Appraise the Teachers'Teaching Qualities
by Using the Fuzzy Comprehensive Evaluation

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Abstract

In this Paper, the three level fuzzy comprehensive evaluation model is used to reach an objective evaluation on the teachers' teaching qualities.

Keywords: fuzzy mathematics; comprehensive evaluation; teaching qualities

1. Introduction

Evaluating the teachers'teaching qualities is an important part of teaching management. It plays a crucial role in improving teaching qualities and arousing enthusiasm of the teachers.

The crux is by which means can we evaluate the teachers' teaching qualities objectively, scientifically and quantitatively. In this article I'll try to clarify the following point: By making use of the three level comprehensive evaluation model of fuzzy mathematics, by taking into consideration the evaluation factors such as the teacher's teaching contents, methods and attitude; by giving scores based on the evaluation by the heads of the universities/colleges as well as the departments, the evaluation by the experts in the same line and also the investigation on the students—— an objective evaluation on a teacher's teaching level can be achieved.

Building scientific evaluation systems ,making appropriate evaluation factors and attaching corresponding weight to them are of vital importance in evaluating correctly the teachers' teaching qualities. Three kinds of evaluation systems are needed for evaluation work: the evaluation by the experts in the same line, the evaluation based on the investigation on the students, and the evaluation made by the heads of the universities/colleges as well as the department. The three kinds of systems are deferent as well as inter-related. The

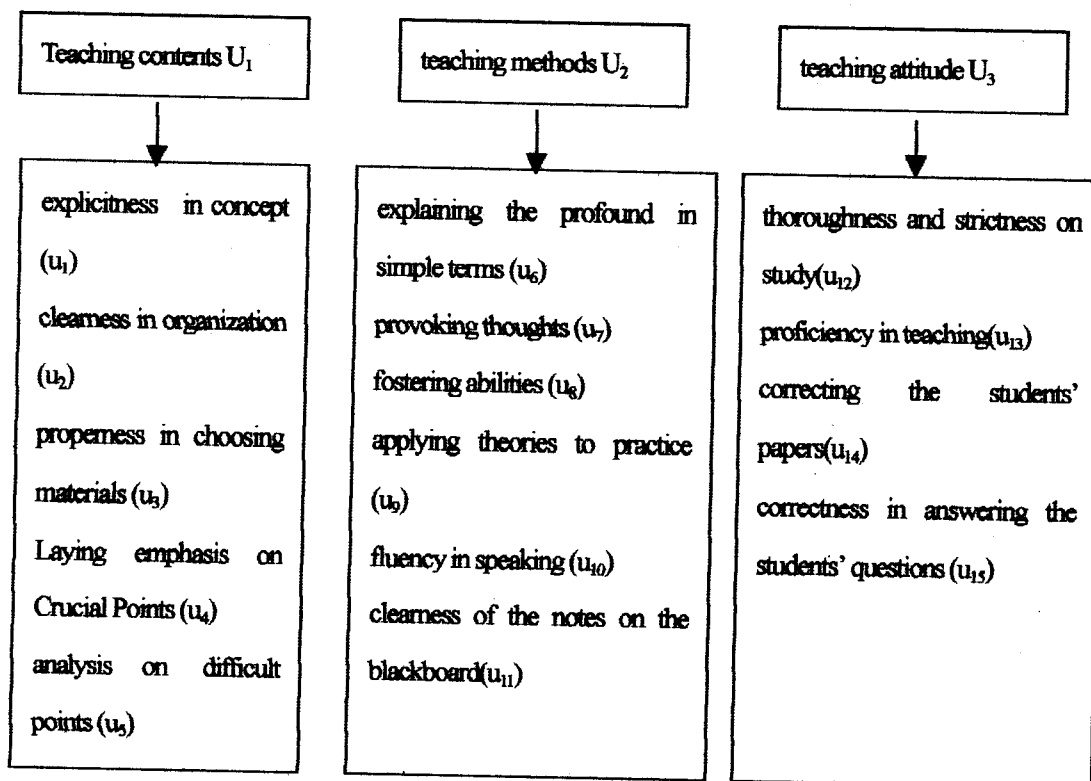evaluation factors of each system have their own special emphases.

It should be pointed out that the weight for each evaluating systems and the evaluating factors are not the same. The weight has an direct impact on the evaluation result and should be conducted with care.

2.Mathematical Model

Take the example of "the evaluation based on the investigation on the students". The contents of the evaluation , the factors and the weight are listed here. The three level comprehensive evaluation model and methods of fuzzy mathematics are explained specifically.

(1) the evaluation comprises three categories and 15 factors

U={U$_1$(teaching   contents),   U$_2$(teaching   method),U$_3$(teaching attitude)}={u$_1$,u$_2$,……u$_{15}$}

Teaching contents U$_1$	teaching methods U$_2$	teaching attitude U$_3$
explicitness in concept (u$_1$)	explaining the profound in simple terms (u$_6$)	thoroughness and strictness on study(u$_{12}$)
clearness in organization (u$_2$)	provoking thoughts (u$_7$)	proficiency in teaching(u$_{13}$)
properness in choosing materials (u$_3$)	fostering abilities (u$_8$)	correcting the students' papers(u$_{14}$)
Laying emphasis on Crucial Points (u$_4$)	applying theories to practice (u$_9$)	correctness in answering the students' questions (u$_{15}$)
analysis on difficult points (u$_5$)	fluency in speaking (u$_{10}$) clearness of the notes on the blackboard(u$_{11}$)	

(2) the weight for the evaluation factors

A={A$_1$,A$_2$, A$_3$}={a$_1$, a$_2$ …, a$_{15}$}

The weight is calculated by using Fuzzy Relation Equation and Method of Weighted Mean. [1] [2]

X · R=B

Let X={$X_1, X_2 \ldots \ldots X_s$}

$B_i = X_i \cdot R$

Then $(B_{io}B) = Max\{(B_i, B)\}$ $i=1,2\ldots\ldots S$

Or:

$$X_i = \sum_{i=1}^{s} x_i w_i$$

(3) the evaluation result

$V=\{ V_1(\text{excellent}), V_2(\text{good}), V_3(\text{just so so}), V_4(\text{poor})\}$

(4) the monomial evaluation matrix [3]

$$R = \begin{pmatrix} R_1 \\ R_2 \\ R_3 \end{pmatrix}$$

$R_i = (r_{ij})_{m \times n}$ $i=1,2,3$

R_1, R_2, R_3 represent respectively monomial matrix of membership grade to the evaluation result. r_{ij} represents membership grade of the *i*th factor u_i to the evaluation result V_j.

(5)the result of the first level fuzzy comprehensive evaluation

$Bi = A_i \cdot R_i$

$= (b_{i1} \ b_{i2} \ b_{i3} \ b_{i4})$ $i=1,2,3$

$$b_j = \bigvee_{i=1}^{s} (a_i \wedge r_{ij})$$

OR

$$b_j = \sum_{i=1}^{S} a_i r_{ij}$$

$j=1,2,3,4$

$\vee$, $\wedge$ express the choice of max and min, respectively.

(6)the result of the second level fuzzy comprehensive evaluation

$B^* = A^* \cdot R^*$

(7) Similarly, the three level comprehensive evaluation result can be obtained by giving respective weight to " the evaluation by the experts in the same line",

"the comprehensive evaluation by the heads of the university/college as well as the department" and " the evaluation based on the investigation on the students".

3. Application Example

With the mathematical model and methods mentioned above, we have conducted an evaluation work on the teacher's teaching qualities in a certain college. Here is a selected examination of the evaluation on a certain teacher by 100 students majoring a certain subject in a certain college .

Using Fuzzy Relation Equation and Method of Weighted Mean,

We get the weights:

A1=(0.3 0.2 0.1 0.25 0.15)

A2=(0.2 0.2 0.2 0.1 0.15 0.15)

A3=(0.3 0.3 0.2 0.2)

The result of the first level fuzzy comprehensive evaluation is:

B1=(0.3 0.27 0.19 0.10)

B2=(0.2 0.2 0.2 0.15)

B3=(0.3 0.3 0.2 0.11)

The weight of each category is:

A*=(0.4 0.35 0.25)

We get the result of the second level fuzzy comprehensive evaluation:

B*=(0.33 0.29 0.22 0.16)

$$W=B^*.C^T=(0.33\ 0.29\ 0.22\ 0.16) \cdot \begin{pmatrix} 92.5 \\ 80.0 \\ 70.0 \\ 50.0 \end{pmatrix}$$

=77.125 ≈ 77

Hence we get the general evaluation scores of the teacher by investigating on the students :77. In similar ways, we get the general evaluation scores from "the evaluation by the experts in the same line" and "the evaluation by the heads of the university/college as well as the department". We get the result of

the three level comprehensive evaluation and the final scores for the teacher.

4. Generalization

Evaluating the teachers' teaching qualities by using the three level comprehensive evaluation of fuzzy mathematics has the following characteristics:

(1) First, this model includes different factors, systems and aspects, and avoid being influenced by some man-made factors. It has a high level of objectivity.

(2) This model uses weight in three levels——attaching weight to different factors at each level. This is utterly different with averaging directly (the weights for each factor are the same) in the common comprehensive appraisal. It is closer to the actuality. Hence it is scientific.

(3) This model can directly be digital processed by micro-computer for a quantitative value. This renders our teaching management more modernized and can be measured in fixed quantity. It can be applied in many fields of college educational management and scientific research management.

References

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