

## A New Evaluation Program of College-Enterprise Cooperation Practice Teaching

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### Abstract

According to the current problems of practical teaching evaluation, this paper establishes a new evaluation program of practical teaching evaluation of college-enterprise cooperation, and builds a mathematics model of the evaluation program by using the analytic hierarchy process. Therefore it can be the theoretical basis and decision support for the practical teaching of college-enterprise cooperation in order to accomplish the teaching goal of the excellent engineering talent cultivation.

### Keywords

Evaluation program, practical teaching, college-enterprise cooperation.

### 1. Introduction

With the international competition becoming increasingly fierce, the cultivation of the excellent engineering talents who have rich ability of practical application and innovation is increasingly important. The practical teaching, as an important part of the college engineering education, is the key link to improve the students' practical ability, innovation consciousness and comprehensive quality. As an effective way to improve the practical teaching quality, college-enterprise cooperation is also an inevitable requirement to cultivate excellent engineering talents.

As an engineering specialty, electrical engineering has strong practicality and applicability, It is a significant task for college electrical professionals to resolve the problems the cultivation of the high quality electrical engineering talents who have the excellent ability of practical and innovative. In order to accomplish the task, it is necessary for colleges to adopt the college-enterprise cooperation pattern to improve the management of practical teaching quality, and the practical teaching quality evaluation is an important guarantee to improve the practical teaching quality. Therefore, a scientific practical teaching quality evaluation system is essential to the electrical engineering talents cultivation.

In this paper, the evaluation index system of the practical teaching quality of college-enterprise cooperation and the practical teaching quality evaluation model based on the analytic hierarchy process are developed. Therefore the teaching managers of college-enterprise cooperation can rapidly and accurately understand the teaching situation and make corresponding decision.

### 2. The construction of the index system of practical teaching quality evaluation

#### 2.1 The Current Problems of the Establishment of the Index System

(1) No enterprise evaluation. The traditional teaching quality evaluation mainly depends on the supervision and inspection of college education departments, but did not consider the enterprise

evaluation [1,2]. As an important role of the college-enterprise cooperation, enterprise should work together with colleges in the teaching quality evaluation of college-enterprise cooperation

(2) No consideration of the investment of equipment and capital in the teaching evaluation. The present teaching quality evaluation only consider the soft factors, such as the courses system, the teaching materials construction and the classroom teaching quality[3, 5], but ignore the evaluation of the hardware equipment, capital and other aspects which is the basic role of practical teaching.

(3) No whole process evaluation. As a complete process, the evaluation methods of practical teaching in past was often limited to the final teaching results evaluation and ignored the influencing factors during the whole teaching process [6]. The whole process evaluation should comprehensively consider the influencing factors of teaching inputs, teaching processes and teaching achievements.

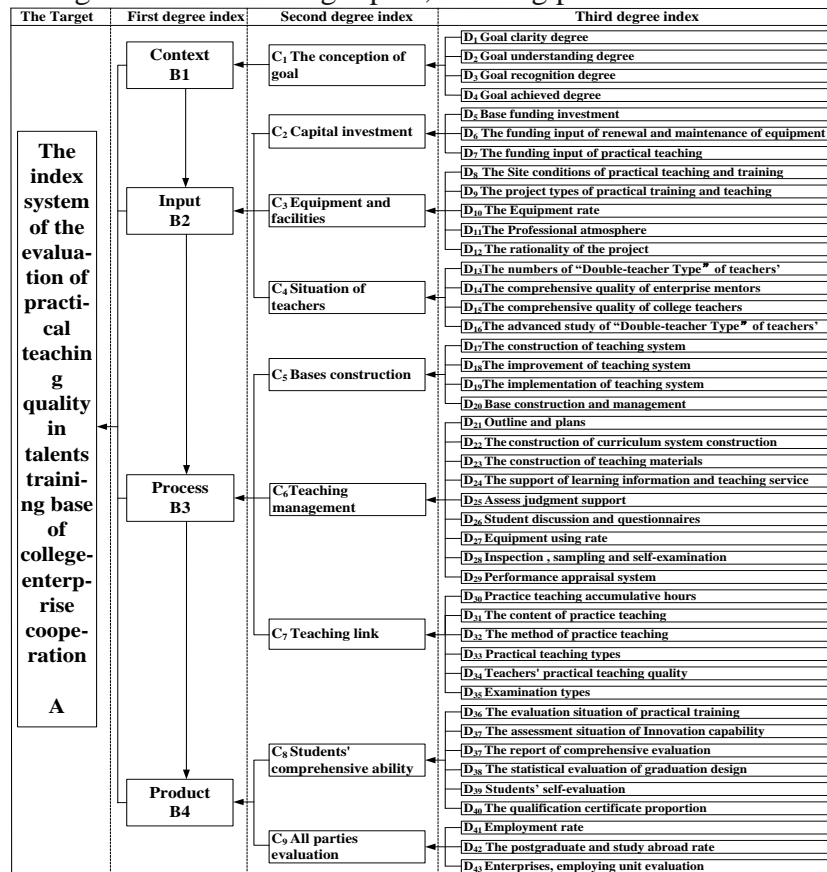


Figure 1 The evaluation index system of the practical teaching quality in talents training base of college-enterprise cooperation.

### 2.2 The Principles of the Establishment of the Index System.

According to the above problems in the teaching evaluation, we make the principles of the index system construction of college-enterprise cooperation as follow.

(1) Directional principle. The establishment of the teaching quality evaluation index system not only has to follow the national policy, but needs to consider teaching situation and base development.

(2) Scientific principle. The teaching quality evaluation index system should be scientific, rational and comprehensive, and it should be able to accurately reflect the practical training teaching quality features.

(3) Systematic principle. Each index requires mutual contact, mutual complementation and mutual improvement in order to form the best indexes combination to constitute an organic whole

(4) Incentive principle. Practical teaching evaluation is not a simply teaching situation description, but the practical teaching measurement which should get the purposes of achievement affirmation, problem diagnosis, summarize experience, potentialities exploit, aim clear and work motivation.

(5) The principle of whole process evaluation. The determination of evaluation index needs a comprehensive investigation of the whole practical teaching process to systematically, scientifically and comprehensively evaluate the practical teaching quality.

**2.3 The Principles of the Establishment of the Index System.**

According to the CIPP evaluation model[7] and the basic principles of the index system construction and the comprehensive consideration of practical teaching, this paper construct the index system of the practical teaching quality of college-enterprise cooperation base. In the Figure 1, there are 57 indexes, among them 4 first degree indexes and 9 second degree indexes and 44 third degree indexes.

**3. The Construction of the Judgment Matrix of Impact Factors.**

**3.1 The Construction of the Judgment Matrix of Impact Factors.**

According to the Analytic Hierarchy Process (AHP) proposed by T.L. Saaty[8], we make a index layer of n factors,  $X=\{x_1, x_2, \dots, x_n\}$ , and compare the importance of them on the criterion of the upper layer, thus determine the proportion of this layer factors with respect to the criterion. The importance comparison of the each factors by using the 1-9 scale.  $b_{ij}$  means the relative importance of the factor i over the factor j, and  $b_{ji}=1/b_{ij}$ . We construct the judgment matrix of each layer according to questionnaires and statistics as shown in Table 1.

Table 1. The general form of judgment matrix.

A	B1	B2	...	Bj	...	Bn
B1	$b_{11}$	$b_{12}$	...	$b_{1j}$	...	$b_{1n}$
...	...	...	...	...	...	...
$B_i$	$b_{i1}$	$b_{i2}$	...	$b_{ij}$	...	$b_{in}$
...	...	...	...	...	...	...
$B_n$	$b_{n1}$	$b_{n2}$	...	$b_{nj}$	...	$b_{nn}$

**3.2 The Calculation of Weight Vector and the Consistency Test.**

(1) Calculate the maximum eigenvalue and its normalized eigenvector of the judgment matrix. We get eigenvalue and its eigenvectors of the judgment matrix and the normalized eigenvectors corresponding to the largest eigenvalues of the judgment matrix, reflect the weight of the n factors  $B=\{b_1, b_2, \dots, b_n\}$  with respect to the upper layer index, and this eigenvector is called the weight vector of the factor  $B=\{b_1, b_2, \dots, b_n\}$  to the upper layer index.

Table 2. The values of all judgment matrixes

Matri x	$\lambda_{max}$	CI	CR	Weight vector
C1-D	4.175	0.0584	0.0649	[0.1473 0.4757 0.2932 0.0837]T
C2-D	3.038 5	0.0192 5	0.0332	[0.6370 0.1047 0.2583]T
C3-D	5.381 9	0.0954 8	0.0852 5	[0.2910 0.1687 0.1078 0.0656 0.3670]T
C4-D	4.144	0.048	0.0533	[0.5019 0.1718 0.2425 0.0838]T
C5-D	4.189 4	0.0631 3	0.0701 4	[0.0745 0.1385 0.2559 0.5312]T
C6-D	10.02 7	0.1284	0.0886	[0.3245 0.2191 0.0976 0.0843 0.0498 0.0437 0.0538 0.0409 0.0863]T
C7-D	6.442 2	0.0884 4	0.0713 2	[0.0594 0.1508 0.2555 0.1026 0.3912 0.0406]T
C8-D	6.385 4	0.0770 8	0.0621 6	[0.2307 0.1718 0.3683 0.1028 0.0443 0.0820]T
C9-D	3.038 5	0.0192 5	0.0331 9	[0.2583 0.1047 0.6370]T

B2-C	3.038 5	0.0192 5	0.0331 9	[0.2583 0.1047 0.6371]T
B3-C	3.038 5	0.0192 5	0.0331 9	[0.1047 0.2583 0.6370]T
B4-C	2	0	0	[0.25 0.75]T
A-B	4.073 1	0.0243 7	0.0270 7	[0.0582 0.1558 0.5323 0.2538]T

Table 3. The weights of the all indexes with respect to the goal A

Index	Weight	Index	Weight	Index	Weight	Index	Weight
D1	0.00867	D2	0.0277	D3	0.0171	D4	0.00487
D5	0.0256	D6	0.00421	D7	0.0104	D8	0.0117
D9	0.00275	D10	0.00176	D11	0.00107	D12	0.00599
D13	0.0498	D14	0.0171	D15	0.0241	D16	0.0832
D17	0.00415	D18	0.00772	D19	0.0143	D20	0.0296
D21	0.0446	D22	0.0301	D23	0.0134	D24	0.0116
D25	0.00685	D26	0.00601	D27	0.00740	D28	0.00562
D29	0.0119	D30	0.0201	D31	0.0511	D32	0.0866
D33	0.0348	D34	0.133	D35	0.0138	D36	0.0146
D37	0.0109	D38	0.0234	D39	0.00652	D40	0.00281
D41	0.00520	D42	0.0492	D43	0.0199	D44	0.121
C1	0.0582	C2	0.0402	C3	0.0163	C4	0.0992
C5	0.0557	C6	0.137	C7	0.339	C8	0.0635
C9	0.190	B1	0.0582	B2	0.156	B3	0.532
B4	0.254						

(2) Calculate the consistency index  $CI = (\lambda_{max} - n)/(n - 1)$ .

(3) Calculate the random consistency ratio  $CR = CI/RI$ .

(4) Level simple sequence. When  $CR < 0.1$ , the judgment matrix has satisfied consistency, otherwise the matrix should be adjusted until its consistency test is satisfactory. The Table 2 shows the values.

(5) Hierarchy general ranking. After level simple sequence, we can get weight vectors of the lower layer index with respect to the upper layer index. Eventually we have to get the weights of all factors with respect to the goal in order to select optimum programs. The weight vector of the low-layer (The layer m) on the top-layer is  $W^{(m)} = w^{(m)} w^{(m-1)} \dots w^{(3)} w^{(2)}$ ,  $w^{(m)}$  is the matrix made by column vector which is made by the layer m with respect to the layer m-1. The Table 3 shows the weights of the all indexes.

#### 4. Conclusion

It is important for the evaluation of practical teaching quality to guarantee the practical teaching quality. In order to accomplish the talents training goals, a scientific, accurate and comprehensive index system of practical teaching evaluation is necessary for the college-enterprise teaching managers to make the appropriate decision-making according to the practical teaching evaluation. However, with the development of college-enterprise cooperation, the reform and research of practical teaching quality evaluation should be a long and arduous work, and the colleges and enterprise education workers need more exploration and practice in the future.

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