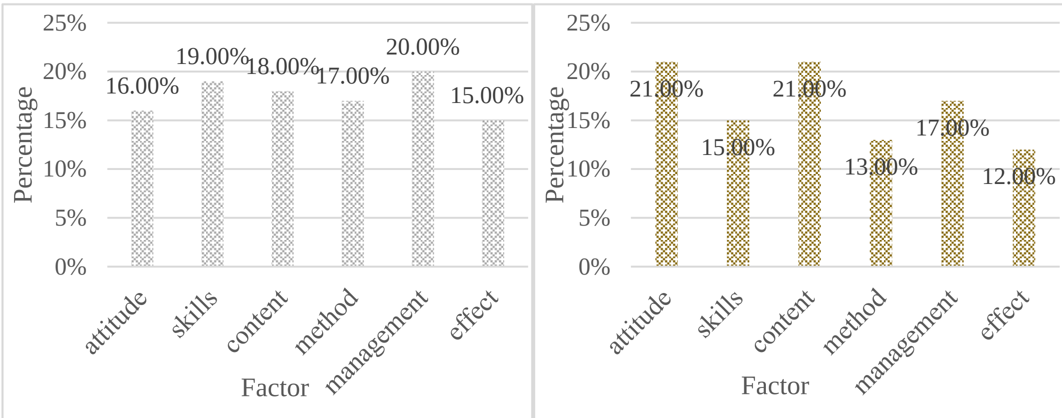

Figure 6: Comparison of the six basic teaching factors of teacher 1 (left) and teacher 2 (right)

As can be seen from Figure 6, according to the analysis results of the teaching evaluation data of teacher 1 and teacher 2, in order to improve the teaching level of teacher 1 and teacher 2, the suggestions are put forward to teachers and schools: The three teaching factors of teacher 1's teaching attitude, teaching content and teaching management are needed to be improved.

4. Conclusions

The fuzzy evaluation system for thinking and course teaching is a way of achieving a return to the quality of professional education. Through the evaluation of classes, it will help teachers to improve their teaching, accelerate the learning effect of students in the classroom and generally improve the establishment of professional quality. These issues also need to be discussed and studied in order to strengthen the theoretical and practical research on teaching evaluation and to establish a teaching evaluation system for Civics teachers.

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