

Evaluation Method of Implementation Effect of Innovation and Entrepreneurship Education Path in Colleges and Universities under the Background of Innovation and Entrepreneurship

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Abstract: In the traditional evaluation method of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship, the evaluation results are low in accuracy due to the inexact division of evaluation indicators. Therefore, a evaluation method of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship is proposed. By constructing evaluation indicator system of university creative education path effect, in view of the evaluation indicator, construct the judgment matrix, determine the weight of each indicator, check its consistency, aftercheckout, bids for evaluation indicator, and calculate the evaluation score, and the design of the evaluation method of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship is completed. Compared with the traditional evaluation method of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship, the experimental results show that the proposed evaluation method of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship has higher evaluation accuracy.

Keywords: Innovation and entrepreneurship; Innovation and entrepreneurship education; Implementation effect; Evaluation

1. Introduction

At present, with the improvement of economic level and scientific and technological creativity of all countries in the world, the demand for innovative talents is increasing. As an important place to cultivate talents, colleges and universities should shoulder the responsibility of cultivating innovative talents. Therefore, both domestic and foreign universities attach great importance to innovation and entrepreneurship education. In 2014, premier Ke-qiang Li put forward the call of "mass innovation", "innovation for everyone" and "grassroots entrepreneurship" [1-3]. Innovation and entrepreneurship mainly refers to innovation and entrepreneurship. In the 2015 government work report, "mass entrepreneurship and innovation" is taken as an important strategic measure for the development of economy, education and science and technology; on the other hand, it is an important way to relieve the sharp increase of college graduates, entrepreneurship can promote employment and promote the in-depth devel-

opment of colleges and universities [5-7]. Seeking reasonable theoretical support, exploring effective implementation paths of innovation and entrepreneurship education in colleges and universities, and promoting the sustained and vigorous development of mass entrepreneurship and innovation are the key to carrying out innovation and entrepreneurship talent training at present [8]. The evaluation of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship can provide certain basis for promoting the implementation effect of innovation and entrepreneurship education path in colleges and universities [9]. However, the existing evaluation method for the implementation effect of innovation and entrepreneurship education in colleges and universities still has the problem of low evaluation accuracy, which needs to be further studied [10]. Based on the above analysis, a evaluation method of the implementation effect of innovation and en-

entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship is proposed.

2. Evaluation Method of the Implementation Effect of Innovation and Entrepreneurship Education Path in Colleges and Universities under the Background of Innovation and Entrepreneurship

AHP is adopted to design the evaluation method of the implementation effect of innovation and entrepreneurship

education path in colleges and universities under the background of innovation and entrepreneurship. The specific content is shown below.

2.1. Construction of the implementation effect evaluation system of innovation and entrepreneurship education path in colleges and universities

Firstly, the evaluation indicator system of the implementation effect of innovation and entrepreneurship education path in universities is constructed, it is shown in table 1.

Table 1. Evaluation indicator system of implementation effect of innovation and entrepreneurship education path in colleges and universities

Items	Primary indicators	Secondary indicators	Tertiary indicators
Evaluation indicator system of implementation effect of innovation and entrepreneurship education path in colleges and universities	Education influence	Education content	Innovation and entrepreneurship education program
			Educational materials for innovation and entrepreneurship
		Teaching conditions	Innovation and entrepreneurship education courses
			Innovation and entrepreneurship education infrastructure
	Teaching staff	Teachers constitute	Special funds for innovation and entrepreneurship education
			The proportion of "double-qualified" teachers
		achievements in scientific research	The proportion of teachers receiving innovation and entrepreneurship training
			Number of papers on innovation and entrepreneurship
	Student satisfaction	Innovation and entrepreneurship teaching effect	Citations of papers on innovation and entrepreneurship
		Personal ability improvement	Teaching satisfaction
			Student performance
	Student performance and outcomes	Creativity	Improvement of entrepreneurial ability
			Improvement of innovation ability
		Entrepreneurship	Quantity of innovation achievements
			Participation rate of innovation and entrepreneurship
			Reward rate of innovation and entrepreneurship activities
		Success rate of innovation and entrepreneurship projects	

As shown in figure 1, the establishment of the innovation of colleges and universities entrepreneurship education path effect evaluation indicator system including four primary indicators (education influence, teaching staff, student satisfaction, student performance and outcomes), the primary indicators are divided into multiple secondary indicators, then the secondary indicators are divided into multiple tertiary indicators, it makes the evaluation index system of the implementation effect of innovation and entrepreneurship education in colleges and universities more perfect.

2.2. Construction of judgment matrix

Each indicator in the evaluation system of the implementation effect of innovation and entrepreneurship education path in colleges and universities is regarded as an element, which can be divided into pro-element and sub-element according to the relationship between the target layer and sub-layer. For sub-elements B_1, B_2, \dots, B_n ,

comparing them in pairs and construct the judgment matrix as shown in formula (1) :

$$B = \begin{pmatrix} 1 & b_{12} & b_{1i} & b_{1j} & b_{1n} \\ b_{21} & 1 & b_{2i} & b_{2j} & b_{2n} \\ & \cdot & & \cdot & \\ b_{i1} & b_{i2} & 1 & b_{ij} & b_{in} \\ & \cdot & & \cdot & \\ b_{j1} & b_{j2} & b_{ji} & 1 & b_{jn} \\ & \cdot & & \cdot & \\ b_{n1} & b_{n2} & b_{ni} & b_{nj} & 1 \end{pmatrix} \quad (1)$$

In formula (1), $b_{ij} (b_{ij} > 0)$ represents the relative importance level of indicator i to indicator j , and the diagonal elements of the matrix are all 1, that is, the indicator i are equally important compared with themselves, and n order indicates that there are n indicator. The greater the

value of b_{ij} , the greater the importance of element B_i relative to B_j . In order to ensure its scientific nature and avoid individual subjective decisions, it is necessary to conduct a questionnaire survey on experts working on decision-making objectives in order to understand their judgment on the relative importance of each factor, and establish judgment matrix at all levels by using pairwise

comparison data of experts. In the questionnaire, the scale of the degree of comparison should be explained at first. The scale contains five grades of judgment accuracy: equal, relatively strong, strong, very strong and absolutely strong. At the same time, judgment values are set between each adjacent grade to finally form a coherent judgment scale of nine values, as shown in figure 1.

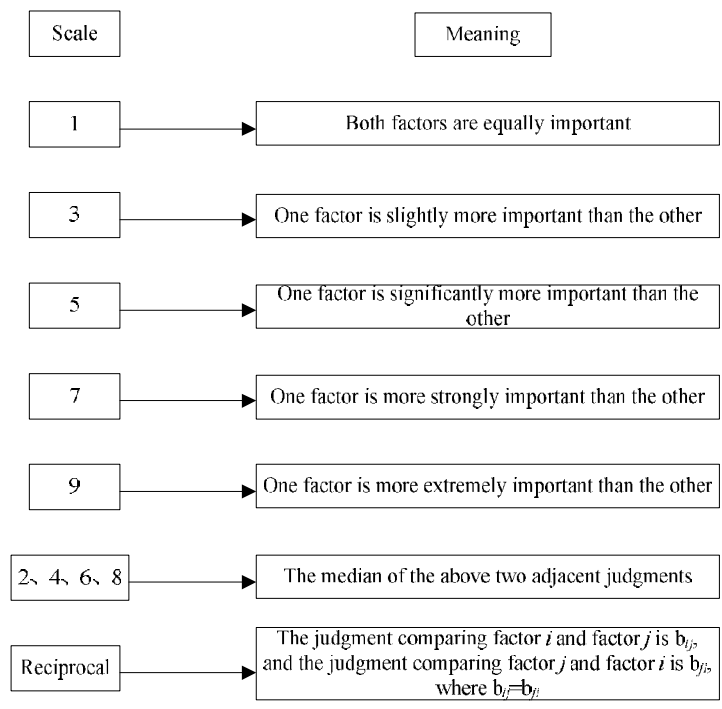


Figure 1. Scale of judgment matrix is meaning

As shown in figure 1, scale 1 represents the two factors of equal importance for comparison; Scale 3 means that when two factors are compared, one factor is slightly more important than the other. Similarly, scale 5, 7 and 9 respectively represent pairwise comparison, which is a judgment value that one factor is more important than the other. Two, four, six, and eight represent the median for each adjacent scale. Based on the hierarchical structure of the implementation effect evaluation system of the path of innovation and entrepreneurship education in colleges and universities, the judgment matrix of each level is established by the above pair comparison method.

2.3. Determination of indicator weight

Through the processing of judgment matrix, the weight value of the order of importance of each element in this level can be determined, and then the weight value of the importance of all elements can be calculated. The weight value can be obtained by the characteristic root method.

The key to the weight value obtained by the characteristic root method is the eigenvector:

$$B_w = \lambda_{\max} w \tag{2}$$

In formula (2), λ_{\max} represents the maximum characteristic quantity of the judgment matrix B , whose value is n , and w is the eigenvector corresponding to the maximum characteristic root. After the standardization of w , the weight value of each element can be obtained. It can be seen that the most fundamental task of calculating the importance of factors is to find the maximum characteristic root of the judgment matrix and its corresponding eigenvector. The calculation of the maximum characteristic root and eigenvectors of the judgment matrix can be obtained by the linear algebra knowledge or the product method. The specific calculation steps of the summation product method for the eigenvectors of judgment matrix are as follows:

Normalize the elements in b according to the column, namely:

$$\bar{b}_{ij} = \frac{b_{ij}}{\sum_{k=1}^5 b_{kj}} \quad (3)$$

Add the columns of the same row of the normalized matrix, namely:

$$\bar{W}_i = \sum_{j=1}^n \bar{b}_{ij}, \quad i=1, 2, \dots, n \quad (4)$$

Normalize the weight vector W_i , namely:

$$W_i = \frac{\bar{W}_i}{\sum_{i=1}^n \bar{W}_i} \quad (5)$$

Through formula (5), the weight vector of each indicator, namely the eigenvector of the judgment matrix, can be calculated. Through the ranking value of each indicator, the eigenvector of each element in the other judgment matrix can be calculated, and the weight of each indicator can be determined through the calculation of importance.

2.4. Consistency test

In order to judge whether the constructed judgment matrix has a high consistency, the consistency test is carried out to judge the logical rationality of the constructed judgment matrix, so as to ensure that the subsequent research results are reasonable and effective. The steps for consistency test are as follows:

Find the consistency indicator CI :

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (6)$$

Find the average random consistency indicator RI , which can be obtained by looking up figure 2.

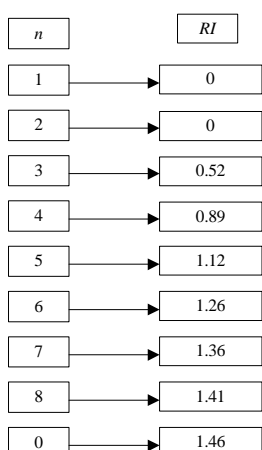


Figure 2. Value of average random consistency indicator

Calculate consistency ratio CR :

$$CR = \frac{CI}{RI} \quad (7)$$

According to CR value obtained, the smaller the CR value, the better the consistency of the judgment matrix. When $CR < 0.1$, the constructed judgment matrix is considered to be meaningful and its consistency test is in line with the standard. When $CR \geq 0.1$, it indicates that the practical guidance of the constructed judgment matrix is not yet ideal and needs to be adjusted again.

2.5. Assignment and calculation of evaluation indicators

After the consistency test meets the standard, the final score of the implementation effect of innovation and entrepreneurship education path in colleges and universities is calculated by assigning scores to the evaluation indicators. First of all, the evaluation indicators are assigned. The assignment of indicators at all levels is shown in figure 3.

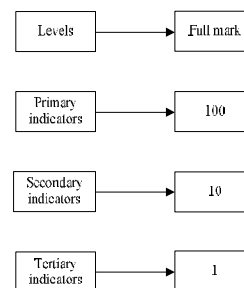


Figure 3. Indicator assignment at each level

Then, determine the weight score as shown in formula (8) :

$$E_i = P \times w_i \quad (8)$$

In formula (8), E_i represents weight score, P represents indicator score, and w_i represents weight coefficient. Finally, formula (9) is used to obtain the total score E of the implementation effect of innovation and entrepreneurship education paths in colleges and universities under the background of mass entrepreneurship and innovation:

$$E = \sum_{i=1}^n E_i \quad (9)$$

According to formula (9), the evaluation score of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of mass entrepreneurship and innovation is calculated.

Thus, the design of evaluation method of the implementation effect of innovation and entrepreneurship educa-

tion path in colleges and universities under the background of innovation and entrepreneurship is completed.

3. Experiment

Using the proposed evaluation method of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship, and taking 5 colleges and universities as examples to evaluate the implementation effect of innovation and entrepreneurship education path, and making a comparison with the traditional evaluation method of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship.

3.1. Experimental process

Five universities are selected to obtain relevant data on the implementation effect of innovation and entrepreneurship education paths in universities under the background of innovation and entrepreneurship. After obtain-

ing the data, constructing a judgment matrix to determine the weight of each index, calculating the score of the evaluation indicator, and the evaluation result of the implementation effect of the path of innovation and entrepreneurship education in colleges and universities under the background of innovation and entrepreneurship is obtained. The evaluation results are compared with the traditional evaluation methods 1 and 2 for the implementation effect of innovation and entrepreneurship education in colleges and universities under the background of innovation and entrepreneurship, and with the actual values obtained by various methods, and the evaluation accuracy of the evaluation results obtained by different evaluation methods is compared.

3.2. Experiment results and analysis

The comparison between the evaluation results obtained by the proposed evaluation method, traditional evaluation method 1 and traditional evaluation method 2 and the actual value is shown in figure 4.

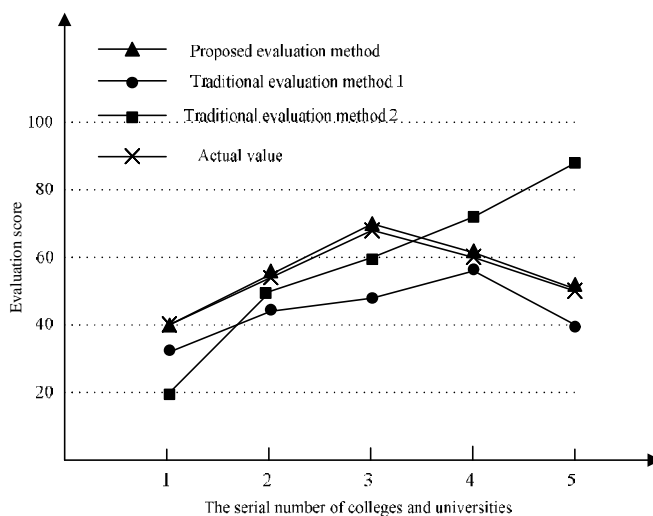


Figure 4. Comparison of evaluation results

As can be seen from figure 4, using the traditional evaluation method 1, only the scores of colleges and universities 5 differ greatly from the actual value, while using the traditional evaluation method 2, only the scores of universities 2 are relatively close to the actual value. By using the proposed evaluation method, the evaluation score curve of the five universities is almost consistent with the actual value curve. Through comparison and discovery, the proposed evaluation method obviously improves the accuracy of the evaluation results by dividing the evaluation system indicators carefully and then

calculating them, indicating that it can evaluate the implementation effect of innovation and entrepreneurship education path in colleges and universities more efficiently under the background of innovation and entrepreneurship.

4. Conclusions

The traditional evaluation method of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship has the problem of low

accuracy of evaluation, through the analytic hierarchy process (AHP) to establish an evaluation indicator system of implementation effect of innovation and entrepreneurship education path in colleges and universities, a evaluation method of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship is designed. Compared with the traditional evaluation method of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship, the experimental results show that the proposed evaluation method of the implementation effect of innovation and entrepreneurship education path in colleges and universities under the background of innovation and entrepreneurship has higher evaluation accuracy, and it is hoped that it can be widely applied.

References

- [1] Tian Jingjing, Li Xinyu, Wang Yixun, et al. Investigation and suggestion on innovative entrepreneurship education in shaanxi applied universities from the perspective of promoting employment. *The Theory and Practice of Innovation and Entrepreneurship*. 2019, 2(07), 92-94.
- [2] Niu Fengrui. The path and perfection of innovation entrepreneurship education in local universities under the background of new normal in economy — taking Fuzhou University as an example. *Journal of North China University of Water Resources and Electric Power (Social Sciences Edition)*. 2018, 34(02), 101-104.
- [3] Ge Hui, Xu Kexin. A research on the construction of innovation and entrepreneurship education system in transforming colleges and universities - Taking Jining Normal University as an example. *Journal of Jining Normal University*. 2019, 41(02), 99-103.
- [4] Wu Jiaqing. The path of innovation and entrepreneurship education in application-oriented universities under the background of new engineering. *Journal of Changchun Institute of Technology (Social Science Edition)*. 2019, 20(02), 120-123.
- [5] Zheng Yongsen, Zhang Renkui. Innovation & entrepreneurship education evaluation system for higher institutions. *Journal of Shenzhen Polytechnic*. 2019, 18(04), 67-71.
- [6] Huang huifu, Zhao congcong. Exploration of education reform of food specialty in university under the background of innovation and entrepreneurship. *Journal of Qujing Normal University*. 2018, 37(06), 96-99.
- [7] He Yiqing, Huang Zhexing, Lin Xuechun, et al. Research on the influence factors upon the education and actions of "innovation and entrepreneurship" of college students——based on structural equation model. *Mathematics in Practice and Theory*. 2019, 49(11), 237-244.
- [8] Lin Xiaolan. Research on reform of innovation and entrepreneurship course system in private colleges under the background of "double creation". *Journal of Shandong Agricultural Administrators' College*. 2019, 36(04), 127-128.
- [9] Xie Pingjuan, Deng Zhenhua. Analysis of problems and countermeasures of innovation and entrepreneurship education in applied vocational colleges. *Journal of Beijing Vocational College of Finance and Commerce*. 2019, 35(03), 50-55,24.
- [10] Zhao Yumei, Zhang Kai, Li Peiyuan. Problems and solutions of innovation and entrepreneurship education in applied undergraduate colleges. *Journal of North China Institute of Aerospace Engineering*. 2019, 29(02), 23-25.