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To develop research of College students' English education model by the method of fuzzy AHP

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ABSTRACT

With the rapid development of China's integration into the global world, the application of English in China has great development, which brings good opportunities to college English education. Meanwhile, it is also faced with great challenges, the reason of which is the policy of seclusion left over by history in China that results the level of understanding of English among college students is not high. Therefore, to build a new thorough English education mode is a major project for every college and university at present. Confronted with such condition, this paper has analyzed every factor in college students' English education mode, built out the factor system of college students' English education mode that is consisted of three levels under the guidance of theory. In the meantime, this paper has determined the weight of the project by the method of analytical hierarchy process. It has also found out the biggest factor that impacts on college students' English education mode. Thereafter, a comprehensive evaluation model has been set up. By adopting examples to experiment, college students' English education mode here is comparably in good level and constructive comments have been proposed, which provide a new way of thinking for promoting college students' English education mode in China.

KEYWORDS

College students' English; Education mode; Fuzzy comprehensive evaluation; Analytical hierarchy process.

INTRODUCTION

In the early 1990s, china has started to popularize the national College English Band Four and Band Six Tests. In the following years, the number of candidates has constantly increased, which propels the development of English education in China. Nowadays, English language has become a quite extensive way of communication. Learning English well has a great influence on students' personal development.

As China's undergraduate enrollment is expanding, English education that is already tense has faced with great pressure and impact. Teacher resources in the field of English are quite lacking, so that to establish a reasonable English teaching system plays a significant role in the development of today's English education. People once tried to promote English education quality by establishing education mode. For example, Song Jv put forward a theoretical framework of fully utilizing teaching system technology with other people in the development of China's ordinary undergraduate course for English major, which provided theory support in achieving the development of English major; Xu Ming put forward some ideas that using Internet as the main content in media teaching based on the web browser network teaching mode, the courses can be played back or do on-line Q&A through network platforms in the cyber space and the teaching quality of teachers can be comprehensively evaluated as well in the article of Design and Implementation of Network Multimedia English Teaching System.

This paper is an in-depth research of college students' English education model in China that is based on previous studies. It is evaluated by AHP, fuzzy mathematics comprehensive evaluation and verified by examples, which provides a theoretical preparation for the improvement of college students' English teaching model.

THE FOUNDATION OF COLLEGE ENGLISH EDUCATION MODE SYSTEM

As the overall English level of today's college students is relatively poor, this paper has conducted a survey among students in a university in order to find out the reasons and establish a reasonable comprehensive evaluation system. The results are shown in Figure 1 below:

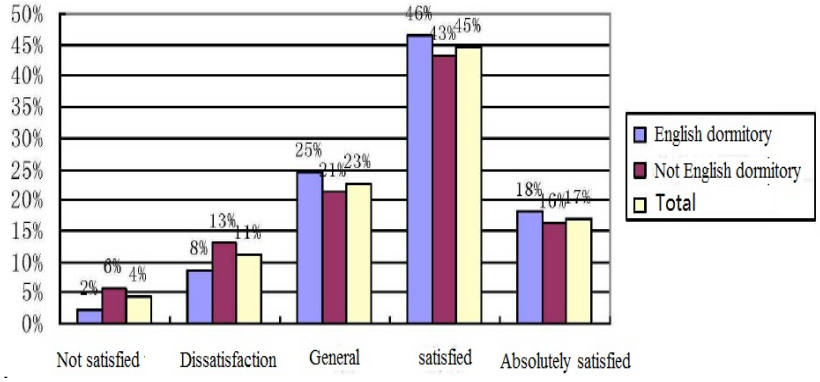

Figure 1: Contemporary university status in English classrooms

From Figure 1 we can see the condition of contemporary university status in English classrooms. The number of the totally approved is relatively small. Comparable original mode of college English education is shown in Figure 2 below:

From Figure 2 we can see that the original education mode is not suitable for the development demand of contemporary college students. To establish a reasonable and scientific system of college English education model need theories as important guarantees. During the establishment, we need to follow the operability of the project, with flexible guidance, systemic objectivity and scientific nature.

The research methods and screening of objects

Based on the above principle, this paper has selected almanac and some relative contents of National Sports Council and the National Statistics as research objects. Combined with survey results by scholars and specialists, initially identified the evaluation system of the college English education model at last. Its targets are shown in TABLE 1 below:

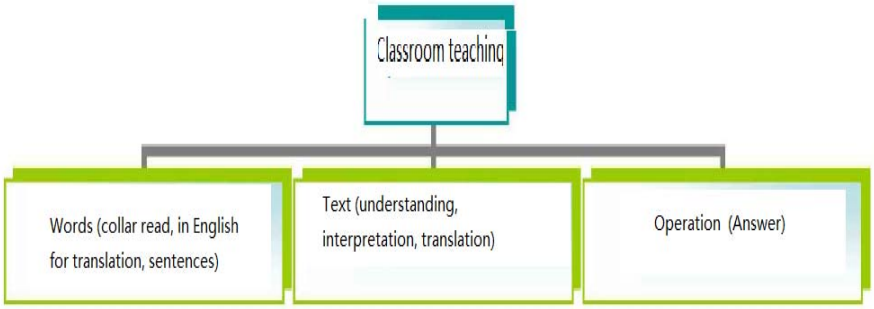

Figure 2 : The original educational model

TABLE 1 : Target system of college students' English education model

First class target	Second class target	Third class target
Students' new model system of English education H	U1Talks between the senior and the junior	R11 English communication
		R12 English information sharing
	U2 Student academic evaluation system	R21 listening
		R22 translating
		R23 writing
		R24 clozing
	U3 evaluate the quality of teaching	R31 student achievements exhibition
		R32 English contest show
	U4 examination system	R41 Special training
		R42 comprehensive test
		R43 unit test

Analytic hierarchy process

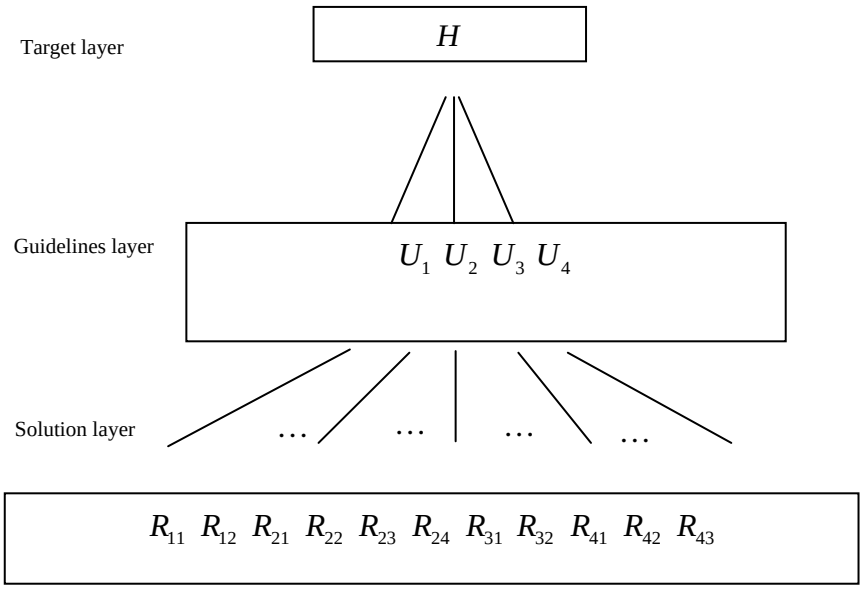

Figure 3: Hierarchical model

In order to determine the weight, this paper has adopted the analytic hierarchy process---AHP. Features of this method are to make complex problems hierarchical, and prioritize them. It has a strong logic and structural level, the algorithm is mainly between the weights to re-calculate the index. Applicable to Comprehensive Assessment System, is to turn the problems into powerful mathematical methods of quantitative research. Today, AHP has been widely used in various fields to solve practical problems. Research on Evaluation System of College Students in the English educational model involving multiple reference indexes and this decision problem just apply to AHP. And on the table that corresponds to the establishment of AHP.

Determination of weight

The relative importance of a careful comparison of the two layers of the above criteria for three indicators to construct judgment matrix. For example, take the importance of U_i, U_j to do importance of comparative structure, use U_{ij} to present. So after comparing all the factors can judgment matrix U be obtained. It is expressed as follows:

$$U = \begin{pmatrix} U_{11} & U_{12} & \cdots & U_{1j} \\ U_{21} & U_{22} & \cdots & U_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ U_{i1} & U_{i2} & \cdots & U_{ij} \end{pmatrix} \quad \textbf{(1)}$$

The importance of U_{ij} that is used to compare both can be described by the quantization value. Using number 1-9 to describe for comparison matrix, the meanings of the following Figures are represented in TABLE 2 :

TABLE 2 : Judgments of Matrix proportional scale and their meanings

No.	The importance rating	U_{ij} assignment
1	i, j are equally important	2
2	i is slightly more important than j	4
3	i is more important than j	6
4	i is much more important than j	8
5	i is extremely important than j	10
6	i is slightly less important than j	1/2
7	i is obviously less important than j	1/4
8	i is much less important than j	1/6
9	i is extremely less important than j	1/8

Then the corresponding judgment matrix of this article is shown in TABLE 3 below.

TABLE 3 : Judgment matrix

U_{ij}	U_1	U_2	U_{ij}
U_1	1/3	1/3	3
U_2	1	2	4
U_{ij}	1/3	1/4	1/3

Weight vector and the maximum feature calculation

Based on judgment matrix-vector of the first class to do normalization process, performing row normalized summation can get Weight vector. According to the relationship between the eigenvalues and eigenvectors eigenvalues can solve out the eigenvalues. The method is as follows:
Firstly, make each column of the judgment matrix normalized, here is the result:

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

Then, make the normalized judgment matrix to do summation according to the rows:

$$\overline{W_i} = \sum_{j=1}^{n} U_{ij} (i = 1, 2, \cdots, n) \quad \textbf{(3)}$$

The vector $\overline{W} = \left[\overline{W_1}, \overline{W_2}, \cdots, \overline{W_n}\right]^T$ can be processed by normalization:

$$\overline{W_i} = \frac{\overline{W_i}}{\sum_{j=1}^{n} \overline{W_j}} (i = 1, 2, \cdots, n) \quad \textbf{(4)}$$

So $W=[W_1, W_2, \ldots, W_n]^T$ is the requested feature vector
To calculate the maximum characteristic root, here is the process:

$$\lambda_{\max} = \sum_{i=1}^{n} \frac{(UW)_i}{nW_i} \quad \textbf{(5)}$$

$(UW)_i$ represents the ith component in UW.

Respectively, based on the above formula, we can obtain analysis of the first indicators, the weight that second indicators impact on the first in college English education model evaluation.

Hierarchical ordering

If the calculation result of m weight factors in a level is R_m. Factors for the next layer in the layers of the computing power is T_{nm}, Then the right sort of total factor value in t layer is:

$$w_i = \sum_{j=1}^{m} R_i T_{ij} \quad \textbf{(6)}$$

Through the calculation, the weights of new model of college English education can be obtained.

THE DETERMINATION OF COLLEGE STUDENTS' ENGLISH EDUCATION MODEL EVALUATION SYSTEM

By the weight of indicators from two classes, the weight of every indicator can be finally obtained through the total order of indicators by Applied Probability theory and mathematical statistics, probability multiplication principle. As in the TABLE 4:

TABLE 4 : Weight of indicator system in college students' English education

The first class	The second class	The third class
H1	U1 0.2745	R11 0.0915
		R12 0.1925
	U2 0.4526	R21 0.1124
		R22 0.1786
		R23 0.0564
		R24 0.0836
	U3 0.2932	R31 0.0694
		R32 0.0356
	U4 0.1758	R41 0.0560
		R42 0.1124
		R43 0.0916

In order to highlight a more prominent relationship between the three indicators, the paper draws a bar chart. As shown in Figure 4:

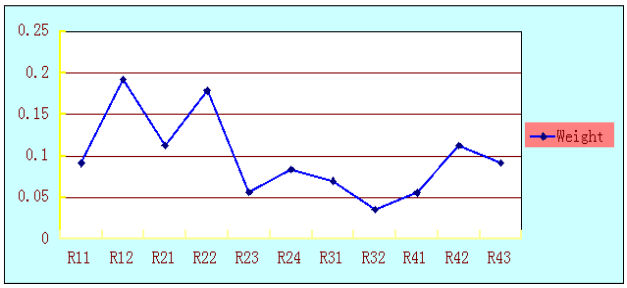

Figure 4 : Three indicator system weight Figure

From Figure 4 we can see the weight of the three indicators.

THE COMPREHENSIVE EVALUATION MODEL OF COLLEGE STUDENTS' ENGLISH EDUCATION MODEL

The theory of comprehensive evaluation model of college students' English education model is to make use of cohesion between linear transformation and maximum membership degree. Doing comprehensive consideration and research under the premise of considering many factors has achieved a

reasonable evaluation results. Therefore, the comprehensive evaluation method and the steps we use through the use of fuzzy mathematics are as follows:

1. The determined factor's set

$$U = (u_1, u_2, u_3, \cdots, u_n) \quad \textbf{(7)}$$

2. The determined evaluation set

$$Q = (q_1, q_2, q_3, \cdots, q_n) \quad \textbf{(8)}$$

3. Single factor's evaluation set

$$f : U \rightarrow \phi(Q) \quad \textbf{(9)}$$

$$u_i \rightarrow f(u_i) \in \phi(U) \quad \textbf{(10)}$$

The corresponding fuzzy relationship is:

$$R_f(u_i, q_i) = f(u_i)(q_i) = r_{ij} \quad \textbf{(11)}$$

The above equation can be used to indicate R_f, that is:

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & & & \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix} \quad \textbf{(12)}$$

From the above, the fuzzy change T_f from U to Q can be derived from the fuzzy relation R. And R is also called single factor evaluation matrix,so that the comprehensive evaluation model is $U = (u_1, u_2, u_3, \cdots, u_n)$,it aims at $A = (a_1, a_2, a_3, \cdots, a_n)$,the total evaluation result makes $B = (b_1, b_2, b_3, \cdots, b_n)$,then to calculate by the formula $B = A \times R$,where rank q_j that corresponds $b_{j\max}$ in b_j is the final evaluation result.

THE APPLICATION OF THE MODEL

In order to present the reasonableness and effectiveness of above mentioned theory more clearly, this paper has selected a new college students' English education model in a region to analyze. Combined with the above selected indicators, this paper selects some indicators. As is shown in TABLE 5:

TABLE 5 : Selected indicators

U2 0.4526	R21 0.1124
	R22 0.1786
	R23 0.0564
	R24 0.0836

Based on the above research, this paper has set five evaluation ratings in this region: very poor, poor, fair, good, very good. The noumenon is analyzed by applying the fuzzy comprehensive evaluation process, and then its second and third class indicators' result can be reached by related software.
The second class indicator:

U2= (0.0025 0.0035 0.0060 0.0044 0.0016)

The third class indicator:

R21= (0.0085 0.0020 0.0399 0.0158 0.0046)
R22= (0.0239 0.0286 0.0380 0.0246 0.0010)
R23= (0.0154 0.0326 0.0358 0.0257 0.0010)
R24= (0.0673 0.0445 0.0295 0.0308 0.0066)

The final result can be obtained by the above process, that is:

U_2 = (0.0025 0.0013 0.0131 0.0221 0.0134)

Based on the results and in accordance with the principle of maximum degree of membership, the final evaluation of new college students' English education model in this region is the good level.

CONCLUSION

Every factor of each index college English education model is analyzed under the guidance of theory, which has established the indicator system of college students' English education model that is consisted by three levels. Meanwhile, weight of the project is determined by analytic hierarchy process and the biggest factor affecting the college students' English education model is obtained. Since then, a comprehensive evaluation model that adopts examples is established, which comes to that college students' English education of this region belongs to a good level of education model. In addition, to improve the English proficiency of university students, depends on changing mode of education alone will be not enough, colleges and universities should strengthen the development of related areas in order to improve the overall level of English of contemporary college students.

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