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Fuzzy Evaluation on University Student Aerobics Club Education Mode

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Abstract: Sports in the form of clubs have a long history in foreign countries, such as Japan that started later, its club sports management and operation have gained development to higher level in short 40 years, while in some western world, sports in the form of clubs even is supported by the mass, and the clubs are also the places that sports activities most frequently appear, for mass residents, the emergence of club sports becomes the main form in bodybuilding. The paper evaluates theory of learning, technology assessment, basic ability of assessment and the self evaluation, it gets the weight result z = (0.3 0.4 0.25 0.05), which shows during university student aerobics sports assessment mode, technology assessment occupied 40% of the assessment mode, theory of learning occupies 30%, basic ability of assessment occupies 25%, and the self evaluation occupies 5%.

Keywords: Aerobics, Club, Assessment mode, Fuzzy Comprehensive evaluation, Fitness effects.

INTRODUCTION

Aerobics originated from America, it went abroad and developed around the world in the beginning of eighties, 20th century [1]. Then, Britain firstly founded aerobics association in 1984, and subsequently it became a country that owned the largest aerobics organizations in Europe [2]. Driven by British aerobics organizations, aerobics gained rapidly development in other countries of Europe [3].

Since China entering into 21st century, comprehensive national power has constantly risen, people's material and spiritual pursuits have also increasingly strengthened; therefore most of people have begun to have the enthusiasm to participate in all kinds of sports events. However, aerobics as a kind of sports that can build up one's body and also cultivate one's taste of these events, it becomes a favorite sport in public, and also due to its good effects in weight losing, is favored by women [4].

As a new style sport event, Chinese aerobics has gained rapidly development with the help of Chinese aerobics rhythmic gymnastics association from 2000 to 2005 due to being loved by teenagers and university students.

MODEL ESTABLISHMENTS

Utilize fuzzy comprehensive evaluation, steps are as following:

(1) Establish factor set U : $U = (U_1 \quad U_2 \quad \cdots \quad U_k)$

(2) Establish judgment set V (evaluation set), $V = (V_1 \quad V_2 \quad \cdots \quad V_n)$

According to general evaluation system, define evaluation grade domain:

$V = \{V_1, V_2, V_3, V_4\} = \{$Very goodgood, normal , bad $\}$

(3) Establish judgment matrix fuzzy mapping from U to V , it gets fuzzy relation as following matrix shows:

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix}$$

(4) Establish weight set, $A = (a_1, a_2, \cdots, a_n)$, it meets conditions: $\sum_{i=1}^{n} a_i = 1 \quad a_i \geq 0$

(5) Fuzzy relation *R* every line reflects the line influence factors to object judgment extent, and meanwhile, *R* every column reflects the column influence factors to object judgment extent [5].

$$\sum_{i=1}^{n} r_{ij} \quad j = 1, 2, 3, \cdots, m$$

$$B = A \cdot R$$

$$= (a_1, a_2, a_3, \cdots, a_n) \cdot \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix}$$

$$= (b_1, b_2, b_3, \cdots, b_n)$$

In *V*, fuzzy combination is evaluation set *B*. Based on above described facts, actual change model is:

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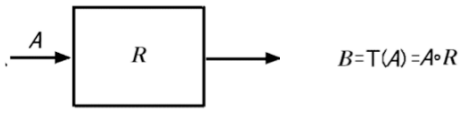

Fig. (1). Changed model.

As Fig. (**1**) show, it gets fuzzy comprehensive evaluation changed model, and can establish corresponding every factor grade evaluation transformation function, evaluation factors u1, u2, u3, u4, u5 membership functions can be expressed as following:

$$u_{v1}(u_1)=\begin{cases}0.5(1+\dfrac{u_i-k_1}{u_i-k_2}), & u_i \ge k_1\\ 0.5(1-\dfrac{k_1-u_i}{k_1-k_2}), & k_2 \le u_i < k_1\\ 0 \quad , & u_i < k_2\end{cases}$$

$$u_{v2}(u_1)=\begin{cases}0.5(1-\dfrac{u_i-k_1}{u_i-k_2}), & u_i \ge k_1\\ 0.5(1+\dfrac{k_1-u_i}{k_1-k_2}), & k_2 \le u_i < k_1\\ 0.5(1-\dfrac{u_i-k_3}{k_2-k_3}), & k_3 \le u_i < k_2\\ 0.5(1-\dfrac{k_3-u_i}{k_2-u_i}), & u_i < k_3\end{cases}$$

$$u_{v1}(u_1)=\begin{cases}0, & u_i \ge k_2\\ 0.5(1-\dfrac{k_1-u_i}{k_2-k_3}), & k_3 \le u_i < k_2\\ 0.5(1+\dfrac{k_3-u_i}{k_2-u_i}), & u_i < k_3\end{cases}$$

Combine with Fuzzy Evaluation Model to Evaluate Aerobics Education Mode

It gets aerobics assessment contents evaluation structure chart, it shows first grade assessment indicators and second grade assessment indicators in (Fig. **2**).

Establish factor set U, $U=(U_1\ U_2\ U_3\ U_4)$. Among them, theory of learning is U_1, technology assessment is U_2, basic ability of assessment is U_3, the self evaluation is U_4, it gets Table **1**.

By Table **1** listed factors, it gets evaluation sets.

$U_1=\{u_{11},u_{12}\}$, $U_2=\{u_{21},u_{22}\}$

$U_3=\{u_{31},u_{32},u_{33}\}$, $U_4=\{u_{41},u_{42},u_{43},u_{44}\}$

By collecting data and analyzing, it gets theory of learning U_1, technology assessment U_2, basic ability of assessment U_3, the self evaluation U_4 four kinds of factors importance degrees ranking statistics, as Table **2** shows.

By Table **2** sorting, it gets theory of learning U_1, technology assessment U_2, basic ability of assessment U_3, the self evaluation U_4 four aspects ranking matrixes:

$U_1=\{23,7,3,0\}$, $U_2=\{7,18,8\ 0\}$

$U_3=\{0,9,13,12\}$, $U_4=\{3,0,9,21\}$

Obtained weighted vector from rank 1 to rank 2:

$\beta=\{\beta_1,\beta_2,\beta_3,\beta_4\}=\{0.4,0.3,0.2,0.1\}$

$U_i^*=U_i\cdot\beta^T$

$U_1^*=12$, $U_2^*=9.7$, $U_3^*=6$, $U_4^*=5$

The paper takes normalization processing:

$U_1^*=0.35$, $U_2^*=0.3$, $U_3^*=0.2$, $U_4^*=0.15$

It gets: $\bar{A}=(0.35\quad 0.3\quad 0.2\quad 0.15)$

Through aerobics assessment reflection, the paper gets remarks membership as Table **3** shows.

By one aerobics assessment mode each indicator obtained evaluation, the paper gets Table **4**.

By above model, it gets single layer indicator weight factor fuzzy set is:

$U_1^*=\{U_{11},U_{12},U_{13},U_{14},U_{15}\}=\{0.25\ 0.25\ 0.2\ 0.15\ 0.15\}$

$U_2^*=\{U_{21},U_{22},U_{23},U_{24}\}=\{0.54\ 0.1\ 0.24\ 0.14\}$

$U_3^*=\{U_{31},U_{32},U_{33},U_{34}\}=\{0.4\ 0.3\ 0.1\ 0.2\}$

$U_4^*=\{U_{41},U_{42},U_{43}\}=\{0.3\ 0.4\ 0.3\}$

By Table **4**, and combine with Table **3** remarks membership, the paper gets theory of learning U_1, technology assessment U_2, basic ability of assessment U_3, the self evaluation U_4 each aspect evaluation set:

Theory of learning $U_1=\begin{pmatrix}0 & 0 & 0.05 & 0.95\\ 0 & 0 & 0.05 & 0.95\end{pmatrix}$

Technology assessment $U_2=\begin{pmatrix}0 & 0 & 0.05 & 0.95\\ 0 & 0 & 0.05 & 0.95\end{pmatrix}$

Basic ability of assessment $U_3=\begin{pmatrix}0 & 0 & 0.05 & 0.95\\ 0 & 0.05 & 0.9 & 0.05\\ 0 & 0.05 & 0.9 & 0.05\end{pmatrix}$

The self evaluation $U_4=\begin{pmatrix}0 & 0 & 0.05 & 0.95\\ 0 & 0.05 & 0.9 & 0.05\\ 0 & 0.05 & 0.9 & 0.05\\ 0.05 & 0.9 & 0.05 & 0\end{pmatrix}$

$B_i=A_i\cdot R_i$

Make normalization processing with obtained B_i, it gets fuzzy evaluation matrix.

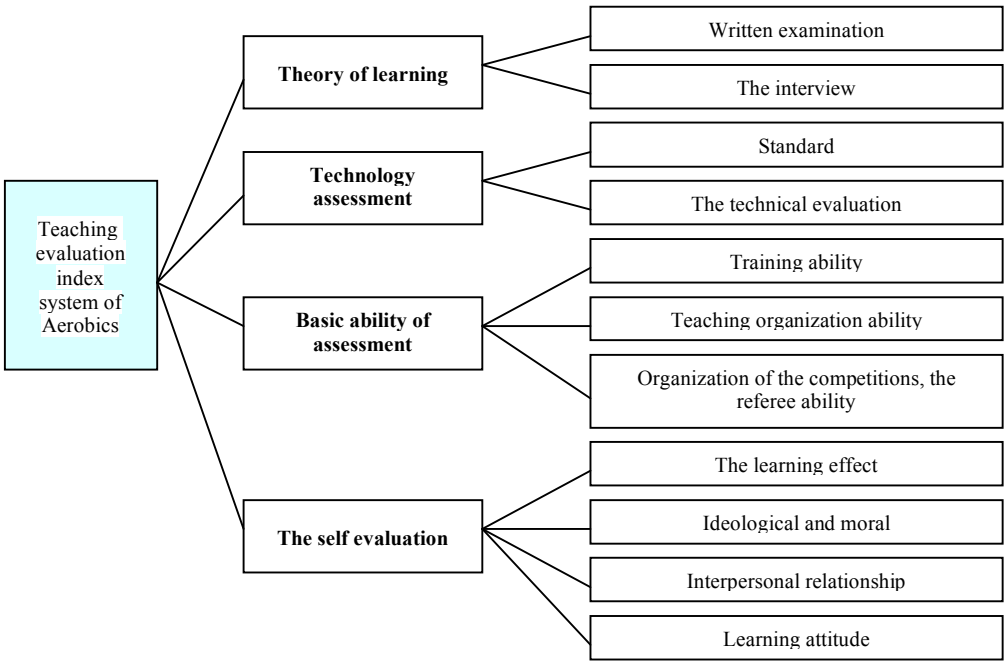

Fig. (2). Aerobics assessment contents evaluation structure chart.

Table 1. Aerobics education evaluation index system.

Theory of learning U_1	Technology assessment U_2	Basic ability of assessment U_3	The self evaluation U_4
Oral examination u_{11}	Reach the standard u_{21}	Teaching organizational ability u_{31}	Ideology and morality u_{41}
Written examination u_{12}	Assessment of technique u_{22}	Exercise training capacity u_{32}	Learning effect u_{42}
		Competition organization, judgment capacity u_{33}	Learning attitude u_{43}
			Interpersonal relationship u_{44}

Table 2. Four kinds of factors importance degree ranking statistics.

Classification	Rank 1	Rank 2	Rank3	Rank 4
Theory of learning U_1	23	7	3	0
Technology assessment U_2	7	18	8	0
Basic ability of assessment U_3	0	9	13	12
The self evaluation U_4	3	0	9	21

$$\bar{B} = \begin{pmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \end{pmatrix} = \begin{pmatrix} 0.07 & 0.27 & 0.13 & 0.53 \\ 0 & 0.1 & 0.4 & 0.5 \\ 0.08 & 0.46 & 0.38 & 0.08 \\ 0.14 & 0.2 & 0.3 & 0.36 \end{pmatrix}$$

It gets comprehensive evaluation value:

$$D = U^* \cdot B = (0.3 \quad 0.4 \quad 0.25 \quad 0.05)$$

CONCLUSION

Up to now, development of fuzzy mathematics has 50 years history, though it is a relative new discipline, it has more plentiful contents in theory, and it gets involved in multiple disciplines. Evaluation is a kind of human thinking process, but it is not linear changing.

Based on fuzzy mathematics characteristics, the paper analyzes university aerobics education mode through fuzzy mathematics. For aerobics course assessment mode, it needs to consider multiple influence factors, as theory of learning, technology assessment, basic ability of assessment and the self evaluation. It gets the weight result $D = (0.3 \quad 0.4 \quad 0.25 \quad 0.05)$. It shows during university aerobics sports assessment mode, technology assessment occupied 40% of the assessment

Table 3. Remarks membership.

Evaluation way	Set Scores Interval			
	0-60	**60-80**	**80-90**	**90-100**
Very good	0	0	0.05	0.95
Good	0	0.05	0.9	0.05
Normal	0.05	0.9	0.05	0
Bad	0.95	0.05	0	0

Table 4. Aerobics assessment mode each indicator obtained evaluation value.

Each Layer Indicator	Evaluation Value	Each Layer Indicator	Evaluation Value
Oral examination u_{11}	Normal	Ideology and morality u_{41}	Very good
Written examination u_{12}	Normal	Learning effect u_{42}	Good
Reach the standard u_{21}	Good	Learning attitude u_{43}	Good
Assessment of technique u_{22}	Very good	Interpersonal relationship u_{44}	Normal
Teaching organizational ability u_{31}	Normal		
Exercise training capacity u_{32}	Very good		
Competition organization, judgment capacity u_{33}	Very good		

mode, theory of learning occupies 30%, basic ability of assessment occupies 25%, and the self evaluation occupies 5%.

CONFLICT OF INTEREST

The author confirms that this article content has no conflict of interest.

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