

## **Evaluation System and Its Empirical Analysis of Students' Practical Ability for Application-oriented University**

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**Abstract.** There are many literatures on college students' practical ability, but the relevant empirical research methods are very few. From the views of the basic practical ability, professional practical ability and innovative practice ability, a practical ability evaluation system is established for students majoring in economic management. And then the interval number TOPSIS method has been carried on the related empirical studies. The results show that the application of this method can effectively reduce the subjectivity of qualitative index assignment, and this method has good feasibility and validity.

### **Introduction**

Since the medieval times in the Europe, it has been one of the most important missions for universities and colleges to cultivate talents through education. However, the higher education of China has been paying more attention on the cognitive knowledge than the practical ability which results in the separation between the talents and the social requirements and affects the employment and adaptation of students in the society. Researches on fostering the practical ability of students thus be done on three main aspects: the analysis on the content, structure and influence factors of the practical ability; the construction of an evaluation system on the practical ability which is conducted according to different standards like majors or degrees; and the building of such system to update the practical ability of the college students.

This paper seeks to establish a practical ability evaluation system of students majoring in economic management for application-oriented universities. Fuzzy comprehensive evaluation based on the interval numbers will be used in the study.

### **The Establishment of A Practical Ability Evaluation System**

Analysis to the relevance theory shows that the practical ability of a college students usually consists of two parts: the internal and the external structure. The internal structure refers to the interests, understanding, planning ability, execution, expression and so on of a

student and the relationships between them while the structure of the external ability is determined by the features of different majors. Both structures can be further divided into three parts: the basic practical ability, the comprehensive practical ability and the innovative practical ability to form the whole evaluation system. Based on such theory, considering the features of the economic management majored talents in application-oriented universities and the results of some talents culturing activities took place in the Beijing Union University, this paper establishes a practical ability evaluation system according to the basic practical ability, the professional practical ability and the innovative practical ability of students, as is shown in Table 1:

**Table 1 The Indexes and Description of the Practical Ability Evaluation System**

Destination Layer	First-class Indexes	Second-class Indexes	Index Weight	Index Number	Index Description
Indexes of the Practical Ability of Economic Management Majored Students	Innovative Practical Ability	Innovative Consciousness and Ability of Thinking	0.0653	C1	Evaluation on the critical thinking, innovation, imagination, logical thinking, etc.
		Ability of Leadership and Organization	0.0972	C2	Position in the class, student societies and student activities
		Interdisciplinary Ability	0.0641	C3	Learning and application of knowledge like Computer Science, Economic, Management, Engineering, Humanities, Law and son on
		Participation of Innovative and Practical Activities	0.0826	C4	Results of various competitions on profession and of innovation and entrepreneurship
	Professional Practical Ability	Fundamental Knowledge and Professional Skills	0.0462	C5	Grades on fundamental classes
		Ability of Applying Professional Knowledge	0.0929	C6	Grades on professional training classes and practice classes
		Ability of Expanding	0.0552	C7	Paper publishing, summer social practice and professional

		Professional Knowledge			certifications
		Professional Ethics and Personal Integrity	0.0558	C8	Comprehensive evaluations on the attitude towards work, job and personal qualities
	Basic Practical Ability	Learning Ability	0.0436	C9	Comprehensive evaluation on learning consciousness, habit and approaches
		Communication Ability	0.0698	C10	Comprehensive evaluation on communication skills and interpersonal relationship
		Cooperation Ability	0.0825	C11	Evaluation on team spirit and cooperation skills
		Adaptation Ability	0.0582	C12	Ability to adapt to a new environment and play the role
		Ability of Using Computers and Searching for Information	0.0572	C13	Comprehensive evaluation on the ability to use computer, search for information and process text
		Writing Ability	0.0754	C14	Writing ability of research reports, working reports and project plans
		Foreign Language Ability	0.0540	C15	Based on the test grade of CET4&6

## **The Evaluation Approach Based on Interval Number TOPSIS and Index Assignment**

### **The Selection of Evaluation Approaches**

When conducting empirical evaluation on the practical ability of students, three aspects are involved: the weighting of indexes, the assignment of indexes and the selection of evaluation approaches.

As to the weighting of indexes, this paper adopted the commonly used analytic hierarchy process in the multi-attribute decision-making. To reduce the subjectivity of results, the weighting of indexes is conducted by five staff of teaching and employment management using analytic hierarchy process, making the average weights of the five staff the weights of indexes. The final weights of the indexes are provided in the Table 1.

As to the assignment of indexes, since most of the indexes are qualitative, fuzzy evaluation is often adopted in such comprehensive evaluation, with numbers 1-10 to represent the value of indexes and the level of abilities. The bigger the number, the higher the level of the ability will be. However, if the valuator does not know the student who is evaluated well or he/she has not very much opportunities to perform some of the abilities, the accuracy of values the valuator given will be affected. Under this circumstance, the valuator can evaluate the abilities of the students with interval numbers. For example, the interval number [6,8] represents that the value of the student who is evaluated is between 6-8, which can reduce the subjectivity of values.

As to the election of the evaluation approaches, considering that interval numbers are employed when assigning indexes, we have chosen interval number TOPSIS method to carry on the comprehensive evaluation of the practical ability of the college students. TOPSIS method is widely adopted in the multi- indexes evaluation.

### **The Assignment Approach of the Indexes**

The assignment of the indexes of the Practical Ability of Economic Management Majored Students here is also conducted with interval numbers. In the 15 indexes in Table 1, we definite the Participation of Innovative and Practical Activities as C4, the Fundamental Knowledges and Professional Skills as C5, the Ability of Applying Professional Knowledges as C6, the Ability of Expanding Professional Knowledges as C7, and the Foreign Language Ability as C15 which are objective indexes that can be evaluated by the test grades, certifications and the grades of CET4&6. The rest of the indexes are subjective ones that can be evaluated by the valuator with interval numbers.

## **Empirical Analysis of the Practical Ability of Students Majoring in Economic Management**

### **Sample Selecting and Rules Making**

The Empirical Analysis here is sampled by the graduates of year 2017 which has 30 students in total.

The five objective indexes, the Participation of Innovative and Practical Activities(C4), the Fundamental Knowledges and Professional Skills(C5), the Ability of Applying Professional Knowledges(C6), the Ability of Expanding Professional Knowledges(C7) and the Foreign Language Ability(C15), are evaluated by headteacher according to the GPA, certification of competition and the test grade of TEM4&6 of students. The rest of ten indexes are evaluated by other 22 students in the class within 1-10 points. To erase some abnormal influence, the lowest three points and the highest three ones are eliminated, leaving the lowest point and the highest point of the remaining 16 students as the interval number of evaluation. For example, after eliminating the highest and the lowest six points, the highest one and the lowest one of

the remaining points are 9 and 6, so the interval number of the evaluation of the student is [6,9].

### **The Original Decision Matrix**

Under the rules stated in Table 2, The original decision matrix of the practical ability evaluation of the eight students can be formed after having the points of the headteacher and other classmates. Due to limited length, the original data is left out.

### **The Decision Matrix with Standardized Weight**

Considering that there may be a large gap between the value of the objective indexes and the subjective indexes, the decision matrix has to be standardized first. We employed the standardizing approach for benefit type interval numbers since these indexes are all benefit type.

We then get a Decision Matrix with Standardized Weight after considering the weight of the indexes. Due to limited length, the original data is left out.

### **The Positive Ideal Solution and Negative Ideal Solution of the Indexes**

The definition of the interval number positive ideal solution and negative ideal solution:

$$\tilde{y}_j^+ = [y_j^{+L}, y_j^{+U}] = [\max_i (y_{ij}^L), \max_i (y_{ij}^U)], j \in M.$$

$$\tilde{y}_j^- = [y_j^{-L}, y_j^{-U}] = [\min_i (y_{ij}^L), \min_i (y_{ij}^U)], j \in M.$$

Then we get the results of the positive ideal solution and negative ideal solution of the indexes.

### **The Results of the Comprehensive Evaluation**

To be specific, first we should calculate the distance of the student to be evaluated to the positive ideal point and the negative ideal point respectively, then the accessible degree of each student towards the ideal point and put the results in order according to the calculation of the accessible degree.

The formulas of the distance of the student to be evaluated to the positive ideal point and the negative ideal point are represented by interval numbers as follow:

$$D_i^+ = \sum_{j=1}^m \|\tilde{y}_{ij} - \tilde{y}_j^+\| = \sum_{j=1}^m \left[ \left| y_{ij}^L - y_j^{+L} \right| + \left| y_{ij}^U - y_j^{+U} \right| \right], i \in N,$$

$$D_i^- = \sum_{j=1}^m \|\tilde{y}_{ij} - \tilde{y}_j^-\| = \sum_{j=1}^m \left[ \left| y_{ij}^L - y_j^{-L} \right| + \left| y_{ij}^U - y_j^{-U} \right| \right], i \in N.$$

Then according to the calculation of the distance of the student to the positive ideal point and the negative ideal point, the formula of the accessible degree of each students to the ideal points are as follow:

$$c_i = \frac{D_i^-}{D_i^+ + D_i^-}, i \in N.$$

So we can put the evaluation results of the practical ability of the students in order with the above values which are ranked from larger number to smaller number.

## **Conclusion**

Developing the practical ability of the students is of high priority to the universities in China, especially to the application-oriented ones. With the advancing of the massive entrepreneurship and innovation initiative, the practical ability of the students is of great importance. The current study, however, have failed to do empirical researches on the it, thus this paper establishes a comprehensive evaluation system on the practical ability of the students majoring in the economic management in the application-oriented universities, and by employing the interval number TOPSIS method, carries on the empirical research. The results show that the evaluation system based on the interval number TOPSIS method is scientific and operable, and can reduce the subjectivity of indexes assignment caused by existing too much qualitative indexes.

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