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University martial arts teaching reformation and innovation research

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ABSTRACT

The paper according to analytic hierarchy process mathematical method, by referencing literatures and listening to experts opinions, it defines martial arts education principle conditions, and selects relative reformation innovative schemes, establishes Chinese universities martial arts education improvement analytic hierarchy process method. Through quantization calculation, the paper solves different schemes weights, and meanwhile gets scheme implementation priority methods. For martial arts reformation education scheme optimization, it makes quantization judgment value to provide references for universities reformation.

KEYWORDS

Martial arts teaching; Reformation and innovation; AHP; Teaching reformation; Physical health.



INTRODUCTION

Since entering into 21st century, Chinese opening-up and reform constantly goes deeper, economy is rapidly developing and rising. Social transformation, new social culture constantly has impacts on traditional culture. Martial arts as one of Chinese culture quintessence, it has strong national colors, Chinese action movies take roles in world film circles, it is clear that martial arts also have considerable impacts on present world, in 21st century it also confronts numerous problems, universities martial arts education continues reform. Old-fashioned teaching plans already cannot adapt to modern universities education, it should improve teaching methods, make clear university students' recognition on Chinese martial arts, promote martial arts charms in the mind of students.

The paper targets at the problem, according to martial arts teaching purposes principles, utilizes analytic hierarchy process mathematical method, analyzes how to reform and innovate martial arts education schemes to define schemes implementation methods.

UNIVERSITIES MARTIAL ARTS EDUCATION STATUS AND COUNTERMEASURES

According to questionnaire survey data statistics, universities martial arts education involved students are little; most of students have no basic knowledge about martial arts, and even have deviation in recognition. Investigation result is as following TABLE 1-4.

TABLE 1 : By which way you understand martial arts

Option	Books	Movie,television	Physical education course	Social way	Others
Students proportion	23.6%	45.8%	16.8%	8.6%	5.2%

TABLE 2 : What do you think the main effects of martial arts is

Option	Antagonism	Icon effects	Fitness entertainment	Cultural connotation	Others
Students proportion	53.8%	30.8%	11.2%	3.1%	1.1%

TABLE 3 : By which way you learn martial arts

Option	Physical education course	Trainer	Self-learning	Folk martial artist	Others
Students proportion	27.6%	39.7%	18.9%	9.2%	4.6%

TABLE 4 : Whether you are interested in martial arts or not

Option	Man (interested)	Woman (interested)	Man (have no interests)	Woman (have no interest)
Students proportion	91.3%	48.7%	8.7%	51.3%

Result analysis, from above TABLE 1-4, it is clear that most of students understand martial arts are from movie, TV play and books; number of people proportion arrives at 69.4%. From physical education course, the proportion of martial arts recognition is less than 20%. And in physical education course, learning martial arts proportions are also not high, other paths learning ways or instructors' quality is deficient. It shows universities efforts extent and popularization in martial arts education aspect are not enough. The essence of martial arts is let martial arts practice persons to build their body, and cultivate their mind, appreciate martial arts internal cultural philosophy, but in investigation, it finds that above 80% interviewees think that martial arts are used to confront fighting, and cause others to worship, which may be related to relevant movie and television books and works. Martial arts suffered traditional culture influences, the proportion that schoolboys' fond of martial arts is far higher than schoolgirls; it shows correct recognition on martial arts is not enough. Martial arts reformation process dilemma suffers traditional martial arts teaching ideological influence, universities martial arts teaching way, textbook backwardness, teaching purposes deviation, teaching contents single and cannot meet different demands from students.

For above problem, it suggests to reform countermeasures and innovate schemes. 1、strengthen campus martial arts education promotion, 2、Improve faculty professional quality level, 3、clarify martial arts teaching fitness and morality cultivating purposes, 4、enrich teaching contents and methods, 5、martial arts textbook diversification.

AHP MODEL ESTABLISHMENTS

Analytic hierarchy process is a mathematical analysis method used in complicated systems that proposed by American scholar Saaty in the 70s of last century, that is AHP. The core of algorithm is weight computation. The method specially applies to multiple target problems, and complex systematic decision problems, is a powerful mathematical method that transforms problems into quantitative research. Its thought is layering system, simplifying complex, establishing hierarchical structure and making numerical value calculation. The process of analytic hierarchy process is mainly divided into four procedures, concrete steps are as following.

Step one: Hierarchical structure establishments

In analytic hierarchy process optimization decision algorithm, hierarchical structure are mainly three layers, 1、Target layer (T) , that is final expected result, in the paper,it is universities martial arts reformation and innovation. 2、Criterion layer (C_m) , is criterion that should following when solving system problems, criterion layer can cover sub criterion layer. 3、Scheme layer (p_n), in general, schemes are various they need reasonable implementation schemes. For different schemes, according to criterion, it establishes hierarchical structure and then calculates scheme weight. According to experts' opinions and literatures information, define martial arts criterion layer, scheme layer as following TABLE 5:

TABLE 5 : Hierarchical structure table

Target layer	Criterion layer C	Scheme layer P
Universities martial arts education reformation and innovation (T)	Beneficial to physical and psychological health (C ₁)	Improve faculty professional quality level (P ₁)
	Improve moral education quality (C ₂)	Clarity teaching fitness and morality cultivating purpose (P ₂)
	Enhance anti-setback competitive capacity (C ₃)	Strength campus martial arts education promotion (P ₃)
	Inherit martial arts culture (C ₄)	Martial arts textbook diversification (P ₄)
		Enrich teaching contents and methods (P ₅)

Step two: judgment matrix

In system scheme hierarchical structure, in criterion layer, there are n pieces of conditions C = (C₁, C₂, ... C_n) that cause impacts on previous layer target. By paired comparison of criterion conditions, express comparison result with 1-9 or its reciprocal. C_i, C_j importance comparison structure is using a_{ij} to express, then all comparison results compose judgment matrix A. Its expression is as following:

$$A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1j} \\ a_{21} & a_{22} & \cdots & a_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ a_{i1} & a_{i2} & \cdots & a_{ij} \end{pmatrix}$$

Among them, numbers' respective expressive definitions are as following TABLE 6.

TABLE 6 : 1~9 scale meaning

Scale	Meaning
1	Indicates two factors have equal importance by comparing
3	Indicates the former is slightly more important than the later by comparing two factors
5	Indicates the former is more important than the later by comparing two factors
7	Indicates the former is relative more important than the later by comparing two factors
9	Indicates the former is extremely more important than the later by comparing two factors
Even number	Represents importance is between two odd numbers
Reciprocal	Represents factors positive and negative comparison orders.

Step-3: Weight vector and maximum feature value calculation

Calculate weight vector. Assume judgment matrix A's one layer has n piece of factors, and the n pieces of factors are all the factors. The weight on previous layer is using vector to express as:

$$W = (w_1, w_2, w_3 \cdots w_n)$$

Weight meets :

$$w_1 + w_2 + w_3 \cdots + w_n = 1$$

Compare n pieces of factors and get consistency matrix.

$$A = \begin{pmatrix} w_1/w_1 & w_1/w_2 & \cdots & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \cdots & w_2/w_n \\ \vdots & \vdots & \ddots & \vdots \\ w_n/w_1 & w_n/w_2 & \cdots & w_n/w_n \end{pmatrix}$$

1、 Firstly make normalization on all column vectors of A and get matrix D

$$D = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix} \bullet \begin{pmatrix} 1/\sum_{i=1}^n a_{i1} & 0 & \cdots & 0 \\ 0 & 1/\sum_{i=1}^n a_{i2} & \cdots & 0 \\ 0 & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & 1/\sum_{i=1}^n a_{in} \end{pmatrix}$$

2、 Solve obtained matrix sum by line

$$E = D \bullet (1 \ 1 \ \cdots \ 1)_{1 \times n}^T$$

$$E = (e_{11} \ e_{12} \ \cdots \ e_{1n})^T$$

3、 Normalize matrix E that is weight vector

$$W = (w_1 \ w_2 \ \cdots \ w_n)^T = \left(e_{11}/\sum_{i=1}^n e_{i1} \ e_{12}/\sum_{i=1}^n e_{i2} \ \cdots \ e_{1n}/\sum_{i=1}^n e_{in} \right)^T$$

4、 Maximum feature value calculation

Weight vector corresponds to maximum feature value, then it surely has :

$$AW = \lambda_{\max} W$$

$$\lambda_{\max} = \frac{1}{n} \sum_{i=1}^n \frac{(AW)_i}{w_i}$$

Step four: Consistency test

Consistency test is a very important step in analytic hierarchy process, only by testing; analytic hierarchy process obtained result will have rationality. CI represents matrix consistency indicator, CR represents matrix consistency ratio, test matrix consistency by calculating the two indicators:

$$CI = \frac{\lambda_{\max} - n}{n - 1}$$

Among them, n represents judgment matrix one layer numbers of factors, and also the order number.

$$CR = \frac{CI}{RI}$$

Among them, RI represents Random Consistency Index value, as following TABLE 7 show.

TABLE 7: RI value table

n	1	2	3	4	5	6	7	8	9	10	11
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51

In criterion layer, factor weight is α_m , in scheme layer, scheme weight in corresponding factor is β_{nm} , then scheme weight in scheme layer is:

$$w_i = \sum_{j=1}^m \alpha_j \beta_{ij}$$

Consistency ratio is:

$$CR = \frac{\sum_{j=1}^m \alpha_j CI_j}{\sum_{j=1}^m \alpha_j RI_j}$$

When $CR \geq 0.1$, matrix inconsistency is unacceptable. When $CR < 0.1$, matrix inconsistency is acceptable.

MARTIAL ARTS TEACHING REFORMATION AHP CALCULATION**Criterion layer weight calculation**

According to TABLE 1 hierarchical structure, construct judgment matrixes and calculates criterion weight and matrix consistency test indicators. Result is as following TABLE 8:

TABLE 8 : Criterion layer calculation result

T	C_1	C_2	C_3	C_4	W	CR
C_1	1	2	3	1	0.354	0.008
C_2	1/2	1	1	1/2	0.161	
C_3	1/3	1	1	1/3	0.132	
C_4	1	2	3	1	0.354	

By above TABLE 8 calculation result, it can get $CR < 0.1$, matrix passes testing. Calculation result indicates that weight of beneficial to physical and psychological health is 0.354, weight of improving moral education quality is 0.161, weight of enhancing anti-setback competitive capacity is 0.132, and weight of inheriting martial arts culture is 0.354.

Scheme layer weight, implementation scheme defining

According to different schemes to criterion layer importance comparison, it constructs judgment matrix, carries out consistency test on matrix. After that, calculate scheme layer weight; establish reasonable schemes implementation method as TABLE 9-12.

TABLE 9 : Importance weight of scheme P to criterion C_1

C_1	P_1	P_2	P_3	P_4	P_5	W	CR
P_1	1	3	1/2	5	2	0.253	
P_2	1/3	1	1/6	2	1/2	0.083	
P_3	2	6	1	9	3	0.468	0.004
P_4	1/5	1/2	1/9	1	1/3	0.048	
P_5	1/2	2	1/3	3	1	0.148	

TABLE 10 : Importance weight of scheme P to criterion C_2

C_2	P_1	P_2	P_3	P_4	P_5	W	CR
P_1	1	2	1/3	3	1/2	0.146	
P_2	1/2	1	1/7	2	1/3	0.080	
P_3	3	7	1	9	2	0.476	0.005
P_4	1/3	1/2	1/9	1	1/5	0.048	
P_5	2	3	1/2	5	1	0.250	

TABLE 11 : Importance weight of scheme P to criterion C_3

C_3	P_1	P_2	P_3	P_4	P_5	W	CR
P_1	1	1/2	3	1/3	2	0.148	
P_2	2	1	7	1/2	3	0.271	
P_3	1/3	1/7	1	1/9	1/2	0.045	0.005
P_4	3	2	9	1	5	0.450	
P_5	1/2	1/3	2	1/5	1	0.086	

TABLE 12 : Importance weight of scheme P to criterion C_4

C_4	P_1	P_2	P_3	P_4	P_5	W	CR
P_1	1	3	1/2	5	2	0.248	
P_2	1/3	1	1/6	2	1/2	0.082	
P_3	2	6	1	8	4	0.476	0.010
P_4	1/5	1/2	1/8	1	1/4	0.047	
P_5	1/2	2	1/4	4	1	0.147	

Every judgment matrix test value $CR < 0.1$, and combination consistency test value $CR < 0.1$. Therefore, analytic hierarchy process judgment matrix consistency conforms to calculation requirements, relative result is as TABLE 13 and TABLE 14.

TABLE 13 : Scheme weight calculation result summary

C	C_1	C_2	C_3	C_4
W				
P	0.354	0.161	0.132	0.354
P_1	0.253	0.146	0.148	0.248
P_2	0.083	0.080	0.271	0.082
P_3	0.468	0.476	0.045	0.476
P_4	0.048	0.048	0.450	0.047
P_5	0.148	0.250	0.086	0.147

TABLE 14 : Scheme layer total weight table

Target layer	Scheme layer	Weight	Scheme weight rank
Universities martial arts education reformation and innovation	Improve faculty professional quality level (P_1)	0.220	2
	Clarity teaching fitness and morality cultivating purpose (P_2)	0.107	4
	Strength campus martial arts education promotion (P_3)	0.417	1
	Martial arts textbook diversification (P_4)	0.101	5
	Enrich teaching contents and methods (P_5)	0.156	3

CONCLUSION

By TABLE 10 computed result, it can get conclusion that best scheme is strengthening campus martial arts education promotion. Secondly are respectively improving faculty professional quality level, enriching teaching contents, clarifying teaching fitness and morality cultivating purpose, martial arts textbook diversification. The paper through mathematics analytic hierarchy process to research on universities martial arts education reformation and innovation research, result shows that in martial arts reformation and innovation, decision-makers should focus on innovation in strengthening campus martial arts education promotion, improving faculty professional quality and enriching teaching ways and contents. The three schemes have important effects on universities martial arts teaching reformation, integration of weight is 0.793. Therefore, universities martial arts education construction should put emphasis on effective reformation ways, and speed up martial arts innovation process.

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