Research on the Evaluation Method of College Students' Comprehensive Quality

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Abstract. With the continuous development of society, the progress of science and technology, the demand for talent is gradually to high-quality composite personnel changes. As the key base of talent training, to constantly adjust their own, make the talents to meet the needs of the society and to enable students to better development. This paper studies the evaluation methods of the comprehensive quality of college students and through the analysis of advantages and disadvantages of each evaluation method in the evaluation of comprehensive quality of college students on the AHP and matter-element method, improve the evaluation accuracy and comprehensiveness. The characteristics of university students better, comprehensive quality response of college students more objective.

Introduction

With the continuous development of statistical methods and operational research theory, the comprehensive evaluation method is enriched. Mao army designed a set of College Students' comprehensive quality evaluation index system, using AHP and fuzzy comprehensive evaluation method to measure China [1]. Clustering analysis theory is introduced into the fuzzy comprehensive evaluation, established evaluation of an open model [2]. These research results in a certain extent to solve the problem of the comprehensive quality evaluation of college students but also there are some problems, such as, the index system is not perfect, the evaluation method cannot be quantified in practical significance to decline [3-4].

Previous studies in this paper, on the basis of summing up the characteristics of matter element method combined with the analytic hierarchy process to evaluate the comprehensive quality of college students [5].The fuzzy extension AHP subjective judgment can be given to people, with the interval number instead of constructing judgment matrix which makes the judgment matrix construction more reasonable and objective [6-7].To overcome from AHP and fuzzy subjective judgment method in the selection, the influence of personal preference, make the evaluation results more reasonable and more reference value, to help schools to improve teaching.

Materials and Methods

The Establishment College Students' Comprehensive Quality Evaluation Index. In order to realize the comprehensive quality of college students in the actual situation, selecting indicators which have universal significance. To build a comprehensive evaluation of College Students' quality index system, as shown in Table 1.

Extension Analytic Hierarchy Process. *Structure Judgment Matrix*. The judgment matrix is established, the comprehensive quality evaluation of college students includes quantitative and qualitative indicators, so the use of T. J. Saaty's reciprocal 1~9 scale as the extension judgment based matrix construction. Compared with extension interval judgment matrix A, $A = (a_{ij})_{n \times n}, i, j = 1, 2, ..., n$ and positive and negative matrix for the extension interval number.

Calculation Comprehensive Extension Judgment Matrix and Weight Vector. Let A^+, A^- are respectively the upper and lower ends of the matrix, and the $A^- = \left[a_{ij}^- \right]_{n \times n}, A^+ = \left[a_{ij}^+ \right]_{n \times n}$. The weight vector step for satisfy the consistency condition as follows:

(1)The normalized characteristic value of the maximum of A^-, A^+,is x^-, x^+.

(2)According the $A^- = \left[a_{ij}^- \right]_{n\times n}$, $A^+ = \left[a_{ij}^+ \right]_{n\times n}$ to count k, m.

(3) Calculate the weight vector

$$k = \sqrt{\sum_{j=1}^{n} \frac{1}{\sum_{i=1}^{n} a_{ij}^+}}, m = \sqrt{\sum_{j=1}^{n} \frac{1}{\sum_{i=1}^{n} a_{ij}^-}} \tag{1}$$

$$S = \left(S_1, S_2, \cdots, S_{nk}\right)^T = \left(kx^-, mx^+\right) \tag{2}$$

Table 1.Evaluation index system of College Students' comprehensive quality

Criterion layer	Index layer
school achievement	Public Course
	Specialized basic course
	Elective course
Scientific research ability	Take part in the project
	publish one's thesis
	Consciousness of innovation
Physical and psychological quality	Ideological and moral
	physical quality
	mental health
Level of skill	Computer level
	English ability
	Professional technical level

Hierarchy Total Ordering. Find all $P_h^k = \left(P_{1h}^k, P_{2h}^k, \cdots, P_{n_k h}^k\right)$ where k is the first k layer, h is the first h element, when $h = 1, 2, \cdots, n_{k-1}$ the $n_k \times n_{k-1}$ order matrix is obtained.

$$P^k = \left(P_1^k, P_2^k, \cdots, P_{n_{k-1}}^k\right)^T \tag{3}$$

If the k-1 layer on the total target of the sort of weight vector, then the first k layer on the total target of all elements of the synthesis of the sort W^k given by the next:

$$W^k = \left(W_1^k, W_2^k, \cdots, W_{n_k}^k\right)^T = P^k W^{k-1} \tag{4}$$

Comprehensive Fuzzy Evaluation Method. *Single Factor Fuzzy Evaluation* Single factor fuzzy comprehensive evaluation first determine the set of factors $U = \{u_1, u_2, \cdots, u_n\}$ and evaluation set $V = \{v_1, v_2, \cdots, v_m\}$ which can be evaluated through the evaluation of formation evaluation matrix set each of the elements in the U class: $R = \left(r_{ij}\right)_{mn}, (i = 1, 2, \cdots, m)$.

$$B_1 = \left(w_{l1}, w_{l2}, \cdots, w_{ln}\right) \bullet \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & \vdots & \cdots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix} = \left(\sum_{i=1}^{n} w_{li} r_{i1}, \sum_{i=1}^{n} w_{li} r_{i2}, \cdots, \sum_{i=1}^{n} w_{li} r_{im},\right) = \left(b_{l1}, b_{l2}, \cdots, b_{lm}\right) \tag{5}$$

Comprehensive Evaluation Score If the total score indicates the results of comprehensive evaluation, in accordance with the better principle, evaluation standard of desirable membership sets, μ=(good, good, general, poor, poor) and assign the μ=(1,0.8,0.6,0.4,0.2), then the comprehensive evaluation index score for all levels:

$$G = \mu M \times 100 \tag{6}$$

Example Application Analysis

To determined the relative importance of each index, Table 2.

Table2.The importance of each attribute index to the target layer

	Target layer	School achievement	Scientific research ability	Physical and psychological quality	Level of skill
Teacher	School achievement	1,1	2.3,3.2	4.6,6	3.7,4.7
	Scientific research ability	0.31,0.43	1,1	3.5,4.3	2.9,3.8
	Physical and psychological quality	0.17,0.22	0.23,0.29	1,1	0.3,0.8
	Level of skill	0.21,0.29	0.26,0.34	1.25,3.33	1,1
	Target layer	School achievement	Scientific research ability	Physical and psychological quality	Level of skill
Student	School achievement	1,1	2.25,3.23	4.26,5.8	3.55,4.25
	Scientific research ability	0.31,0.44	1,1	3.3,4.2	2.87,3.6
	Physical and psychological quality	0.17,0.23	0.24,0.30	1,1	0.3,0.85
	Level of skill	0.24,0.28	0.28,0.35	1.18,3.33	1,1

Table 2 According to formula (1) to calculate the comprehensive extension interval judgment matrix point lower A^-, A^+.

$$A^- = \begin{bmatrix} 1 & 2.25 & 4.75 & 4.6 \\ 0.275 & 1 & 3.5 & 2.75 \\ 0.67 & 0.26 & 1 & 0.3 \\ 0.186 & 0.29 & 1.45 & 1 \end{bmatrix}, A^+ = \begin{bmatrix} 1 & 3.25 & 5.5 & 4.94 \\ 0.396 & 1 & 3.85 & 3.45 \\ 0.165 & 0.265 & 1 & 0.65 \\ 0.175 & 0.283 & 2.34 & 1 \end{bmatrix}$$

Calculated by (2) type: $X^- = (0.567, 0.260, 0.071, 0.102)^T$, $X^+ = (0.556, 0.258, 0.073, 0.113)^T$ and $k = 0.873 < 1 < m = 1.018$.

So the consistency of the judgment matrix is better. Thus obtained by formula (3):

$$S_1 = \langle 0.452, 0.578 \rangle, S_2 = \langle 0.234, 0.245 \rangle, S_3 = \langle 0.069, 0.074 \rangle, S_4 = \langle 0.087, 0.126 \rangle.$$

And $V(S_1 \geq S_3) = 56.235$, $V(S_2 \geq S_3) = 29.36$, $V(S_4 \geq S_3) = 5.65$.

According to formula (3): $P_1 = 0.617, P_2 = 0.265, P_3 = 0.137, P_4 = 0.066$. The single ranking of the total target can be got by the criterion layer index: $P = (0.417, 0.265, 0.137, 0.985)^T$. Thus, step by step, the other two indicators of the level of the standard is the weight of the layer, see Table 3.

Results

According to the formula 3~8, the comprehensive score of each index is obtained as $G = (65.12, 54.79, 50.09, 46.27)$, and the value of each criterion layer index of is as follows.

$$W = (W_{B1}, W_{B2}, W_{B3}, W_{B4}) = (0.417, 0.265, 0.137, 0.181).$$

Finally score formula (6) is $G = \mu M \times 100 = 56.92$.

According to some consensus, recognized standards, the comprehensive quality evaluation of college students according to the results of the final score is divided into 5 grades: excellent (80~100), good grade (60~79), intermediate (45~59), poor (35~44), inferior grade (0~34). To sum up, change the students' comprehensive score of 56.92 to the good level range this method, comprehensive consideration of all aspects of students, to provide reference for the cultivation of talents.

Table 3.Evaluation index system and index evaluation grade

Criterion layer	Weight of index layer	Index layer	Weight of index layer	v1	v2	v3	v4	v5
School achievement B1	0.417	Public Course	0.343	0.182	0.236	0.058	0.058	0.114
		Specialized basic course	0.476	0.231	0.237	0.237	0.237	0.236
		Elective course	0.181	0.198	0.000	0.000	0.324	0.179
Scientific research ability B2	0.265	Take part in the project	0.472	0.940	0.019	0.019	0.000	0.483
		publish one's thesis	0.225	0.825	0.223	0.223	0.050	0.260
		Consciousness of innovation	0.303	0.179	0.179	0.235	0.235	0.235
Physical and psychological quality B3	0.137	Ideological and moral	0.400	0.529	0.227	0.243	0.134	0.149
		physical quality	0.370	0.296	0.125	0.053	0.064	0.000
		mental health	0.230	0.764	0.254	0.000	0.000	0.300
Level of skill B4	0.181	Computer level	0.285	0.432	0.065	0.000	0.000	0.013
		English ability	0.472	0.337	0.256	0.212	0.000	0.000
		Professional technical level	0.243	0.278	0.212	0.000	0.000	0.223

Conclusion

In order to make the evaluation method of the operation of scientific, reasonable, effective, must establish and adapt to the environment of teaching and management, in order to facilitate individualized and pay attention to students' personality development, cultivate the spirit of innovation and practical ability, and strive to create a comprehensive optimization of the comprehensive quality of college students. Therefore, colleges and universities should intensify reform efforts, such as the implementation of the complete credit system, reform the existing examination and evaluation system, the implementation of the student management mode from traditional mode to the modern transformation of closed open mode.

Acknowledgements

References

[1] Mao Junquan. *Study on the design and evaluation method of College Students' comprehensive quality evaluation system* [J]. Journal of University of Shanghai for Science and Technology (SOCIAL SCIENCE EDITION), 2002,02:10-13.

[2] Shen Wei. *College students comprehensive quality evaluation research of Fujian* [J]. computer, 2012,01:64-66

[3] Jin Lingling, Wang Wenjun, Wang Xifeng. *The gray fuzzy comprehensive quality evaluation of college students model* [J].computer technology and development, 2012,05:109-112.

[4] Wang Fang, Chen Huaxi, XuXu. *Application of analytic hierarchy process based on triangular fuzzy number in comprehensive quality evaluation of college students* [J]. Journal of Yili Normal University (NATURAL SCIENCE EDITION), 2012,02:14-18.

[5] Dong Zhuoning, Zhang Jiang, Zhang. *Exploration and Research on the implementation methods of* [J].education and construction of College Students' comprehensive quality evaluation system, 2012,12:120-121.

[6] Chen Huaxi, Wang Fang, Wang Yongbin, Cheng Zhilong. *Research on college students comprehensive quality evaluation model based on AHP* [J]. Journal of Shangqiu Normal University, 2011,09:11-15.

[7] Cai Wen, Yang Chunyan. *The basic theory and method of extension theory* [J]. Science Bulletin, 2013,13:1190-1199.