

The Fuzzy Comprehensive Evaluation of Colleges and Universities Teaching Quality

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Abstract. Teaching Quality Evaluation is an important part of teaching management. In this paper, the conventional evaluation method for qualitative analysis, with a certain degree of subjectivity and one-sidedness, not comprehensive and accurate, proposed a fuzzy comprehensive method to the scientific quantitative evaluation, application of fuzzy systems theory, fuzzy evaluation model, comprehensive assessment and scientific quantitative calculation of the inaccuracies in the evaluation of the quality of teaching. By actual specific numerical example, show that the method is simple, easy, and accurate.

Introduction

The evaluation of the quality of teaching is an important part of teaching management, is a highly scientific work, Literature [1][2][3] involves education, psychology, management science, and other disciplines and multiple fields. In the past, the most of judge method of Literature [4] is qualitative analysis, with a certain degree of subjectivity and one-sidedness, not comprehensive and accurate. In this paper, a fuzzy system theory, developing an evaluation model, for the inaccuracies in the evaluation of the quality of teaching to comprehensive assessment of quantitative and scientific computing.

Mathematical Model

Improved mathematical models in the literature [5] assume that evaluating a objects set is $X = \{x_1, x_2, \dots, x_n\}$, assessment experts set is $S = \{s_1, s_2, \dots, s_k\}$, evaluation index set is $U = \{u_1, u_2, \dots, u_n\}$, remark set is $V = \{v_1, v_2, \dots, v_m\}$. To each evaluation object $x_i (i=1, 2, \dots, n)$, each experts $s_i (i=1, 2, \dots, k)$ according to their own point of view on the evaluation index to determine, determination result belongs to one of remark set V, order to determine the fuzzy relationship matrix of specific assessment objects.

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix} \quad (1)$$

In the formula, r_{ij} said i-assessment indicators, the class jassess level score, the formula is:

$$r_{ij} = \frac{v_{ij}}{k} \quad (2)$$

I-assessment indicators where denotes the specific object, experts give the number of class j reviews, k is the total number of experts, This article selected the evaluation index set:

$$U = \{u_1, u_2, u_3, u_4, u_5\} = \{\text{purposes, attitude, content, methods, effectiveness}\} \quad (3)$$

The

$$u_1 = \{u_{11}, u_{12}\} = \{\text{reflect outline demand, appropriate to students' actual}\} \quad (4)$$

$$u_2 = \{u_{21}, u_{22}, u_{23}, u_{24}, u_{25}\} = \{\text{passion for teaching work, prepare lessons fully, explain in detail, teachers, marking timely}\} \quad (5)$$

$$u_3 = \{u_{31}, u_{32}, u_{33}, u_{34}, u_{35}\} = \{\text{materials selection reasonable, teaching depth suitable, theory with practice, clarity, large amount of information}\} \quad (6)$$

$$u_4 = \{u_{41}, u_{42}, u_{43}, u_{44}\} = \{\text{vivid language, Blackboard neat, specific examples of appropriate, deal with the problem dexterity}\} \quad (7)$$

$$u_5 = \{u_{51}, u_{52}, u_{53}\} = \{\text{classroom lively atmosphere, reacted strongly, press plans to complete the task}\} \quad (8)$$

Evaluation set is

$$V = \{v_1, v_2, v_3, v_4, v_5, v_6\} = \{\text{excellent, good, mid, general, poor, bad}\} \quad (9)$$

The role and impact of the various assessment indicators, in the comprehensive assessment, weight coefficient matrix given the indicators assessed by experts $W = [w_1, w_2, \dots, w_n]$, the combination of weighting matrix W and fuzzy relationship matrix R , is a comprehensive evaluation of the assessment object[6][7][8].

Comprehensive Evaluation Method

Definition $A = W \cdot R$, for object x_i , seen $A_i = W \cdot R = \{x_{i1}, x_{i2}, \dots, x_{im}\}$. According to the principle of maximum degree of membership, if $v_i = \max\{x_{i1}, x_{i2}, \dots, x_{im}\}$, then the rating of object x_i is v_i .

If the assessed object more, such as university courses can be divided into public courses, basic courses and specialized courses in three categories, it is difficult to reasonable given the weight distribution, multi-level evaluation is needed [9]. First comprehensive evaluation of each class, and each class as a judge of a single factor, a total of three single factor, the last of the three single-factor comprehensive evaluation to their respective weights, the second-level comprehensive evaluation, in order to achieve a reasonable effect.

$$A = W \cdot R = W \cdot \begin{bmatrix} W_1 \cdot R_1 \\ W_2 \cdot R_2 \\ W_3 \cdot R_3 \end{bmatrix} \quad (10)$$

W is the three single factor weighting matrix W_i each category subdivided each index weighting matrix, so that you can judge the results on two judges. All kinds of factors contain too much can also be subdivided by three or more levels judged to come to a better comprehensive evaluation.

Specific examples

Here we have a certain teacher evaluation process, for example, to illustrate the comprehensive evaluation process. This paper selected 10 experts on a teaching evaluation survey, as shown in Table 1.

Table 1 teachers teaching evaluation questionnaire

main factors	Sub-factors	Evaluation (people)					
		Excellent	Good	Mid	General	Poor	bad
Teaching Purpose	Reflect the program requirements	3	5	1	1	0	0
	Appropriate to students' actual	2	4	2	2	0	0
Teaching Attitude	Passion for teaching work	0	2	5	2	1	0
	Lesson planning in earnest	1	3	3	3	0	0
	Explain carefully	3	5	2	0	0	0
	Teachers	1	3	2	3	1	0
	Marking timely	2	2	3	3	0	0
Teaching Content	Materials selection and reasonable	2	4	4	0	0	0
	Teaching depth suitable	1	5	3	0	1	0
	Theory with practice	0	3	4	2	1	0
	Well organized	2	2	4	2	0	0
	Large amount of information	3	3	3	1	0	0
Teaching Means	Vivid language	2	5	2	1	0	0
	Blackboard neat	0	2	5	3	0	0
	Specific examples of appropriate	3	3	4	0	0	0
	Flexible handling problems	2	2	6	0	0	0
Teaching Effect	Classroom atmosphere	3	2	4	1	0	0
	Reflect the strong	3	4	2	1	0	0
	The successful completion of tasks on schedule	5	2	3	0	0	0

According to the different degrees of importance of various factors in the evaluation items, given different weights, specific allocation is as follows:

$$W = [0.1 \quad 0.3 \quad 0.3 \quad 0.2 \quad 0.1] \quad (11)$$

$$W_1 = [0.5 \quad 0.5] \quad (12)$$

$$W_2 = [0.1 \quad 0.2 \quad 0.3 \quad 0.2 \quad 0.2] \quad (13)$$

$$W_3 = [0.2 \quad 0.25 \quad 0.25 \quad 0.2 \quad 0.1], \quad W_4 = [0.25 \quad 0.2 \quad 0.25 \quad 0.3], \quad (14)$$

$$W_5 = [0.3 \quad 0.5 \quad 0.2] \quad (15)$$

The following comprehensive evaluation:

$$A_1 = W_1 \cdot R_1 = [0.25 \quad 0.45 \quad 0.15 \quad 0.15 \quad 0 \quad 0] \quad (16)$$

$$A_2 = W_2 \cdot R_2 = [0.19 \quad 0.33 \quad 0.27 \quad 0.2 \quad 0.03 \quad 0] \quad (17)$$

$$A_3 = W_3 \cdot R_3 = [0.135 \quad 0.35 \quad 0.365 \quad 0.1 \quad 0.05 \quad 0] \quad (18)$$

$$A_4 = W_4 \cdot R_4 = [0.185 \quad 0.3 \quad 0.43 \quad 0.085 \quad 0 \quad 0] \quad (19)$$

$$A_5 = W_5 \cdot R_5 = [0.34 \quad 0.3 \quad 0.38 \quad 0.08 \quad 0 \quad 0] \quad (20)$$

After the normalization processing, Fuzzy relationship matrix:

$$R = \begin{bmatrix} A_1 \\ A_2 \\ A_3 \\ A_4 \\ A_5 \end{bmatrix} = \begin{bmatrix} 0.25 & 0.45 & 0.15 & 0.15 & 0 & 0 \\ 0.19 & 0.32 & 0.26 & 0.2 & 0.03 & 0 \\ 0.135 & 0.35 & 0.365 & 0.1 & 0.05 & 0 \\ 0.185 & 0.3 & 0.43 & 0.085 & 0 & 0 \\ 0.32 & 0.27 & 0.34 & 0.07 & 0 & 0 \end{bmatrix} \quad (21)$$

then

$$A = W \cdot R = [0.186 \quad 0.333 \quad 0.3225 \quad 0.123 \quad 0.024 \quad 0] \quad (22)$$

After the normalization processing

$$A = [0.188 \quad 0.327 \quad 0.326 \quad 0.125 \quad 0.034 \quad 0]$$

The highest value of A is 0.327, according to the principle of maximum degree of membership, found that teachers teaching evaluation results is good.

Conclusion

Uncertainty for teaching evaluation system itself, use of fuzzy comprehensive method to judge, scientific and rationality, either all things considered, and appropriate weights relationship. In this paper, the conventional evaluation method for qualitative analysis, with a certain degree of subjectivity and one-sidedness, not comprehensive and accurate, proposed a fuzzy comprehensive method to the scientific quantitative evaluation, application of fuzzy systems theory, fuzzy evaluation model, comprehensive assessment and scientific quantitative calculation of the inaccuracies in the evaluation of the quality of teaching. By actual specific numerical example, show that the method is simple in principle, convenience of calculation, practicability, is an effective means of evaluation.

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