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Research Article

An Improved Performance Evaluation Index System and Fuzzy Evaluation Model of College Students' Ideological and Political Education

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Abstract

As the key to ensure the quality of higher education, the ideological and political education of college students is of great significance to improving the comprehensive quality and competitiveness of top talents so that they can better service the society and promote social development. Through analysis of the problems in the performance evaluation of college students' ideological and political education, this paper unveils an improved performance evaluation index system and fuzzy evaluation model. Firstly, the author discusses the perspective of constructing the evaluation index system, and outlines the perspective of constructing the performance evaluation index system of ideological and political education; secondly, the author selects evaluation indices by analyzing the principle of index selection, and constructs a hierarchal performance evaluation index system of college students' ideological and political education on the basis of the selected indices; thirdly, based on the theory of fuzzy mathematics, the author establishes a fuzzy evaluation model of college students' ideological and political education which gives full consideration to the evaluation indices, realizing the quantitative analysis of the performance of college students' ideological and political education; finally, the author summarizes the features and looks at the prospects of the evaluation index system and the evaluation model.

Keywords

Colleges; Ideological and Political Education • Performance Analysis • Evaluation Index System • Fuzzy Evaluation Model

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With the rapid social development, the ideological and political performance of top talents is playing an increasingly important role in promoting high-level scientific and technological innovation and social advancement. Therefore, more and more importance is being attached to the ideological and political education of college students. Scholars have carried out research and analysis from multiple angles, presenting many valuable findings (Zhang, 2011; She, 2014; Wu & Zhang, 2014; Li, 2012). As the key to ideological and political education, the ideological and political education performance evaluation of college students charts the course for the models, means and methods of implementing college students' ideological and political education in the future, and improves the level of ideological and political education of college students so that these top talents can adapt to social development and serve the society in a better way (Zhang & Liu, 2012; Long, 2013). So far, there has been some research on the performance evaluation of college students' ideological and political education. Achieving fruitful results in the aspects of evaluation systems, strategies and models, the previous research has played a positive role in promoting the ideological and political education of college students. (Guo & Li, 2008; Li, 2008; Yang & Wang, 2010; Li & Ou, 2015). However, due to the complexity of performance evaluation, especially the limitations of existing evaluation systems and models emerging with the rapid social development, this paper probes into the a brand new performance evaluation system of college students' ideological and political education, and constructs a corresponding performance evaluation model on the basis of fuzzy mathematics (Chatterjee, Mukherjee & Kar, 2014; Shidpour, Da Cunha & Bernard, 2016; Ban & Coroianu, 2015).

A New Perspective of Performance Evaluation of College Students' Ideological and Political Education

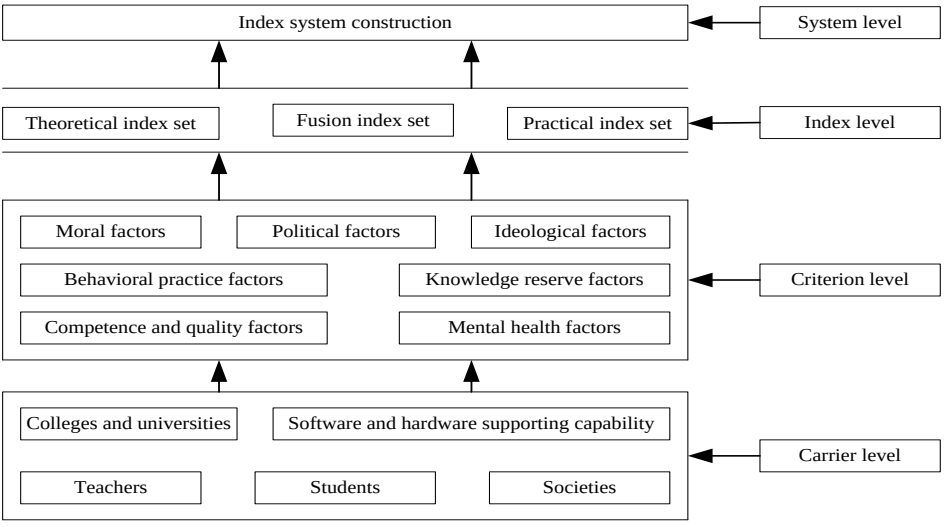

Figure 1. A new perspective of constructing a performance evaluation system of ideological and political education

Previous performance evaluation systems of college students' ideological and political education are often constructed to analyze issues from a single perspective or at a single level. These systems may have some positive effects on the level of ideological and political education. However, their perspectives are too narrow to have a holistic and integrated view of the problems and find a solution to the problems. Lacking completeness and consistency, these evaluation systems can only be applied within limited areas. Ideological and political performance evaluation index system should be constructed in consideration of the theoretical soundness, practical feasibility, and the interaction between the two indices. Besides, it should be noted that these indices are affected by factors like politics, ideology, knowledge reserve, capacity and quality, moral character, mental health, and behavior, and these factors are closely bounded up with a variety of carriers, such as colleges, the society, teachers, students, software, hardware, etc. To make the results of performance evaluation more scientific, objective and accurate, the performance evaluation systems of college students' ideological and political education should be established from a holistic and integrated perspective. To this end, this paper, through comprehensive analysis and reference to the existing research results, provides a new perspective of constructing a performance evaluation system of college students' ideological and political education. See Figure 1.

Performance Evaluation Index System of College Students' Ideological and Political Education

Principles of index selection

The performance evaluation indices of college students' ideological and political education should be selected in the following principles:

(1) The principle of scientificity: To ensure the scientific nature of the evaluation, the evaluation indices should be selected properly, rationally in accordance with scientific laws.

(2) The principle of objectivity: To ensure the objectivity and authenticity of the evaluation results, the evaluation indices should be selected in view of the reality and in exclusion of subjective factors.

(3) The principle of hierarchy: Since single-level evaluation indices often fail to clearly describe the evaluation contents of complex problems, thus affecting the effectiveness of the evaluation results, the evaluation indices should be rendered into a hierarchical structure to improve the credibility of the evaluation results.

(4) The principle of relevance: To effectively improve the accuracy of the evaluation results, the evaluation indices should be selected in consideration of the relevance and integration between difference sets of evaluation indices, achieving a clear, modular representation of the relationship.

(5)The principle of integrity and completeness: To make the evaluation results more authentic, the evaluation indices should be selected from the overall perspective. The indices should be consistent, and capable of reflecting the different levels and sides of the overall situation.

(6) The principle of operability: To improve the reliability of the evaluation results, the evaluation indices should be selected with the aim to quantify the evaluation results.

Construction of evaluation index system

Table 1
Performance Evaluation Index System of College Students' Ideological and Political Education

Primary Indices	Secondary Indices	Tertiary Indices
Theoretical Soundness	Curriculum Setting	Plan Rationality
		Curriculum Systematicness
		Contemporariness
		Scientific Development
		Clarity of Purpose
	Demonstration by Teaching Process	Teaching Measures
		Teaching Methods
		Teaching Ways and Means
		Teaching Ability
		Teaching Quality and Attitude
		Teaching Contents
	Teaching Effect	Social Satisfaction
		Overall Quality Improvement
		Student Satisfaction
		Actual Progress Against the Plan
Practical Feasibility	Planning of Practical Activities	Rationality
		Scientificity
		Contemporariness
		Expansibility
	Implementation of Practical Activities	Appraisal Mode
		Practical Teaching Contents
		Practice Approaches
		Practice Contents and System
		Practice Management Mechanism
		System of Practice Methods
	Effect of Practical Mode	Practice Quality Improvement
		Practice Ability Improvement
		Practical Innovation Ability
		Social Service Capacity
Integration Capacity	Integration of Implementation Processes	Scientificity and rationality of Institutional Settings
		Institutional Perfection and Development
		Staffing
		Mission Planning
	Platform Construction	Unity of Theory and Practice
		Construction and Improvement of Excellent Courses
		Quality of Supporting Software and Hardware
		Social Services
	Integration of Plan Implementations	Systematicness
		Innovation
		Effectiveness
		Scientificity
	Integration of Carriers	Consistency
		Adaptability
		Rationality
		Soft and Hard Power Integration
		Internal and External Environment Integration
	Integration Results	Demonstration by Scientific Research Results
		Demonstration by Educational Reform Results
		Rate of Outstanding Talents
		Ideological Improvement
		Political Consciousness Improvement
		Morality Improvement
		Mental Health
		Practicality

Selection of evaluation indices

The performance evaluation indices of ideological and political education are selected from three perspectives, namely the theoretical soundness of ideological and political education, the practical feasibility of ideological and political education, and the integration capacity of ideological and political education.

The theoretical soundness of ideological and political education mainly focuses on theory teaching, including curriculum setting, demonstration by teaching process, and the teaching effect.

The practical feasibility of ideological and political education mainly focuses on practical teaching, including the planning and implementation of practical activities, and the effect of the practice mode.

The integration capacity of ideological and political education mainly focuses on the interaction between the theoretical soundness and practical feasibility, including the integration of institutional and systematic sophistication, platform construction and execution, the integration of plan implementations, the integration of carriers, and demonstration by integration results.

The author further refines the above performance evaluation indices and establishes an improved, hierarchal performance evaluation index system of college students' ideological and political education. See Table 1 for specific contents and hierarchies.

Fuzzy Evaluation Model of College Students' Ideological and Political Education

Because of the fuzziness of the performance evaluation indices of college students' ideological and political education, this paper uses the triangular fuzzy numbers to build a model for the performance evaluation of college students' ideological and political education (Molinari, 2016; Chandra & Aggarwal, 2015; Liao & Chen, 2015).

The concept of triangular fuzzy numbers

If $b = (b^1, b^2, b^3)$, and $0 \le b^1 \le b^2 \le b^3)$, $b = (b^1, b^2, b^3)$ is called a triangular fuzzy number, abbreviated as. Its corresponding fuzzy membership function $\theta_b(x)$ is expressed as:

$$\theta_b(x) = \begin{cases} 0, x \le b^1 \\ \dfrac{x - b^1}{b^2 - b^1}, b^1 \le x \le b^2 \\ \dfrac{b^3 - x}{b^3 - b^2}, b^2 \le x \le b^3 \\ 0, x \ge b^3 \end{cases}$$

If there are two triangular fuzzy numbers $\tilde{b} = (b^1, b^2, b^3)$ and $\tilde{a} = (a^1, a^2, a^3)$, the following operation is satisfied:

(1) Addition

$$\tilde{b} + \tilde{a} = (b^1 + a^1, b^2 + a^2, b^3 + a^3)$$

(2) Scalar Multiplication

$$k * \tilde{b} = (k * b^1 + k * b^2 + k * b^3)$$

Where, k is a real number.

(3) Multiplication

$$\tilde{b} * \tilde{a} = (b^1 * a^1, b^2 * a^2, b^3 * a^3)$$

(4) Division

$$\tilde{b}/\tilde{a} = (b^1/a^3, b^2/a^2, b^3/a^1)$$

Triangular fuzzy number normalization for performance evaluation indices

During the performance evaluation of college students' ideological and political education, the diversified indices often have different dimensions. To make effective measurement, these indices should be normalized.

Assuming that the number of performance evaluation objects is *M*, the number of indices of the evaluation is *N*, and the triangular fuzzy value of the evaluation object *i* with respect to the index *j* is $\tilde{v}_{ij}(v_{ij}^1, v_{ij}^2, v_{ij}^3)$. If the index is a benefit-oriented decision-making index, the normalized triangular fuzzy value is $\tilde{r}_{ij}(r_{ij}^1, r_{ij}^2, r_{ij}^3)$, i.e.:

$$\tilde{r}_{ij}\left(r_{ij}^1, r_{ij}^2, r_{ij}^3\right) = \left(\frac{v_{ij}^1}{\max\limits_{1\le i\le M}\left(v_{ij}^3\right)}, \frac{v_{ij}^2}{\max\limits_{1\le i\le M}\left(v_{ij}^3\right)}, \frac{v_{ij}^3}{\max\limits_{1\le i\le M}\left(v_{ij}^3\right)}\right)$$

If the index is a cost-oriented decision-making index, the normalized triangular fuzzy value is$\tilde{r}_{ij}\left(r_{ij}^1, r_{ij}^2, r_{ij}^3\right)$, i.e.:

$$\tilde{r}_{ij}\left(r_{ij}^1, r_{ij}^2, r_{ij}^3\right) = \left(\frac{\min\limits_{1\le i\le M}\left(v_{ij}^1\right)}{v_{ij}^3}, \frac{\min\limits_{1\le i\le M}\left(v_{ij}^1\right)}{v_{ij}^2}, \frac{\min\limits_{1\le i\le M}\left(v_{ij}^1\right)}{v_{ij}^1}\right)$$

The above normalization ensures that the triangular fuzzy number $\tilde{r}_{ij}\left(r_{ij}^1, r_{ij}^2, r_{ij}^3\right)$ satisfies the requirement of $0 \le r_{ij}^1 \le r_{ij}^2 \le r_{ij}^3 \le 1$, that is, all triangular fuzzy numbers have a uniform scale, which guarantees the reliability of the analysis results.

Similarity of triangular fuzzy numbers

After the data statistics and analysis, the author acquires the triangular fuzzy value of different indices. With these indices, the author constructs the initial triangular fuzzy number matrix *V* for the performance evaluation of college students' ideological and political education.

$$\mathbf{V}=\begin{bmatrix} \tilde{v}_{11} & \cdots & \tilde{v}_{1j} & \cdots & \tilde{v}_{1N} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \tilde{v}_{i1} & \cdots & \tilde{v}_{ij} & \cdots & \tilde{v}_{iN} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \tilde{v}_{M1} & \cdots & \tilde{v}_{Mj} & \cdots & \tilde{v}_{MN} \end{bmatrix}$$

After normalization, the normalized triangular fuzzy number matrix R is obtained:

$$\mathbf{R}=\begin{bmatrix} \tilde{r}_{11} & \cdots & \tilde{r}_{1j} & \cdots & \tilde{r}_{1N} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \tilde{r}_{i1} & \cdots & \tilde{r}_{ij} & \cdots & \tilde{r}_{iN} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \tilde{r}_{M1} & \cdots & \tilde{r}_{Mj} & \cdots & \tilde{r}_{MN} \end{bmatrix}$$

The author selects the maximum value on each row of the triangular fuzzy number matrix R, thus getting the optimal triangular fuzzy values of different indices. The optimal triangular fuzzy numbers of the indices are denoted as $\tilde{u}_{ij}\left(u_{ij}^1, u_{ij}^2, u_{ij}^3\right)$, i.e.

$$\tilde{u}_{ij}\left(u_{ij}^1, u_{ij}^2, u_{ij}^3\right) = \left(\max_{1\le i\le M}\left(r_{ij}^1\right), \max_{1\le i\le M}\left(r_{ij}^2\right), \max_{1\le i\le M}\left(r_{ij}^3\right)\right)$$

Hence, the similarity between the triangular fuzzy value of the evaluation object i with respect to the index j and the optimal triangular fuzzy number $\tilde{u}_{ij}\left(u_{ij}^1, u_{ij}^2, u_{ij}^3\right)$ can be expressed as λ_{ij}^1:

$$\lambda_{ij}^1 = \frac{r_{ij}^1 * u_{ij}^1 + r_{ij}^2 * u_{ij}^2 + r_{ij}^3 * u_{ij}^3}{\max[\left(r_{ij}^1\right)^2 + \left(r_{ij}^2\right)^2 + \left(r_{ij}^3\right)^2, \left(u_{ij}^1\right)^2 + \left(u_{ij}^2\right)^2 + \left(u_{ij}^3\right)^2]}$$

Or, the similarity between the triangular fuzzy value of the evaluation object *i* with respect to the index *j* and the optimal triangular fuzzy number $\tilde{u}_{ij}\left(u_{ij}^1, u_{ij}^2, u_{ij}^3\right)$ can be expressed as λ_{ij}^2:

$$\lambda_{ij}^2 = \frac{\min[\left(r_{ij}^1\right)^2 + \left(r_{ij}^2\right)^2 + \left(r_{ij}^3\right)^2, \left(u_{ij}^1\right)^2 + \left(u_{ij}^2\right)^2 + \left(u_{ij}^3\right)^2]}{r_{ij}^1 * u_{ij}^1 + r_{ij}^2 * u_{ij}^2 + r_{ij}^3 * u_{ij}^3}$$

In application, the analyzer can either choose to use one of expression, or obtain a similarity λ_{ij} through comprehensive treatment of the two expressions, i.e.:

$$\lambda_{ij} = \lambda_{ij}^1 + (1-\xi) * \lambda_{ij}^2$$

Where, $0 \le \xi \le 1$.

Performance evaluation model of college students' ideological and poitical education

From above, the author obtains γ_i, the similarity between the triangular fuzzy value of each evaluation object with respect to a certain index and the optimal triangular fuzzy number $\tilde{u}_{ij}\left(u_{ij}^1, u_{ij}^2, u_{ij}^3\right)$:

$$\gamma_i = \sum_{j=1}^{N} (w_j * \lambda_{ij})$$

Thereby, the author establishes the performance evaluation model of college students' ideological and political education, i.e.;

$$\gamma_{max} = \max_{1 \le i \le M} (\gamma_i = \sum_{j=1}^{N} (w_j * \lambda_{ij})) = \gamma_k$$

k stands for the object with the optimal performance.

Steps of model implementation

To sum up, the model implementation steps can be expressed as follows:

(1) In light of the actual situation, select the reasonable evaluation indices targeted at the needs of the performance evaluation of college students' ideological and political education.

(2) Obtain the triangular fuzzy value of each performance evaluation object with respect to the indices, forming the initial triangular fuzzy number matrix.

(3) Normalize the initial data according to the type of the index and the triangular fuzzy number normalization model, acquiring the normalized triangular fuzzy number matrix *R*.

(4) Obtain the optimal triangular fuzzy numbers of the indices based on triangular fuzzy number matrix *R*.

(5) According to the calculation model for the similarity between triangular fuzzy numbers, obtain the similarity between the triangular fuzzy value of each evaluation object with respect to a certain index and the optimal triangular fuzzy number.

(6) Select the appropriate weight acquisition method to determine the weight of different indices.

(7) Calculate the comprehensive similarity between different performance evaluation objects with respect to a certain index and the optimal triangular fuzzy number.

(8) Based on the performance evaluation model of university students' ideological and political education, analyze the comprehensive similarity and obtain the evaluation object with the best performance.

Conclusion and Prospect

This paper has two innovations during the preliminary discussion and the analysis of the performance evaluation of college students' ideological and political education. this main innovation spot manifests in two aspects.

(1) From a more scientific, holistic, comprehensive and objective perspective, the author gives a new performance evaluation index system of college students' ideological and political education, and carries out comprehensive analysis of the theoretical soundness, practical feasibility and integration capacity of ideological and political education.

(2) To ensure the practicality and reliability of the evaluation results, the author provides an improved fuzzy evaluation model of college students' ideological and political education, and conducts quantitative analysis of performance evaluation indices of various forms and types.

With the rapid social development, the existing evaluation index systems and models of ideological and political evaluation may more or less have limitations. Therefore, the systems and models ought to be improved and developed with the time. Keeping abreast with the times is the only way to effectively promote the capacity and level of ideological and political education.

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