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## University students' english teaching mode redeveloped research under fuzzy AHP approach

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### ABSTRACT

As world maximum language, English impacts on all countries of globe should not be underestimated. China early has regarded English as our second language to develop, however presently national people's English level is not optimistic. The paper establishes university students' English teaching mode redeveloped model, utilizes fuzzy AHP method to make quantitative analysis of university students English teaching mode. Firstly, it classifies six kinds of teaching modes into general education mode, happy English teaching mode and multimedia technology teaching mode such three kinds, combines with AHP method to define evaluation matrix, and respectively calculate each teaching mode weight, and finally gets optimal teaching mode that happy English teaching mode has the highest weight, collaborative teaching team and race against type teaching have largest reaction in university students' English teaching. Meanwhile, to further change current university students English general lower status and improve university English level, it should combine with multimedia and other high technologies, combine theory and practice, improve classroom efficiency and inspire learning enthusiasm.

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### KEYWORDS

University students' English teaching;  
Fuzzy AHP method;  
Optimal teaching mode;  
Happy english teaching.

### INTRODUCTION

With English world position improvement and Chinese economic rapidly development, English education has already become one of most important events in Chinese education. In English educational research process, there are many scholars have made outstanding contributions.

Han Bao-Cheng in "Looking back and thinking Chinese basic education phase English teaching", by recalling Chinese exploring basic education progress, he analyzed English education and pointed out Chinese

English teaching was moving forward with economic development, English teaching occupied great proportions in Chinese education, and presented globalization, public-oriented features, English education was not test-oriented, it would add lots of English oral test contents. Xiao Li-Quan in "Discuss Chinese English education development trend", utilized multiple kinds of methods, by interviewing and investigation, consulting lots of documents and combining with previous research basis, he stated Chinese English education. The thesis pointed out Chinese English education would develop towards globalization direction, English edu-

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education would more focus on combination with real life, business English, daily English would be more widely promoted some time in future. Wang Min in "Discuss university English education and university students' employment competitiveness analysis", she took university English education as research objects, use university students' perspective to analyze English important roles in daily life. The thesis pointed out that university English education was spring board for university students improving English levels and moving toward social English, in intensified university students' employment competitions, high English level was the best chip of employment.

The paper by referencing many scholars' research result, utilizes mathematical method to quantitative analyze Chinese university students' English teaching features, and establishes university students English teaching redeveloped model, so that present current university students' English teaching best teaching mode.

### MODEL ESTABLISHMENT

By far, lots of university students' emphasis on English has become lower and lower after graduating from high school, their English levels basically rest on high school level, even someone's level is inferior to high school, university students English levels mostly are level four, less can pass level six testing, which is more remarkable in independent college. Education on university students' English has become one of important issues in current stage university students' education.

For university students' English teaching, its teaching way impacts on contemporary university students' interests on English learning to some extent. Novelty and unique teaching ways can inspire university students' enthusiasm in learning English and positively input into

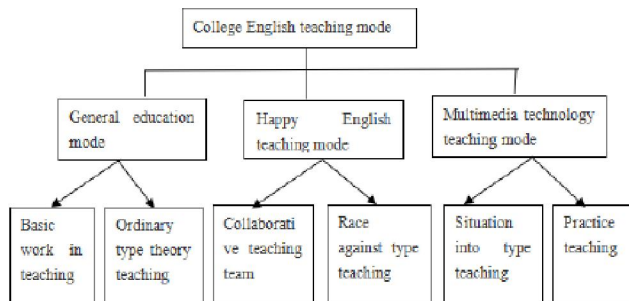


Figure 1 : College English teaching mode

English class, and further improve their English levels.

For Chinese university students' English teaching six kinds of teaching modes (as Figure1), from which basic work in teaching means group according to students' different basis, and define different teaching contents for every group; ordinary type theory teaching refers to pass on theoretical knowledge to students, and then carry out special practical teaching; collaborative teaching team refers to assign fixed task to students and let students to fulfill homework in the form of team collaboration; race against type teaching refers to inspire students' learning enthusiasm by organizing races and further impel to students' competitiveness; situation into type teaching refers to set certain situations on teaching task, let students to experience teaching in real situations; practice teaching refers to pass on theoretical knowledge to students in the way of practice.

### University students' English teaching mode redeveloped research based on fuzzy comprehensive evaluation method

By previous researches and practical investigation, it can get that university students' teaching model can be concluded into six kinds: basic work in teaching, ordinary type theory teaching, collaborative teaching team, race against type teaching, situation into type teaching and practice teaching, as TABLE 1.

Carry out comprehensive evaluation analysis of above teaching modes, analysis process is as following:

#### Define evaluation indicator set

According to:  $U = \{u_1, u_2, \dots, u_m\}, m = 1, 2, 3, \dots, 6$

Evaluation indicator set is = { basic work in teaching, ordinary type theory teaching, collaborative teaching team, race against type teaching, situation into type teaching, practice teaching }.

#### Define evaluation grade set

When research on university students' English education mode, it uses experts evaluation method to define evaluation grade set. According to:

$V = \{v_1, v_2, \dots, v_n\}, n = 1, 2, 3, 4$

University students' English education mode evaluation grade set is = { Very satisfied, relative satisfied, normal, not so satisfied }.

TABLE 1 : University students' English teaching mode classification

Type	General education mode		Happy English teaching mode		Multimedia technology teaching mode	
	Basic work in teaching	Ordinary type theory teaching	Collaborative teaching team	Race against type teaching	Situation into type teaching	Practice teaching

**Define each evaluation indicator weight**

Weight main expression method is:

$$w = \{\mu_1, \mu_2, \dots, \mu_m\}, m = 1, 2, \dots, 6$$

Among them:  $\sum_{m=1}^6 \mu_m = 1$

Define evaluation indicator weight method mainly has analytic hierarchy process and normalization method, from which normalization method is as following:

$$w_i = \frac{\frac{C_i}{S_i}}{\sum_{i=1}^n \frac{C_i}{S_i}}, (i = 1, 2, \dots, m)$$

Among them,  $w_i$  is evaluation parameter  $i$  monitoring value,  $\bar{S}_i$  is evaluation parameter  $i$  grade  $m$  criterion arithmetic average value, then weight set is:  $w = \{w_1, w_2, \dots, w_m\}$ .

Here, apply normalization method to calculate weight, university students' English education mode evaluation indicator weight is:  $w = \{0.04, 0.06, 0.25, 0.30, 0.15, 0.20\}$

**AHP method-based university students' English teaching mode evaluation matrix**

Comprehensive evaluation matrix  $R$  evaluation methods mainly have expert evaluation method, analytic hierarchy process, and membership function method.

In above three methods, expert evaluation method is based on questionnaire survey and expert's evaluation result statistics, so to let computed result to be more accurate, here uses analytic hierarchy process, define fuzzy relation matrix  $R$ , from which:

$$R = (R_1, R_2, R_3, R_4, R_5, R_6)^T$$

**AHP method guiding thought**

Establish hierarchical structure(As Figure 2)

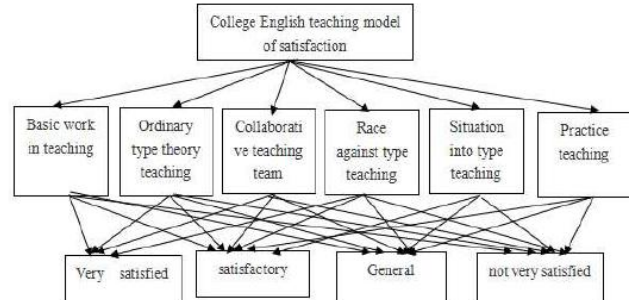


Figure 2 : Class Hierarchy

Target layer: University students' English teaching mode satisfaction degree

Criterion layer: Scheme influence factors,  $C_1$  is basic work in teaching,  $C_2$  is ordinary type theory teaching,  $C_3$  is collaborative teaching team,  $C_4$  is race against type teaching,  $C_5$  is situation into type teaching,  $C_6$  is practice teaching

Scheme layer:  $A_1$  is very satisfied,  $A_2$  is relative satisfied,  $A_3$  is normal,  $A_4$  is not so satisfied.

(2) Construct paired comparison matrix

Construct paired comparison matrix is carrying on paired comparison among elements, using matrix to express each layer every element importance to previous layer all elements, here apply operational research expert proposed 1~9 ratio scale, as TABLE 2.

According to above scale table, set judgment matrix  $A$  as:

$$A = \begin{pmatrix} 1 & 2 & \frac{1}{4} & \frac{1}{5} & \frac{1}{3} & \frac{1}{2} \\ \frac{1}{2} & 1 & \frac{1}{3} & \frac{1}{4} & \frac{1}{3} & \frac{1}{2} \\ 4 & 3 & 1 & 3 & 4 & 5 \\ 5 & 4 & \frac{1}{3} & 1 & 3 & 6 \\ 3 & 3 & \frac{1}{4} & \frac{1}{3} & 1 & \frac{1}{3} \\ 2 & 2 & \frac{1}{5} & \frac{1}{6} & 3 & 1 \end{pmatrix}$$

And constructed scheme layer judgment matrixes correspond to different criterion layers are as following TABLE 3-5:

Calculate weight

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TABLE 2 : 1~9 scale definition

Scale	Definition
$a_{ij}$	
1	factor i and factor j have equal importance
3	factor i is slightly more important than factor j
5	factor i is relative more important than factor j
7	factor i is extremely more important than factor j
9	factor i is absolute more important than factor j
2, 4, 6, 8	Indicates middle state corresponding scale value of above judgments

TABLE 3 : Criterion layer judgment matrix

C <sub>1</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	C <sub>2</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>
A <sub>1</sub>	1	3	4	5	A <sub>1</sub>	1	2	3	5
A <sub>2</sub>	1/3	1	4	4	A <sub>2</sub>	1/2	1	4	5
A <sub>3</sub>	1/4	1/4	1	3	A <sub>3</sub>	1/3	1/4	1	3
A <sub>4</sub>	1/5	1/4	1/3	1	A <sub>4</sub>	1/5	1/5	1/3	1

To judgment matrix:

$$A = \begin{pmatrix} 1 & 2 & \frac{1}{4} & \frac{1}{5} & \frac{1}{3} & \frac{1}{2} \\ \frac{1}{2} & 1 & \frac{1}{3} & \frac{1}{4} & \frac{1}{5} & \frac{1}{3} \\ 4 & 3 & 1 & 3 & 4 & 5 \\ 5 & 4 & \frac{1}{3} & 1 & 3 & 6 \\ 3 & 3 & \frac{1}{4} & \frac{1}{3} & 1 & \frac{1}{3} \\ 2 & 2 & \frac{1}{5} & \frac{1}{6} & 3 & 1 \end{pmatrix}$$

Firstly use MATLAB software to make following processing:

$$\begin{matrix} \text{Column vector normalization} \rightarrow \\ \begin{pmatrix} 0.882 & 0.925 & 0.874 & 0.733 & 0.619 & 0.427 \\ 0.736 & 0.811 & 0.821 & 0.722 & 0.509 & 0.653 \\ 0.652 & 0.657 & 0.773 & 0.604 & 0.527 & 0.662 \\ 0.551 & 0.431 & 0.694 & 0.585 & 0.448 & 0.586 \\ 0.288 & 0.305 & 0.548 & 0.454 & 0.339 & 0.496 \\ 0.186 & 0.063 & 0.167 & 0.145 & 0.185 & 0.386 \end{pmatrix} \\ \text{According to the row sum} \rightarrow \begin{pmatrix} 2.898 \\ 2.196 \\ 1.254 \\ 0.993 \\ 0.874 \\ 0.627 \end{pmatrix} \xrightarrow{\text{The normalized}} \begin{pmatrix} 0.213 \\ 0.176 \\ 0.715 \\ 0.579 \\ 0.451 \\ 0.322 \end{pmatrix} = W^0 \end{matrix}$$

TABLE 4 : Criterion layer judgment matrix

C <sub>3</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	C <sub>4</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>
A <sub>1</sub>	1	2	3	5	A <sub>1</sub>	1	2	3	3
A <sub>2</sub>	1/2	1	3	3	A <sub>2</sub>	1/2	1	3	4
A <sub>3</sub>	1/3	1/3	1	1/3	A <sub>3</sub>	1/3	1/3	1	1/3
A <sub>4</sub>	1/5	1/3	3	1	A <sub>4</sub>	1/3	1/4	3	1

TABLE 5 : Criterion layer judgment matrix

C <sub>5</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	C <sub>6</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>
A <sub>1</sub>	1	2	3	4	A <sub>1</sub>	1	3	4	7
A <sub>2</sub>	1/2	1	2	3	A <sub>2</sub>	1/3	1	3	4
A <sub>3</sub>	1/3	1/2	1	1/3	A <sub>3</sub>	1/4	1/3	1	1/3
A <sub>4</sub>	1/4	1/3	3	1	A <sub>4</sub>	1/7	1/4	3	1

Then, by:  $A \times W^0 = \begin{pmatrix} 0.213 \\ 0.176 \\ 0.715 \\ 0.579 \\ 0.451 \\ 0.322 \end{pmatrix}$  it further solves:

$\lambda^0_{\max} = 4.135$ .

Similarly, criterion layer judgment matrix corresponding maximum feature value and feature vector are successively:

$\lambda^{(1)}_{\max} = 2.871, \omega_1^1 = \begin{pmatrix} 0.567 \\ 0.413 \\ 0.902 \\ 0.883 \\ 0.747 \\ 0.624 \end{pmatrix};$

$$\lambda_{\max}^{(2)} = 2.865, \omega_2^1 = \begin{pmatrix} 0.112 \\ 0.057 \\ 0.872 \\ 0.761 \\ 0.595 \\ 0.385 \end{pmatrix};$$

$$R_1 = \begin{pmatrix} 0.567 \\ 0.413 \\ 0.902 \\ 0.883 \\ 0.747 \\ 0.624 \end{pmatrix}; R_2 = \begin{pmatrix} 0.112 \\ 0.057 \\ 0.872 \\ 0.761 \\ 0.595 \\ 0.385 \end{pmatrix}; R_3 = \begin{pmatrix} 0.406 \\ 0.146 \\ 0.875 \\ 0.769 \\ 0.654 \\ 0.527 \end{pmatrix};$$

$$\lambda_{\max}^{(3)} = 2.859, \omega_3^1 = \begin{pmatrix} 0.406 \\ 0.146 \\ 0.875 \\ 0.769 \\ 0.654 \\ 0.527 \end{pmatrix};$$

$$R_4 = \begin{pmatrix} 0.406 \\ 0.251 \\ 0.885 \\ 0.741 \\ 0.621 \\ 0.557 \end{pmatrix}; R_5 = \begin{pmatrix} 0.369 \\ 0.321 \\ 0.898 \\ 0.751 \\ 0.624 \\ 0.547 \end{pmatrix}; R_6 = \begin{pmatrix} 0.441 \\ 0.242 \\ 0.893 \\ 0.731 \\ 0.544 \\ 0.527 \end{pmatrix};$$

$$\lambda_{\max}^{(4)} = 2.841, \omega_4^1 = \begin{pmatrix} 0.406 \\ 0.251 \\ 0.885 \\ 0.741 \\ 0.621 \\ 0.557 \end{pmatrix};$$

And further by  $R = (R_1, R_2, R_3, R_4, R_5, R_6)^T$ , it can get comprehensive evaluation matrix as following:

$$R = \begin{pmatrix} 0.567 & 0.112 & 0.406 & 0.406 & 0.369 & 0.441 \\ 0.413 & 0.057 & 0.146 & 0.251 & 0.321 & 0.242 \\ 0.902 & 0.872 & 0.875 & 0.885 & 0.898 & 0.893 \\ 0.883 & 0.761 & 0.769 & 0.741 & 0.751 & 0.731 \\ 0.747 & 0.595 & 0.654 & 0.621 & 0.624 & 0.544 \\ 0.624 & 0.385 & 0.527 & 0.557 & 0.547 & 0.527 \end{pmatrix}$$

$$\lambda_{\max}^{(5)} = 2.865, \omega_5^1 = \begin{pmatrix} 0.369 \\ 0.321 \\ 0.898 \\ 0.751 \\ 0.624 \\ 0.547 \end{pmatrix};$$

**Make comprehensive evaluation**

Known  $W = (\mu_j)_{1 \times m}$ ,  $R = (r_{ji})_{m \times n}$ , by

$$S = w \circ R = (\mu_1, \mu_2, \dots, \mu_m) \circ \begin{pmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ r_{m1} & r_{m2} & \dots & r_{mn} \end{pmatrix} = (s_1, s_2, \dots, s_n)$$

It can get fuzzy evaluation set  $S$ , from which "o" is fuzzy composition operator. Here take fuzzy operator as  $M(\cdot, \oplus)$  operator, that:

$$s_k = \min \left( 1, \sum_{j=1}^m \mu_j r_{jk} \right), k = 1, 2, \dots, n$$

**Comprehensive evaluation matrix**

By above computed results, it is clear:



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TABLE 6 : University students' English education mode comparison table

Type	General education mode		Happy English teaching mode		Multimedia technology teaching mode	
	Basic work in teaching	Ordinary type theory teaching	Collaborative teaching team	Race against type teaching	Situation into type teaching	Practice teaching
Weight	9.5%	8.3%	26.7%	27.1%	15.8%	12.6%
Total	17.8%		53.8%		28.4%	

Input above computed result into above formula, it can get:

$$S = (0.125 \quad 0.113 \quad 0.357, \quad 0.339 \quad 0.288 \quad 0.241)$$

Get results

By analyzing fuzzy evaluation vector  $S$ , it makes comprehensive conclusion. Generally, it can adopt maximum membership principle, weighted average principle, fuzzy vector uniformization, and here apply maximum membership principle.

For maximum membership principle, if given fuzzy evaluation set  $s = (s_1, s_2, \dots, s_n)$ , (from which  $S_i$  is grade  $v_i$  to fuzzy evaluation set membership),  $M = \max(s_1, s_2, \dots, s_n)$ ,  $M$  corresponding element is comprehensive evaluation result of evaluation, as TABLE 6.

By  $s = (0.095 \quad 0.083 \quad 0.267, \quad 0.271 \quad 0.158 \quad 0.126)$ , it is clear:

Compare three kinds of teaching modes, and make analysis Figure 3:

And further easily know that:

$$M = \max(\text{Happy English teaching mode}) = 0.538$$

University students' English teaching process, happy English teaching mode has higher students' satisfaction degree; its occupied weight is 53.8%. It can be seen that future university students' English education mode

should be major in happy English teaching mode, focus on collaborative type and race against type teaching, let students to get knowledge during collaboration and race, and inspire learning enthusiasm.

Meanwhile, multimedia technology teaching mode also relative occupies higher weight, it is because that situation into type teaching and practice teaching play relative significant roles in innovating classroom teaching, guiding students learning, inspiring students' learning enthusiasm. Therefore, university students English teaching mode redevelopment should on the basis of happy English teaching, combine with multimedia as well as other high technological ways in teaching, so that improve classroom efficiency and let class contents to be more novelty and unique.

CONCLUSION

The paper utilizes fuzzy AHP method to research university students' English teaching mode redevelopment. Firstly, it classifies six kinds of teaching modes that are general education mode, happy English teaching mode and multimedia technology teaching mode such three kinds, and makes use of fuzzy comprehensive evaluation method to evaluate students' satisfaction degree on it and further gets optimal teaching mode.

Secondly, it combines AHP method to define six kinds of teaching modes evaluation matrix, and respectively calculates each teaching mode weight, and finally gets conclusion: collaborative teaching team and race against type teaching that is happy English teaching mode has the highest weight, which also shows the best teaching mode that impels university students' English teaching quality, and changes current stage university students' English generally low status in future is happy English teaching mode. In addition, it should also based on this, combine with multimedia and other high technology, let university students English teaching efficiency

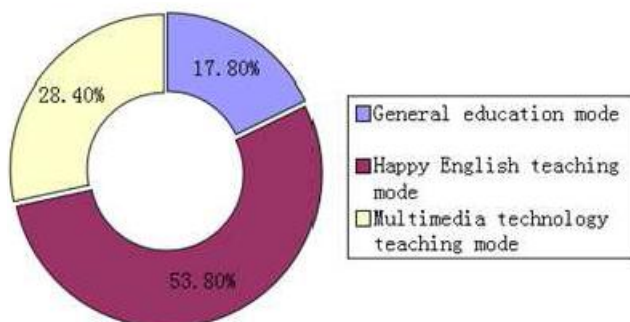


Figure 3 : Three types of college English teaching mode

to be higher, contents to be more novelty, and to be more innovative.

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