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Cheerleading teaching comprehensive assessment-based analysis and analytic hierarchy process application

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ABSTRACT

The paper according to cheerleading teaching cooperation mode learning method and teaching features, it carries out comprehensive assessment on 14 indicators by applying analytic hierarchy process method. Research shows the assessment way and indicator weight can clearly reflect that compiling teaching plan ability is most important in cheerleading teaching, from which: compiling teaching plan ability K_{11} > improving students' self-defensive ability K_{12} > implementing syllabus ability K_{14} > making teaching program ability K_{13} > motion correctly demonstration ability K_{21} > terms applying ability K_{23} > training method applying ability K_{32} > language hint ability K_{24} > referee ability K_{33} > correctly grasp demonstration opportunity ability K_{22} > training result prediction ability K_{31} > proper selecting teaching method ability K_{34} > training using common teaching method ability K_{35} > essential of exercise analytic ability K_{25}. So use the paper established comprehensive assessment system, it can play a well guiding role in future cheerleading teaching selection aspect.

KEYWORDS

Cheerleading teaching;
Indicator weight;
Analytic hierarchy process;
Comprehensive assessment.

INTRODUCTION

With era development, cheerleading relative sports event is waking into people's view, it is a kind of entertainment sports events that well received by broad masses and extremely passionate, just because of that, nation makes use of the features let every university respectively provide the course, result shows that cheerleading entry into campus is much loved by broad students.

Researches based on cheerleading, former scholars have already made great contributions, such as: Qiu Lan in relative dynamic cheerleading to girl students influence research, she made analysis and researches on university students by applying mathematical statistics, questionnaire and other ways, and proposed that school should strengthen dynamic cheerleading publicity in school, and cheerleading was beneficial to students' health that should be widely spread.

On the basis of previous research, the paper carries out further research on cheerleading teaching's comprehensive assessment, and combines with analytic hier-

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archy process, mathematical statistics as well as applies relative software to process, uses final results to show the model's rationality and universality, and the research will propel to cheerleading research and provide impetus for social development.

CHEERLEADING TEACHING COMPREHENSIVE ASSESSMENT MODEL

Cheerleading teaching assessment involved directions are more and contents are universal. Cheerleading teaching assessment investigation involved indicators are multiple. The paper according to analytic hierarchy process, it establish a multiple indicator for cheerleading teaching assessment, by collected data from investigation and interviewing with participants, it establishes analytic hierarchy process comprehensive assessment system.

Cheerleading teaching assessment indicator system

The paper according to cheerleading teaching, it

TABLE 1: Teachers' teaching ability evaluation system indicator table

Target layer	Criterion layer	Project layer
Teachers' teaching ability (U)	Making teaching plan and management ability(T_1)	Compiling teaching plan ability(K_{11})
		Improving students' self-defensive ability (K_{12})
		Making teaching program ability(K_{13})
		Implementing syllabus ability(K_{14})
	Language and demonstration ability(T_2)	Motion correctly demonstration ability (K_{21})
		Correctly grasp demonstration opportunity ability (K_{22})
		Terms Applying ability(K_{23})
		Language hint ability(K_{24})
		Essential of exercise analytic ability(K_{25})
	Training and organizing ability (T_3)	Training result prediction ability (K_{31})
		Training method applying ability (K_{32})
		Referee ability (K_{33})
		Proper selecting teaching method ability (K_{34})
		Training using common teaching method ability (K_{35})

makes comprehensive evaluation, divides teachers' teaching abilities into three different levels that are respectively making teaching plan and management ability, language and demonstration ability, training organizing ability the three kinds, in addition, it respectively makes subdivision on above each process, obtained result is as TABLE 1 show.

Correspond to above TABLE 1 hierarchical structure model is as following Figure 1 show:

Analytic hierarchy process calculates indicators weights

AHP features are hierarch zing complicated problems, making clear about primary and secondary, possessing stronger logicality and hierarchical structure, the algorithm mainly is calculating indicators weights. It is applicable to comprehensive assessment system, is a powerful mathematical method that converts problems into quantitative research. Nowadays analytic hierarchy process has already widely used in each field to solve practical problems. Cheerleading teaching assessment involves multiple reference indicators, the decision problems is suitable to analytic hierarchy process.

(1) Construct judgment matrix

For above criterion layer's three kinds of indicators, it makes meticulous comparison of the two relative importance's to construct judgment matrix. Such as : Take T_i, T_j to make important comparison, the structure is using b_{ij} to express, and then all factors after comparing can get judgment matrix U . Its expression is as following.

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

In formula, b_{ij} the two compared importance uses quantized value to express, uses1—9 number to describe, number representative meaning is as following TABLE 2 show:

By above method we construct first and second grade judgment matrixes as well as second and third grade judgment matrixes, in addition, we also respectively implement single hierarchical arrangement, and corresponding result is as following TABLE 3-6 show.

(2) Weight vector and maximum feature calculation

According to first grade indicator's judgment matrix vector, carry out normalization with it; solve the sum and then make normalization, then it can get weight vector. According to feature value and feature vector relations, it can solve feature value; its implementation method is as following:

Firstly, normalize judgment matrix every column,

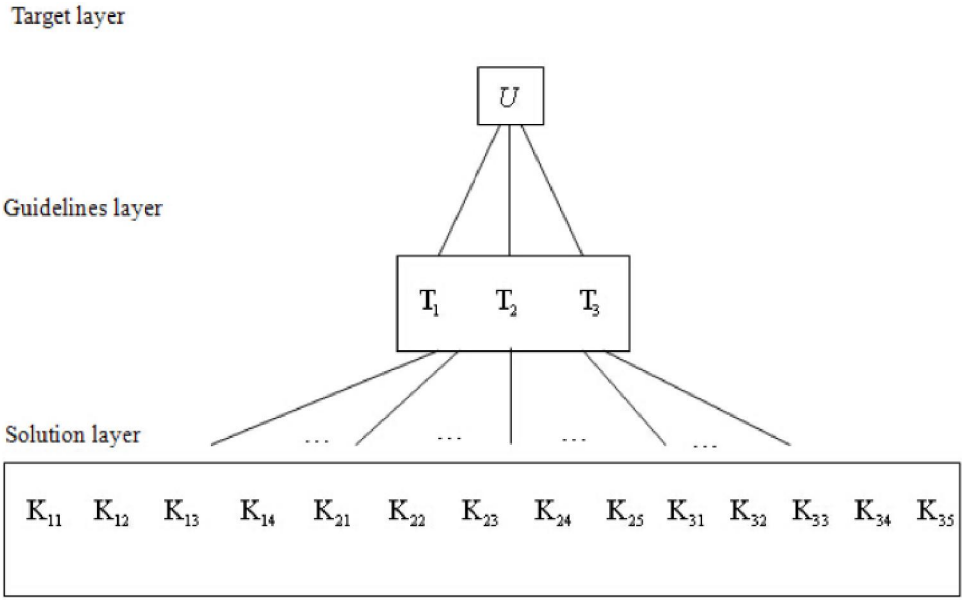

Figure 1: Hierarchical mode

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TABLE 2 : 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 relatively 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 order

TABLE 3 : $U-T$ Judgment matrix

U	T_1	T_2	T_3
T_1	1	$\frac{1}{3}$	3
T_2		1	5
T_3			1

its result is:

$$b_{ij} = b_{ij} / \sum_{k=1}^{n} b_{kj} (i, j = 1, 2, \cdots, n)$$

Then solve the sum by lines on judgment matrix that makes normalization by column, it can get:

$$\overline{W_i} = \sum_{j=1}^{n} b_{ij} (i = 1, 2, \cdots, n)$$

Above vector $\overline{W} = \left[\overline{W_1}, \overline{W_2}, \cdots, \overline{W_n}\right]^T$ proceeds

TABLE 4 : T_1—K Judgment matrix

T_1	K_1	K_2	K_3	K_4	K_5	K_6	K_7	K_8	K_9	K_{10}	K_{11}	K_{12}	K_{13}	K_{14}
K_1	1	3	5	2	4	7	6	8	8	8	8	9	9	9
K_2		1	3	$\frac{1}{2}$	2	5	4	6	9	8	7	8	9	9
K_3			1	$\frac{1}{4}$	$\frac{1}{2}$	3	2	4	9	6	5	7	8	9
K_4				1	3	6	5	7	9	8	8	9	9	9
K_5					1	4	3	5	9	7	6	8	8	9
K_6						1	$\frac{1}{2}$	2	7	4	3	5	6	8
K_7							1	3	8	5	4	6	7	9
K_8								1	6	3	2	4	5	7
K_9									1	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{3}$	$\frac{1}{2}$	2
K_{10}										1	$\frac{1}{2}$	2	3	5

T_1	K_1	K_2	K_3	K_4	K_5	K_6	K_7	K_8	K_9	K_{10}	K_{11}	K_{12}	K_{13}	K_{14}
K_{11}											1	3	4	6
K_{12}												1	2	4
K_{13}													1	3
K_{14}														1

TABLE 5 : T_2—k Judgment matrix

T_1	K_1	K_2	K_3	K_4	K_5	K_6	K_7	K_8	K_9	K_{10}	K_{11}	K_{12}	K_{13}	K_{14}
K_1	1	2	3	4	5	9	6	9	9	9	7	8	8	9
K_2		1	2	3	4	8	5	9	9	9	6	7	8	9
K_3			1	2	3	8	4	9	9	8	5	6	7	9
K_4				1	2	7	3	9	8	8	4	5	6	9
K_5					1	6	2	9	8	7	3	4	5	8
K_6						1	$\frac{1}{5}$	5	3	2	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{4}$
K_7							1	9	7	6	2	3	8	4
K_8								1	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{7}$	$\frac{1}{6}$	$\frac{1}{2}$
K_9									1	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{1}{5}$	$\frac{1}{4}$	2
K_{10}										1	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{3}$	3
K_{11}											1	2	3	7
K_{12}												1	2	8
K_{13}													1	5
K_{14}														1

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TABLE 6 : T_3—k Judgment matrix

T_1	K_1	K_2	K_3	K_4	K_5	K_6	K_7	K_8	K_9	K_{10}	K_{11}	K_{12}	K_{13}	K_{14}
K_1	1	6	8	5	2	7	8	3	9	4	9	9	9	9
K_2		1	4	$\frac{1}{2}$	$\frac{1}{5}$	2	3	$\frac{1}{4}$	8	$\frac{1}{3}$	5	7	6	9
K_3			1	$\frac{1}{5}$	$\frac{1}{8}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{7}$	5	$\frac{1}{6}$	2	4	6	3
K_4				1	$\frac{1}{4}$	3	4	$\frac{1}{3}$	9	$\frac{1}{2}$	6	8	9	7
K_5					1	6	7	2	3	8	9	9	9	9
K_6						1	2	$\frac{1}{5}$	7	$\frac{1}{4}$	4	5	4	5
K_7							1	$\frac{1}{6}$	6	$\frac{1}{5}$	3	5	7	4
K_8								1	9	2	8	9	9	8
K_9									1	$\frac{1}{9}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{3}$	2
K_{10}										1	7	9	9	8
K_{11}											1	3	5	2
K_{12}												1	3	$\frac{1}{2}$
K_{13}													1	$\frac{1}{4}$
K_{14}														1

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

TABLE 8 : Consistency test calculation table

Judgment matrix	U	T_1	T_2	T_3
CI	0.019	0.127	0.149	0.126
CR	0.0328	0.0804	0.0943	0.0797

with normalization processing:

$$\overline{W_i} = \frac{\overline{W_i}}{\sum_{j=1}^{n} \overline{W_j}} (i = 1, 2, \cdots, n)$$

Then:$W=[W_1, W_2, \ldots, W_n]^T$ is solved feature vector. In addition, calculate maximum feature root, the process is:

TABLE 9 : Indicator weight calculation result

U	T_1	T_2	T_3	W_{total}
	0.260	0.634	0.106	
K_1	0.235	0.234	0.236	0.2345
K_2	0.143	0.183	0.064	0.1600
K_3	0.084	0.143	0.026	0.1153
K_4	0.186	0.109	0.084	0.1271
K_5	0.110	0.084	0.186	0.1013
K_6	0.046	0.017	0.045	0.0281
K_7	0.063	0.065	0.035	0.0613
K_8	0.035	0.008	0.143	0.0296
K_9	0.009	0.010	0.009	0.0105
K_{10}	0.025	0.015	0.110	0.0271
K_{11}	0.026	0.047	0.021	0.0398
K_{12}	0.016	0.028	0.011	0.0284
K_{13}	0.012	0.027	0.008	0.0215
K_{14}	0.008	0.015	0.015	0.0135

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

In above formula $(AW)_i$ represents vector AW's i component.

According to above formula, we can respectively solve cheerleading teaching comprehensive assessment analysis first grade indicator, second grade indicator to first grade indicator weight and maximum feature value.

(3) Consistency test

To matrix $U = (b_{ij})_{n*n}$, if matrix element meets $b_{ij}b_{jk} = b_{ik}$, then matrix is straight matrix. Among them, $b_{ij} > 0$, $b_{ij} = 1/b_{ji}$. In order to use it to calculate factor weight, it requires that matrix inconsistency only under acceptable conditions. When problems are relative complicated, we cannot take all factors into account, which causes paired comparison construct judgment matrix instant, judgment matrix cannot arrive at ideal state consistency.

Judgment matrix consistency indicator CI, and judgment matrix consistency ratio CR, its computational method is as following formula show

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

Among them, n represent order number of judgment matrix that is also the number of compared factors.

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

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

When $CR \geq 0.1$, it is thought that judgment matrix occurs inconsistency that needs to make adjustment on judgment matrix again. When $CR < 0.1$, judgment matrix inconsistency is within acceptable range.

By calculating, it gets four judgment matrixes' consistency indicator CI, and consistency ratio CR, calculation result as following TABLE 8:

Single hierarchy judgment matrix conforms to consistency requirements by consistency testing; it can be thought that calculated weight is reasonable. Next step is doing combination consistency testing. Assume that in one layer, m pieces of factors weight calculation result is α_m, corresponding consistency indicator value respectively is CI_m, combination consistency test consistency ratio is:

$$\mathbf{CR} = \frac{\sum_{j=1}^{m} \alpha_j \mathbf{CI}_j}{\sum_{j=1}^{m} \alpha_j \mathbf{RI}_j}$$

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By calculating, combination consistency ratio calculated value is:

$CR < 0.1$

So hierarchical total arrangement's consistency testing meets consistency requirement. It can be thought that cheerleading teaching each indicator weight calculation result is reasonable that can be applied into teaching assessment.

(4) Weight calculation arrangement

If in one layer, m pieces of factors weight calculation result is α_m, corresponding consistency indicator value respectively is CI_m, in next layer n pieces of factors to A layer calculation weight is β_{nm}, then in T layer factors total arrangement weight is:

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

By above formula calculating, it gets each indicator weight in total target as following TABLE 9.

By above TABLE 9 data, in order to better see each indicator weight, we can draw out corresponding bar chart, as following Figure 2-3 show:

Among them, criterion layer comprehensive evaluation Figure 2:

Corresponding project layer performance Figure 3:

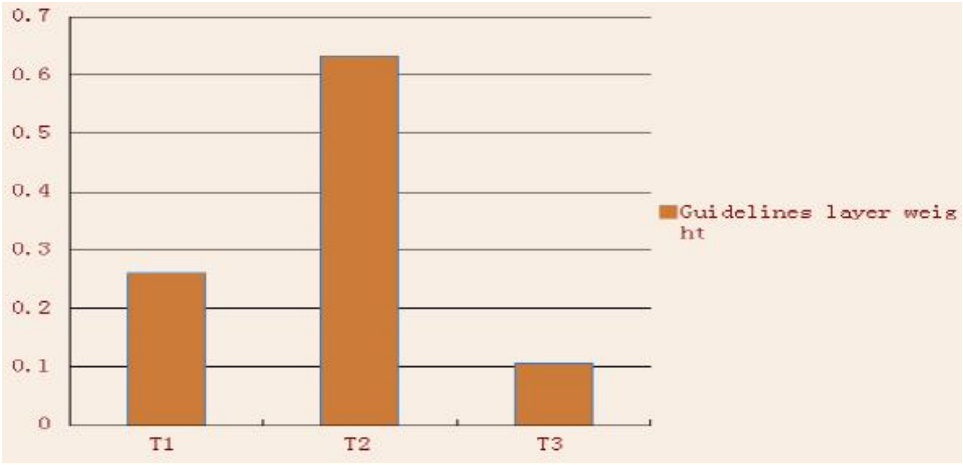

Figure 2 : Criterion layer weights

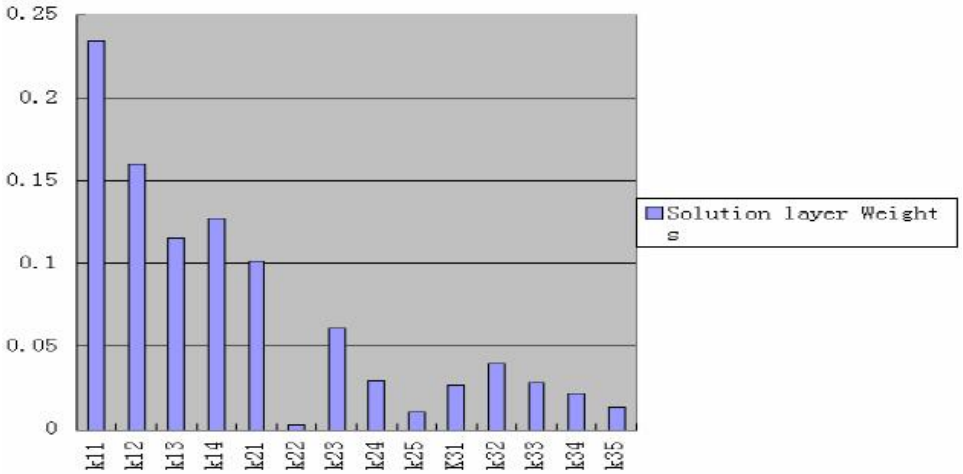

Figure 3 : Solution layer weights

CONCLUSIONS

By above calculation process, we can get two points conclusions:

1) By the paper, it can see that in cheerleading comprehensive assessment, language and demonstration ability is main influence factor, secondary is

making teaching plan and management ability, and minimum affected is training and organizing ability.

2) By K layer comprehensive arrangement result, it can get cheerleading teaching assessment data and can make arrangement of assessment indicators' importance degree order from big to small as : compiling teaching plan ability K_{11} > improving students' self-defensive ability K_{12} > implementing syllabus ability K_{14} > making teaching program ability K_{13} > motion correctly demonstration ability K_{21} > terms applying ability K_{23} > training method applying ability K_{32} > language hint ability K_{24} > referee ability K_{33} > correctly grasp demonstration opportunity ability K_{22} > training result prediction ability K_{31} > proper selecting teaching method ability K_{34} > training using common teaching method ability K_{35} > essential of exercise analytic ability K_{25} .

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