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The application of comprehensive evaluation system on martial arts teachers' work ability based on fuzzy mathematical model

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ABSTRACT

This paper uses fuzzy mathematical theory and fuzzy comprehensive evaluation method to give the evaluation mathematical model and evaluation methods, finds a more objective and quantitative teaching evaluation method, and ultimately conducts comprehensive evaluation on the martial arts teacher's level. Through layers of selection, the experts select out these 11 evaluation indexes and the weighting coefficients, which reflect the essence of the teachers' work, fit the current actual needs of evaluation on teachers' work ability, and have good application value. © 2013 Trade Science Inc. - INDIA

KEYWORDS

Fuzzy mathematics;
Martial arts teacher;
Evaluation system.

INTRODUCTION

In recent years, martial arts are in the rapid development in the world, and increasingly gets people's attention; the 2008 Beijing Olympic Games, even took the martial arts as a competitive item, showing in front of the world. Meanwhile in the country, martial arts competitions of all sizes have gradually expanded, the number of participants increases every year, and the influence grows increasingly. Meanwhile the demand for professional martial arts teachers is also increasingly urgent. At present, for the assessment of the level of martial arts instructors we took some assessment measures and methods. But the method of assessing ranks lacks quantitative criteria, subjective, which is not conducive to the selection of highly qualified referees. Moreover highly qualified and high-level coach teams are vital to the development of Chinese martial arts career.

To this end, we apply the fuzzy comprehensive evaluation method, conduct comprehensive evaluation on the work ability of the martial arts teachers, by introducing the mathematical model, evaluates on the teacher's level.

THE ESTABLISHMENT OF FUZZY MATHEMATICS THEORY MODEL

Since 1965, the fuzzy mathematics has gain increasing attention. Since then, the fuzzy topology, fuzzy measure theory and the general terms in mathematics areas are developed on the basis of fuzzy sets and fuzzy logic, and they are the mathematical tools to study the problem that is of obscurity even fuzzy boundaries in the real world.

Evaluation index selection

In the establishment of the evaluation index, based

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on the principles of combining the scientific and feasibility, we take the independence indexes that can truly reflect the work essence of the martial arts teacher, have strong commonality easy to implementation and high correlation degree as the important content of the evaluation work. Comply with the principles of combining guidance and effectiveness, the knowledge innovation index are given greater weight to encourage the efforts and enterprising spirit of the teachers under assessment. At the same time, we also pay attention to the actual situation that the evaluation indexes do not depart from the physical education work, not only taking into account the points and surfaces of the evaluation, but also taking into account the school's teaching conditions and the actual results of the final evaluation. While insisting the principle of combining qualitative and quantitative, for some indicators that are difficult to quantify, we use the quantitative evaluation method of numerical value conversion on the basis of the qualitative description. Based on the principles of combining fuzzy and comparability, it simplifies the number of evaluation index, requires the indicators of same level do not overlap, no causal relationship between them, and pays attention to give the reasonable evaluation level of the various indicators, requires participating personnel be familiar with the standards, uniform standards, be fair and realistic, tries to make the fuzzy membership by the evaluation staff close to the same, thus makes it easy for them to do the same level same classification and same homogeneous comparison and easy to form a reliable conclusion.

Based on the above ideological principles of the evaluation index determination, first of all, design a variety of related factors for the research on this project, then, use the expert investigation method to 23 specialists and professors' suggestions that have been engaged in physical education, and strive to unify the evaluation criteria. From the expert's response results, it has a clear convergence trend, finally, analyze and classify a variety of collected information material, establish the evaluation index system of martial arts teacher's teaching capacity, as shown in TABLE 1.

Evaluation procedures and methods of fuzzy mathematics

The so-called comprehensive evaluation is to make a general judgment on the many things or phenomena of many factors, that is for all the objects of the judgment, according to the given conditions, each object is assigned to one or more non-negative real numbers - evaluation index, then, line up and pick over according to it. Here we do a comprehensive analysis and evaluation of all aspects that reflect the level of training and teaching for teachers in the process of teaching and training. When we carry out the evaluation on teaching and training, the various factors of evaluation on teaching and training should be seen as an aggregate. There are a lot of content to form aggregates. But as a discussion object in the discussion domain, we can elect N important factors to study and other factors may be negligible. Here we suppose the evaluation factors set of the level of training and teaching is as follows:

$$U = \{u_1, u_2, u_3, \cdots u_n\}$$

TABLE 1 : Evaluation index range of Martial arts teacher's teaching ability

Main aspects	Related indicators
A. Ideology and morality	1. Professionalism
	2. the spirit of dedication
B. Teaching Ability of Martial Arts	3. materials studying
	4.explanation and demonstration
	5.Organization teaching
	6. application methods
	7. Movement load
	8. Classroom discipline
	9. Knowledge Innovation
C. Teaching Achievement of Martial Arts	10. student enthusiasm for learning
	11. skills grasping situation of students

For the teaching capacity evaluation of sports specialized teachers, this paper uses multilevel comprehensive evaluation method of fuzzy mathematics and designs an evaluation model; the specific steps are as follow:

Suppose the evaluation factors set

Suppose $U = \{u1, u2 \cdots, u11\}$

Then: $U1 =$ Ideology and morality $= \{u1, u2\}$

$U2 =$ Teaching Ability of Martial Arts $= \{u3, u4, u5 \cdots, u9\}$

$U3 =$ Teaching Achievement of Martial Arts $= \{u10, u11\}$

Set the comment set

X={poorer, bad, medium, good, excellent} $= \{x1, x2, x3, x4, x5\}$, respectively classify in accordance with 20 points, 40 points, 60 points and 80 points, then $X_j = \{1, 2, 3, 4, 5\}$ can be seen as a fuzzy set of scores section set $J = \{20, 40, 60, 80, 100\}$, as shown in TABLE 2:

TABLE 2 : The membership of the various scores section's reviews

Scores	20	40	60	80	100
Excellent	0	0	0	0.25	0.75
good	0	0	0.25	0.5	0.25
medium	0	0.25	0.5	0.25	0
bad	0.25	0.5	0.25	0	0
poorer	0.25	0.25	0	0	0

(1) Weight distribution

$$m1 = (m1(1), m2(1)) = (0.4, 0.6)$$

$$m2 = (m1(2), m2(2), \cdots, m7(2))$$

$$= = (0.1, 0.15, 0.1, 0.1, 0.15, 0.1, 0.3)$$

$$m3 = (m1(3), m2(3), m3(3)) = (0.2, 0.45, 0.35)$$

$$m0 = (m1(0), m2(0), m3(0)) = (0.15, 0.6, 0.25)$$

(2) Single factor evaluation

From TABLE 2 we can find the evaluation results of a single factor. Such as the evaluation results of $u1$ is good, then the corresponding evaluation result is(0, 0, 0. 25, 0. 2, 0. 25). Then you can line up the judgment results of various factors and form the comprehensive evaluation transformation matrix RI .

Comprehensive evaluation method

Comprehensive Evaluation of the first layer $Z1$

$Z_{11} = M_1 * R_1, Z_{12} = M_2 * R_{12}, Z_{13} = M_3 * R_{13}$ respectively, are the membership vectors for the three factors of the second layer on the score vector $(20, 40, 60, 80, 100)$.

Wherein the matrix M represents the weight distribution set $M = [U_1, U_2; \cdots, U_n]$, U_i is the corresponding weights.

M Is the scores based on the experience of the judges and the relevant leaders, conduct comprehensive statistics and determine the corresponding weights of various levels.

TABLE 3 : Weights of all levels

Ideology and morality (M1)		
Professionalism	45%	0.45
the spirit of dedication	55%	0.55
Teaching Ability of Martial Arts(M2)		
explanation and demonstration	25%	0.25
organization teaching	10%	0.1
the application method	25%	0.35
the movement load	15%	0.15
the classroom discipline	5%	0.05
knowledge innovation	10%	0.1
materials studying	10%	0.1
Teaching Achievement of Martial Arts(M3)		
student enthusiasm for learning	68%	0.68
skills grasping situation of students	32%	0.32

Arrange Z_{11}, Z_{12}, Z_{13} in turn into comprehensive evaluation membership matrix:

$$P_{11} = \begin{pmatrix} Z_{11} \\ Z_{12} \\ Z_{13} \end{pmatrix}$$

Calculate the comprehensive assessment scores Y, $Y = Z_{11} \times P^T$, P is scores matrix in the membership degree table of first-grade referee, P^T is the transposed matrix of P.

The provision is shown in TABLE 4:

TABLE 4 : Teacher's grade classification

Grades	Teacher's grade
100-81	First-grade Martial arts Teacher
80-75	Second-grade Martial arts Teacher
74-60	Third-grade Martial arts Teacher
<60	Unqualified

THE APPLICATION OF FUZZY MATHEMATICS EVALUATION MODEL

Suppose during the game process of a teacher, af-

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ter assessment the professionalism is excellent, the spirit of risk is good, materials studying is good, explanation and demonstration is excellent, organization teaching is medium, the application method is medium, the movement load is medium, the classroom discipline is good, knowledge innovation is excellent, student enthusiasm for learning is excellent, skills grasping situation of students is good.

(1) Conduct comprehensive evaluation of the first layer:

Ideology and morality:

$$Z_{11} = M_1 \times R_{11}$$

$$= (0.45 \quad 0.55) \times \begin{pmatrix} 0 & 0 & 0 & 0.25 & 0.75 \\ 0 & 0 & 0.25 & 0.5 & 0.25 \end{pmatrix}$$

$$= (0 \quad 0 \quad 0.14 \quad 0.39 \quad 0.48)$$

Teaching Ability of Martial Arts:

$$Z_{12} = M_2 \times R_{12} = (0.25 \quad 0.1 \quad 0.25 \quad 0.15 \quad 0.05 \quad 0.1 \quad 0.1)$$

$$\begin{pmatrix} 0 & 0 & 0.25 & 0.5 & 0.25 \\ 0 & 0 & 0 & 0.25 & 0.75 \\ 0 & 0.25 & 0.5 & 0.25 & 0 \\ 0 & 0.25 & 0.5 & 0.25 & 0 \\ 0 & 0.25 & 0.5 & 0.25 & 0 \\ 0 & 0 & 0.25 & 0.5 & 0.25 \\ 0 & 0 & 0 & 0.25 & 0.75 \end{pmatrix}$$

$$= (0 \quad 0.11 \quad 0.31 \quad 0.34 \quad 0.24)$$

Teaching Achievement of Martial Arts:

$$Z_{13} = M_3 \times R_{13} = (0.68 \quad 0.32)$$

$$\begin{pmatrix} 0 & 0 & 0 & 0.25 & 0.75 \\ 0 & 0 & 0.25 & 0.5 & 0.25 \end{pmatrix}$$

$$= \begin{pmatrix} 0 & 0 & 0.25 & 0.5 & 0.25 \end{pmatrix}$$

Conduct comprehensive evaluation of the second layer:

$$R = (R_1 ; R_2 ; R_3)$$

$$Z = M \times R = (0.45 \quad 0.35 \quad 0.2)$$

$$\begin{pmatrix} 0 & 0 & 0.14 & 0.39 & 0.48 \\ 0 & 0.11 & 0.31 & 0.34 & 0.24 \\ 0 & 0 & 0.25 & 0.5 & 0.25 \end{pmatrix}$$

$$= (0 \quad 0.04 \quad 0.22 \quad 0.4 \quad 0.35)$$

(2) Conduct comprehensive evaluation of the third layer

Finally calculate the composite score, according to the score assess the teacher's level.

$$Y = Z \cdot P^T = (0 \quad 0.04 \quad 0.22 \quad 0.4 \quad 0.35)$$

$$\begin{pmatrix} 20 \\ 40 \\ 60 \\ 80 \\ 100 \end{pmatrix} = 81.39$$

The results show that the teacher is regarded as a first-grade teacher after a comprehensive evaluation.

CONCLUSIONS

The purpose and nature of Martial arts teacher's evaluation is to promote the teacher's capacity, and the most importantly to improve the quality of personnel training. Through the above established mathematical model evaluation criteria, evaluation on martial arts teachers are divided into three levels of rating, which makes the talent selection quantitative, combines qualitative with quantitative, makes the evaluation on work ability more scientific and rational, can better promote the development of martial arts teachers' work.

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