

Unascertained Rational Number's Model in the Evaluation of Student Teachers' Teaching Ability

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Abstract. The cultivation of teacher is connected with normal education. Building high-quality teaching force is the basic guarantee of the comprehensive implementation of quality education. In order to establish a scientific and rational evaluation of the teaching system, to evaluate teachers' teaching objectively and fairly, to mobilize teachers' enthusiasm, initiative and creativity fully, to form a mechanism of analysis, evaluation and feedback, to create a good teaching environment and to encourage teachers to improve and perfect themselves continually, it is necessary to establish an evaluation index system of the teaching and determine weights of the various indicators by documentation and investigation. A mathematical model is established by using the theory of the Unascertained Rational Number. It evaluates teachers' teaching comprehensively from these four aspects: the accomplishment of teachers, the quality of the teaching progress, the reform and research of teaching, teaching effects. The objective and fair evaluation result is obtained by using the model of the Unascertained Rational Number. By comparing with the result of "the average", it illustrates the superiority of the Unascertained Rational Number. The objective and fair result helps them promote the teaching quality and optimize the building of teachers' contingent in primary and secondary schools, also provides a scientific and feasible way for evaluating teachers' achievements.

Introduction

Giving objective and fair evaluation to teachers' teaching work, can give full play to the teacher's enthusiasm, initiative and creativity, The use of feedback mechanism, can promote the teachers to continue to improve, improve themselves, improve the quality of teaching, help to optimize the primary and secondary school teachers team construction, and ensure the full implementation of quality education and the education reform deeply. Only by establishing scientific and reasonable evaluation index system, using scientific evaluation method, can obtain the objective and fair evaluation results. People in evaluating teachers' teaching work often use "average method", due to the difference of professional evaluators' cognition levels, viewing Angle is different, may the evaluation results be the following:

Table 1

Evaluator	1	2	3	4	5
Score	78	77	90	77	78

The final score of the average method using is: $(78+77+90+77+78)/5$ (points). If making further analysis to the results of this evaluation: a total of five times score for some teacher's teaching evaluation, in which 99 points appear once, twice in each of 88 points and 77 points, so we think the possible true score for the credibility, and credibility are 0.2 for 90 points, and 0.4 for both of 78 and 77, then when the teacher's true score is in $[77, 78]$, the credibility of the score is $0.4+0.4=0.8$, and according to the average method, taking 80 points as the true score. Therefore, the credibility of the true score, which is any number in $[77, 78]$ is large than that of 80 points. It is visible that it can't completely show the evaluator's subjective credibility

of evaluation results to evaluate the teachers' teaching work. To make up for the defect and to reflect all information in the process of teaching evaluation finely and objectively, the evaluation results of teachers' teaching work have no characteristic, so adopt the method of unascertained rational number to evaluate.

The construction of the unascertained rational number model is set up

The determination of the evaluation index and distribution sets

There are several factors for the evaluation of classroom teaching, according to the traditional classroom teaching evaluation standards and demands of new curriculum reform, the following is the weight of the determined criteria and the corresponding factors [1]:

(1)Course design of 40 points (coherent structure of the content, highlighting, can arouse the enthusiasm of students, the learning effect is good);

(2)Language expression of 30 points (accurated and specificated language , which was very infectious, can reflect the new teaching ideas)

(3)Blackboard design of 20 points (blackboard writing design beautiful and specificated, drawing the image accurately, enlightening. Blackboard writing design is reasonable, no wrong characters);

(4)Teaching aids of 10 points (the rational use of courseware teaching aids, the interpretation is scientific and accurate, concise, intuitive, can stimulate students' interests, innovative).

Table2.1 the table of evaluation of the teacher A_1

evaluator	The index factor of the evaluation			
	u_1	u_2	u_3	u_4
1	38	27	17	7
2	36	26	19	6
3	38	26	17	6
4	38	26	18	7
5	37	27	18	8
6	36	28	19	7
7	37	28	17	7
8	37	27	18	7

Table2.2 the table of evaluation of the teacher A_2

evaluator	The index factor of the evaluation			
	u_1	u_2	u_3	u_4
1	35	28	18	6
2	38	26	17	8
3	38	27	17	6
4	35	27	19	9
5	36	27	17	9
6	36	28	18	9
7	38	26	17	6
8	37	27	19	6

To take the teacher's evaluation of A_1 as an example to show that the evaluation method. Representing the evaluation of quantitative values by the unascertained rational number:[2]: $u_1 = [[36, 38], \varphi_1(x)]$, $u_2 = [[26, 28], \varphi_2(x)]$, $u_3 = [[17, 19], \varphi_3(x)]$, which is resulted from the various factors $u_i (i = 1, 2, 3, 4)$ above, and

$$\varphi_1(x) = \begin{cases} 0.250, x = 36 \\ 0.375, x = 37 \\ 0.375, x = 38 \\ 0, x \notin \{36, 37, 38\}, x \in R \end{cases}, \varphi_2(x) = \begin{cases} 0.375, x = 26 \\ 0.375, x = 27 \\ 0.250, x = 28 \\ 0, x \notin \{26, 27, 28\}, x \in R \end{cases},$$

$$\varphi_3(x) = \begin{cases} 0.375, x = 17 \\ 0.375, x = 18 \\ 0.250, x = 19 \\ 0, x \notin \{17, 18, 19\}, x \in R \end{cases}, \varphi_4(x) = \begin{cases} 0.250, x = 6 \\ 0.625, x = 7 \\ 0.125, x = 8 \\ 0, x \notin \{6, 7, 8\}, x \in R \end{cases}.$$

Calculate $\sum_{i=1}^4 u_i$

By addition operation of the unascertained rational number [3], to find out the possible values summation matrix, and the reliable product matrix of u_1 and u_2 , then draws the possible values summation matrix and reliable product matrix of u_1 and u_2 , respectively:

$$\begin{bmatrix} 62 & 63 & 64 \\ 63 & 64 & 65 \\ 64 & 65 & 66 \end{bmatrix} \begin{bmatrix} 0.09382 & 0.0938 & 0.0624 \\ 0.1406 & 0.1406 & 0.0938 \\ 0.1406 & 0.1406 & 0.0938 \end{bmatrix}$$

Then we obtain $u_1 + u_2 = [[62, 66], \varphi_{1+2}(x)]$, and

$$\varphi_{1+2}(x) = \begin{cases} 0.0938, x = 62 \\ 0.2344, x = 63 \\ 0.3437, x = 64 \\ 0.2344, x = 65 \\ 0.0938, x = 66 \\ 0, x \text{ is the other values} \end{cases}$$

Further calculate, we obtain the possible values summation matrix and reliable product matrix of $u_1 + u_2 + u_3 + u_4$, respectively:

$$\begin{bmatrix} 85 & 86 & 87 \\ 86 & 87 & 88 \\ 87 & 88 & 89 \\ 88 & 89 & 90 \\ 89 & 90 & 91 \\ 90 & 91 & 92 \\ 91 & 92 & 93 \end{bmatrix} \begin{bmatrix} 0.0132 & 0.0132 & 0.0088 \\ 0.0461 & 0.0461 & 0.0308 \\ 0.0901 & 0.0901 & 0.0602 \\ 0.0784 & 0.1032 & 0.0688 \\ 0.0784 & 0.0784 & 0.0523 \\ 0.0351 & 0.0351 & 0.0234 \\ 0.0088 & 0.0088 & 0.0059 \end{bmatrix}.$$

Then we can obtain $A_1 = \sum_{i=1}^4 u_i = [[85, 93], \varphi_{1+2+3+4}(x_1)]$, in which

$$\varphi_{1+2+3+4}(x_1) = \begin{cases} 0.0132, x = 85 \\ 0.0593, x = 86 \\ 0.1450, x = 87 \\ 0.2241, x = 88 \\ 0.2416, x = 89 \\ 0.1824, x = 90 \\ 0.0962, x = 91 \\ 0.0322, x = 92 \\ 0.0059, x = 93 \\ 0, x \text{ is the other values} \end{cases}$$

Similarly, representing the other two teachers classroom teaching situation of quantitative evaluation value by unascertained rational number, respectively:

$$A_2 = \sum_{i=1}^4 u_i = [[83, 94], \varphi_{1+2+3+4}(x_2)],$$

in which

$$\varphi_{1+2+3+4}(x_2) = \begin{cases} 0.0156, x = 84 \\ 0.0547, x = 85 \\ 0.0898, x = 86 \\ 0.1309, x = 87 \\ 0.1791, x = 88 \\ 0.1689, x = 89 \\ 0.1455, x = 90 \\ 0.1133, x = 91 \\ 0.0684, x = 92 \\ 0.0322, x = 93 \\ 0.0059, x = 94 \\ 0, x \text{ is the other values} \end{cases}.$$

Sorting

Evaluation result is expressed by the unascertained rational number density type and amount of information of evaluation process, can be fully showed, but it also can't explain whose teaching effects is better, or sorting according to the merits of the teaching effect as a result, finally using the relationship between the size of the unascertained rational number, compare their size, sorting

Transform the results of unascertained rational number which is density type to the results of the unascertained rational number distribution type.

$$A_1 = \sum_{i=1}^4 u_i = [[85, 93], \phi_{1+2+3+4}(x_1)], A_2 = \sum_{i=1}^4 u_i = [[83, 94], \phi_{1+2+3+4}(x_2)], \text{in which}$$

$$\phi_{1+2+3+4}(x_1) = \begin{cases} 0, x < 85 \\ 0.0117, 85 \leq x < 86 \\ 0.0791, 86 \leq x < 87 \\ 0.2480, 87 \leq x < 88 \\ 0.5056, 88 \leq x < 89 \\ 0.7561, 89 \leq x < 90 \\ 0.9177, 90 \leq x < 91 \\ 0.9831, 91 \leq x < 92 \\ 0.9985, 92 \leq x < 93 \\ 1, x \geq 93 \end{cases}, \phi_{1+2+3+4}(x_2) = \begin{cases} 0, x < 84 \\ 0.0156, 84 \leq x < 85 \\ 0.0703, 85 \leq x < 86 \\ 0.1601, 86 \leq x < 87 \\ 0.2901, 87 \leq x < 88 \\ 0.4629, 88 \leq x < 89 \\ 0.6318, 89 \leq x < 90 \\ 0.7773, 90 \leq x < 91 \\ 0.8906, 91 \leq x < 92 \\ 0.9590, 92 \leq x < 93 \\ 0.9912, 93 \leq x < 94 \\ 1, x \geq 94 \end{cases}.$$

By the calculation formula [1],[2] of the unascertained rational number heart , and we obtain the heart of A_1 , A_2 , respectively:

$$(x_{A_1}, y_{A_1}) = (181.2353, 0.8060); (x_{A_2}, y_{A_2}) = (181.8631, 0.7674).$$

Because of the different heart of A_1 , A_2 , and $x_{A_2} > x_{A_1}$ by the unascertained rational number [1], we obtain $t_{A_2} > A_1$, that is to say, the effect of classroom teaching quality sorting result is: A_2, A_1 , and the sorting result and actual results are almost identical for good teachers, have no difference with the actual situation.

Conclusion

Using unascertained rational number to evaluate the efficacy of the teachers' classroom teaching has the following advantages: (1) the evaluation results not only are quantitative, but also can show the amount of information and subjective credibility in evaluation process, and the overall ability is strong; (2) the evaluation result is the unascertained rational number, which can compare the size .compared with the sorting method ,the average method has less subjective elements, and more objective elements ,and the creditability of the evaluation results is high, and the evaluation results are almost identical with the method in literature [4]; (3) although the calculation process of the unascertained rational number is relatively complex, we can use operations of the unascertained rational number and the the calculating program to complete the computing in the size of the credibility in literature [3].It is rigorous and universal according to the theory of the unascertained rational number and in other areas, it also has a broad range of applications such as medical consultation and business decisions and so on.

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