

Construction of Practical Teaching Quality Evaluation System of Engineering Major in Xizang Universities

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Abstract: Application-oriented talent cultivation is an indispensable key link in the transformation and upgrading of practical teaching of engineering majors in Xiang universities. This paper combines the practice teaching problems of engineering majors in Xiang colleges and universities, and constructs the evaluation index system of practice teaching quality of engineering majors in Xiang colleges and universities from the aspects of preparation for practice teaching, conditions of practice teaching and effect of practice teaching in engineering majors in Xiang colleges and universities. Based on the hierarchical analysis method to determine the weight of each index in the index layer, combined with the fuzzy comprehensive evaluation of statistical survey data, the practice teaching quality score is derived, and based on the calculation results and the current problems, the path of improving the practice teaching quality of engineering majors in Xiang colleges and universities is put forward, which provides a new way of thinking and a new reference to improve the quality of practice teaching of engineering majors in Xiang colleges and universities.

1. Introduction

The cultivation of applied talents' ability is not only the cultivation of professional ability, but also the cultivation way of practical ability, innovation ability, cooperation ability and comprehensive ability. Therefore, it is of great significance to construct a practical teaching quality evaluation system for engineering majors in Xiang universities oriented to applied talents for the transformation and upgrading of practical teaching of engineering majors.

Yu Lijing et al analyze the current training problems in colleges and universities based on the matching degree of industrial demand, the integration degree of collaborative education and the cultivation of innovation and entrepreneurship, and put forward the innovative initiatives for the cultivation of applied talents in logistics management under the background of new liberal arts[1]. Zhou Yanli proposed the improvement of teaching strategies and methods including the improvement of experimental teaching, the introduction of project-based learning and the integration of technological means based on the theoretical basis of the cultivation of application-oriented talents[2]. Zhang Hongguo et al with the goal of meeting the talent needs of national and regional emerging industries, conducted preliminary exploration in the new mode of talent cultivation, new system, new

mechanism and new platform for collaborative training between industry, academia, research and application[3]. Yu Xiaochuan et al explored the solution path by analyzing the problems existing in computer basic education in the context of new engineering disciplines, respectively from five aspects, including computer basic practice training mode, computer application talents training program, computer basic curriculum reform, application of teaching tools, and construction of diversified teaching evaluation system[4]. Zhou Li for the positioning of applied personnel training and mode of analysis helps to point out the direction for the cultivation of talents in colleges and universities, so that colleges and universities from the social needs of the development of a more reasonable talent training program[5]. Cai Wei discusses the competence elements that new engineering applied talents should have, explores the problems that exist in the current internationalization service of universities in the cultivation of new engineering applied talents, and puts forward the solution strategies, with a view to cultivating more new engineering applied talents adapted to internationalization standards[6].

In summary, scholars have carried out a lot of research on the practical teaching of engineering majors in colleges and universities, which is effective in the cultivation of applied talents. However, due to the Xizang plateau climate and social and cultural factors, the practice of engineering in colleges and universities is lacking, so that there is a lack of research on the construction of practice teaching quality evaluation system for engineering majors in Xizang colleges and universities oriented to application-oriented talents. Therefore, this paper explores the factors affecting the quality of practice teaching of engineering majors in Xizang colleges and universities based on the preparation of practice teaching, conditions of practice teaching and the effect of practice teaching and constructs a practice teaching quality evaluation system based on the hierarchical analysis method and the fuzzy comprehensive evaluation method. Therefore, this paper explores the influencing factors of practice teaching quality of engineering majors in Xizang universities based on the aspects of practice teaching preparation, practice teaching conditions and practice teaching effect, constructs the evaluation system of practice teaching quality of engineering majors in Xizang universities based on the Hierarchical Analysis Method and Fuzzy Comprehensive Evaluation Method, and proposes the improvement strategies based on the evaluation results.

2. Factors affecting the quality of practical teaching of engineering majors in Xizang colleges and universities

2.1 Scarcity of practice sites and supporting facilities

The shortage of practice sites and supporting facilities is a key factor affecting the quality of practice teaching of engineering majors in Xizang colleges and universities. In the case of not being able to provide venues and supporting facilities, teachers show the practice process through the video for theoretical teaching, which leads to students' absorption of theoretical knowledge and understanding at the same time reduces the students' hands-on ability, so as to reduce the students' motivation to practice learning, affecting the quality of practice teaching.

2.2 Students' enthusiasm for practice needs to be improved

Students' practical enthusiasm to be improved and the teacher's guiding role is not strong has a close connection. Teachers in guiding students to learn theoretical knowledge at the same time did not pay attention to practice, resulting in a decline in students' interest in practice courses. The lack of practical interest and enthusiasm makes students unable to form good practice habits, resulting in the cultivation of students' hands-on ability can not play a positive role.

2.3 Lack of orientation of practice teaching evaluation

In the teaching process of practice courses of engineering majors in some Xizang colleges and universities, the teaching quality evaluation is carried out such as student evaluation, supervision courses, etc. However, there is a lack of assessment and rewards for students and teachers in practice course teaching, which leads to a lack of motivation of students in practice courses. In the teaching process of engineering majors in most colleges and universities in Xizang students only pay attention to the learning of theory, think that only need to pass the theoretical knowledge test, and pay insufficient attention to the practical courses, which can be seen in the lack of practical teaching quality evaluation orientation.

2.4 Lagging teaching mode of practical courses

Most of the engineering majors in Xizang colleges and universities limit the use of time for practice, and it is difficult for students to complete the practice tasks within the specified time, which negatively affects the quality of practice teaching and leads to the inability of students to master the practice skills in a timely manner, improve the practical hands-on ability, and further implementation of the content of the practice teaching courses.

3. The construction of practice teaching quality evaluation system for engineering majors in Xizang universities

3.1 Indicators and weights

The development of practice teaching quality of engineering majors in Xizang colleges and universities requires that the practice of engineering majors must meet the needs of Xizang's infrastructure construction, and it was mentioned in the Seventh Central Committee's Symposium on Xizang Work in 2020 that it is necessary to cultivate more engineering majors with shortage talents. By analyzing the basic quality and professional skills of the graduates of engineering majors in Xizang, and based on the skill demand of engineering talents in Xizang, we construct the evaluation index system of practice teaching quality of engineering majors in Xizang colleges and universities from the aspects of preparation for practice teaching, conditions for practice teaching and effect of practice teaching.

The hierarchical analysis method is used to determine the weights of the indicators. Based on the questionnaire survey conducted by 20 educational experts and teachers of practice courses of engineering majors in Xizang colleges and universities on each index of practice teaching of engineering majors, the weights of each index at the index level were determined, and the results are shown in Table 1.

It can be seen from Table 1: In the index system, the target layer A is the evaluation of practice teaching quality of engineering majors in Xizang. Among them, the weight value of practice teaching preparation B_1 is 0.0716, the weight value of practice teaching conditions B_2 is 0.0716, the weight value of practice teaching process B_3 is 0.4282, and the weight value of practice teaching effect B_4 is 0.4286.

Table 1: Indicator weights of practical teaching quality for engineering majors in Xizang

Target level <i>A</i>	Standardized layer <i>B</i>	Weights	Indicator layer <i>C</i>	Relative weights	Combination weights
Practice of Engineering Specialties Teaching Quality Evaluation System	Preparation for Practical teaching B_1	0.0716	Management system C_1	0.1683	0.0121
			Teaching goal C_2	0.3476	0.0249
			Lesson plan C_3	0.3289	0.0235
			Preparation of lesson plans C_4	0.1552	0.0111
	Practical Teaching conditions B_2	0.0716	Managerial staff C_5	0.1523	0.0109
			Teacher level C_6	0.3951	0.0283
			Practice area C_7	0.2541	0.0182
			Service C_8	0.1985	0.0142
	Practical Teaching process B_3	0.4282	Attitude C_9	0.3521	0.1508
			Attendance discipline C_{10}	0.1526	0.0653
			Practical ability C_{11}	0.1294	0.0554
			Specialized theory C_{12}	0.1526	0.0653
			Teamwork C_{13}	0.1467	0.0628
			Duration of practice C_{14}	0.0666	0.0285
	Effectiveness of Practical Teaching B_4	0.4286	Practical work C_{15}	0.1846	0.0791
			Practice Report C_{16}	0.1653	0.0708
			Group mutual evaluation C_{17}	0.0657	0.0282
			Teacher assessment C_{18}	0.1534	0.0657
			Practical results C_{19}	0.1954	0.0837
			After-school guidance C_{20}	0.1532	0.0657
			Feedback on Teaching and Learning C_{21}	0.0824	0.0353

3.2 Comprehensive evaluation method

(1) Hierarchical analysis method

Since the evaluation system of practical teaching quality of engineering majors in Xizang colleges and universities contains 21 indicators of influencing factors, the weights obtained by expert scoring method may lose accuracy, so this paper is based on hierarchical analysis method to calculate the weights of indicators at the indicator level to improve the final accuracy of the indicator weights. Hierarchical analysis is a subjective assignment method that can reflect the degree of importance between indicators, and can be used for the systematic evaluation of the unstructured characteristics of the quality of practical teaching of engineering majors in Xizang universities, as well as the systematic evaluation of multi-objective, multi-criteria, multi-period and so on[7]. According to the subjective evaluation of experts, the indexes of the index layer of practical teaching quality of engineering majors in Xizang are compared two by two. The judgment matrix was constructed after scoring and assigning values to them as shown in formula (1).

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix} \quad (1)$$

Calculate the weights of the indicators according to the judgment matrix, and test the consistency of the judgment matrix by consistency.

(2) Fuzzy comprehensive evaluation method

Based on the fuzzy comprehensive evaluation method, the evaluation of practical teaching quality of engineering majors in Xizang colleges and universities is based on the theory of affiliation degree of fuzzy mathematics to transform qualitative evaluation into quantitative evaluation, i.e., using fuzzy mathematics to make an overall evaluation of the object constrained by multiple factors[8]. The fuzzy comprehensive evaluation method systematically deals with the problems that are difficult to quantify in the practical teaching quality of engineering majors in Xizang universities, and has the characteristics of clear and accurate evaluation results. According to the results of the weight value of the index layer, combined with the fuzzy comprehensive evaluation method, the evaluation value of engineering majors in Xizang colleges and universities was calculated according to the principle of maximum membership of the fuzzy comprehensive evaluation method, and the quality of practical teaching was judged.

The basic model for fuzzy comprehensive evaluation is:

$$B = A * R \quad (2)$$

Where: B is the evaluation value vector; A is the weight value of each indicator in the indicator layer; $*$ is the sign of fuzzy operator; R is the fuzzy relationship matrix, which is used by educational experts and teachers of engineering professional practice courses in Xizang colleges and universities to judge the situation of each indicator in the indicator layer of teaching quality:

$$A_i \geq 0, \sum A_i = 1; *R \quad (3)$$

4. Application of practice teaching quality evaluation system for engineering majors in Xizang colleges and universities

Taking the 2020 and 2021 grades of transportation railroad major and transportation road major in the College of Engineering of Xizang University as evaluation samples, combining the evaluation of education experts and teachers of engineering majors in Xizang colleges and universities in practice courses and fuzzy comprehensive evaluation statistics to determine the degree of index affiliation, and based on the results of the calculations, each index of the index layer of two majors of transportation road and railroad is evaluated. In this paper, the evaluation set is: excellent 100 points, good 75 points, general 50 points, poor 25 points. Based on the evaluation results, the collection of fuzzy comprehensive evaluation analysis, can establish a fuzzy evaluation matrix, the results are shown in Table 2, Table 3.

Table 2: Matrix of affiliation of various indicators of practical teaching quality of engineering majors oriented to application-oriented talents in the class of 2020

Norm	Transportation Railway Specialization	Transportation Road Specialization
Preparation for practical teaching B_1	$\begin{bmatrix} 0.4 & 0 & 0.3 & 0.3 \\ 0.2 & 0.7 & 0.1 & 0 \\ 0 & 0.4 & 0.1 & 0.5 \\ 0 & 0.3 & 0.6 & 0.1 \end{bmatrix}$	$\begin{bmatrix} 0.4 & 0.4 & 0.1 & 0.1 \\ 0.2 & 0.4 & 0.1 & 0.3 \\ 0.3 & 0.2 & 0.5 & 0 \\ 0.2 & 0 & 0.7 & 0.1 \end{bmatrix}$
Practical teaching conditions B_2	$\begin{bmatrix} 0.3 & 0.3 & 0.3 & 0.1 \\ 0.2 & 0.7 & 0 & 0.1 \\ 0.4 & 0.3 & 0 & 0.3 \\ 0.3 & 0.2 & 0.4 & 0.1 \end{bmatrix}$	$\begin{bmatrix} 0.4 & 0.1 & 0.3 & 0.2 \\ 0.1 & 0.7 & 0.1 & 0.1 \\ 0.4 & 0.4 & 0.1 & 0.1 \\ 0.3 & 0.5 & 0.1 & 0.2 \end{bmatrix}$
Practical teaching process B_3	$\begin{bmatrix} 0.5 & 0.3 & 0.1 & 0.1 \\ 0.2 & 0.6 & 0 & 0.2 \\ 0.3 & 0.4 & 0.1 & 0.2 \\ 0.4 & 0.5 & 0 & 0.1 \\ 0.3 & 0.6 & 0 & 0.1 \\ 0.5 & 0.4 & 0.1 & 0 \end{bmatrix}$	$\begin{bmatrix} 0.2 & 0.3 & 0.4 & 0.1 \\ 0.2 & 0.2 & 0.5 & 0.1 \\ 0 & 0.4 & 0.5 & 0.1 \\ 0.4 & 0.4 & 0.1 & 0.1 \\ 0.3 & 0.1 & 0.5 & 0.1 \\ 0.3 & 0.6 & 0 & 0.1 \end{bmatrix}$
Effectiveness of Practical Teaching B_4	$\begin{bmatrix} 0.3 & 0.4 & 0.2 & 0.1 \\ 0.5 & 0.2 & 0.2 & 0.1 \\ 0.5 & 0.4 & 0 & 0.1 \\ 0 & 0.8 & 0.1 & 0.1 \\ 0.5 & 0.4 & 0 & 0.1 \\ 0.1 & 0 & 0.5 & 0.4 \\ 0.2 & 0.3 & 0.2 & 0.3 \end{bmatrix}$	$\begin{bmatrix} 0.4 & 0.3 & 0.1 & 0.2 \\ 0.5 & 0.2 & 0 & 0.3 \\ 0 & 0.3 & 0.6 & 0.1 \\ 0.4 & 0.6 & 0 & 0 \\ 0.3 & 0.3 & 0.1 & 0.3 \\ 0.1 & 0.6 & 0.1 & 0.2 \\ 0.3 & 0.5 & 0.1 & 0.1 \end{bmatrix}$

Table 3: Affiliation matrix of each indicator of practical teaching quality of engineering majors oriented to application-oriented talents in class 2021

Norm	Transportation Railway Specialization	Transportation Road Specialization
Preparation for practical teaching B_1	$\begin{bmatrix} 0.6 & 0.3 & 0.1 & 0 \\ 0.6 & 0.3 & 0 & 0.1 \\ 0.8 & 0.2 & 0 & 0 \\ 0.8 & 0 & 0.1 & 0.1 \end{bmatrix}$	$\begin{bmatrix} 0.7 & 0.2 & 0.1 & 0 \\ 0.8 & 0.2 & 0 & 0 \\ 0.9 & 0.1 & 0 & 0 \\ 0.9 & 0 & 0.1 & 0 \end{bmatrix}$
Practical teaching conditions B_2	$\begin{bmatrix} 0.8 & 0.1 & 0.1 & 0 \\ 0.7 & 0.2 & 0 & 0.1 \\ 0.8 & 0.2 & 0 & 0 \\ 0.8 & 0.1 & 0 & 0.1 \end{bmatrix}$	$\begin{bmatrix} 0.9 & 0 & 0 & 0.1 \\ 0.8 & 0.1 & 0.1 & 0 \\ 0.8 & 0 & 0 & 0.2 \\ 0.6 & 0.3 & 0.1 & 0 \end{bmatrix}$
Practical teaching process B_3	$\begin{bmatrix} 0.9 & 0 & 0.1 & 0 \\ 0.6 & 0.3 & 0 & 0.1 \\ 0.6 & 0.2 & 0.2 & 0 \\ 0.9 & 0 & 0.1 & 0 \\ 0.8 & 0.1 & 0 & 0.1 \\ 0.7 & 0.3 & 0 & 0 \end{bmatrix}$	$\begin{bmatrix} 0.6 & 0.3 & 0 & 0.1 \\ 0.8 & 0.2 & 0 & 0 \\ 0.9 & 0.1 & 0 & 0 \\ 0.8 & 0.1 & 0.1 & 0 \\ 0.6 & 0.3 & 0 & 0.1 \\ 0.8 & 0 & 0.1 & 0.1 \end{bmatrix}$
Effectiveness of Practical Teaching B_4	$\begin{bmatrix} 0.7 & 0.1 & 0.1 & 0.1 \\ 0.9 & 0 & 0.1 & 0 \\ 0.9 & 0.1 & 0 & 0 \\ 0.6 & 0.2 & 0.2 & 0 \\ 0.7 & 0.2 & 0.1 & 0 \\ 0.9 & 0 & 0 & 0.1 \\ 0.7 & 0.2 & 0 & 0.1 \end{bmatrix}$	$\begin{bmatrix} 0.7 & 0.3 & 0 & 0.1 \\ 0.8 & 0.1 & 0.1 & 0 \\ 0.8 & 0 & 0.1 & 0.1 \\ 0.6 & 0.3 & 0.1 & 0 \\ 0.8 & 0 & 0.2 & 0 \\ 0.7 & 0.2 & 0.1 & 0 \\ 0.7 & 0.2 & 0 & 0.1 \end{bmatrix}$

Through the fuzzy comprehensive evaluation model of practical teaching preparation, practical teaching conditions and practical teaching effect of engineering majors in Xizang universities, finally this text get the result vector of practical teaching quality indexes of engineering majors oriented to application-oriented talents in Table 4, and the scores of practical teaching quality of engineering majors oriented to application-oriented talents in Table 5.

Table 4: Vector of results of judging the value of practice teaching quality indicators of engineering majors oriented to application-oriented talents

Project	Year	Transportation Rail Specialization	Transportation Road Specialization
Preparation for practical teaching B_1	Class of 2020	(0.137,0.421,0.211,0.230)	(0.267,0.272,0.325,0.137)
	Class of 2021	(0.697,0.221,0.032,0.050)	(0.832,0.136,0.032,0.000)
Practical teaching conditions B_2	Class of 2020	(0.286,0.438,0.125,0.151)	(0.257,0.483,0.128,0.132)
	Class of 2021	(0.784,0.129,0.040,0.047)	(0.776,0.099,0.059,0.066)
Practical teaching process B_3	Class of 2020	(0.384,0.440,0.055,0.122)	(0.226,0.304,0.370,0.100)
	Class of 2021	(0.787,0.106,0.076,0.030)	(0.713,0.208,0.022,0.057)
Effectiveness of Practical Teaching B_4	Class of 2020	(0.300,0.359,0.178,0.162)	(0.317,0.392,0.101,0.191)
	Class of 2021	(0.761,0.111,0.085,0.042)	(0.714,0.162,0.091,0.033)

Table 5: Scores of various scores of practical teaching quality of engineering majors oriented to application-oriented talents

Project	Transportation Rail Specialization		Transportation Road Specialization	
	Class of 2020	Class of 2021	Class of 2020	Class of 2021
Preparation for practical teaching B_1	61.617	89.098	66.715	94.981
Practical teaching conditions B_2	71.479	91.295	71.593	89.602
Practical teaching process B_3	77.146	91.280	66.388	89.454
Effectiveness of Practical Teaching B_4	69.928	89.806	70.859	88.941
Average score	72.535	90.448	68.703	89.634

Using the fuzzy comprehensive evaluation to calculate the score, the results show that the total score of practical teaching quality of engineering majors with application-oriented talents in the transportation major of grade 2021 has been significantly improved relative to that of the transportation major of grade 2020. It can be seen that the evaluation index system of practice teaching quality of engineering majors can reflect the actual situation of teaching quality of each specialty under the application-oriented talent cultivation mode of engineering in Xizang colleges and universities. According to the factors affecting the practical teaching quality of engineering majors in Xizang colleges and universities and the scores of practical teaching quality of engineering majors oriented to application-oriented talents, the practical teaching quality of engineering majors in Xizang colleges and universities is proposed to improve the path of practical teaching quality.

5. Analysis of the path to improve the quality of practical teaching of engineering majors in Xizang colleges and universities

5.1 Optimize the preparation process of practical teaching

Under the current background of deepening the teaching reform of practice courses, teachers of engineering majors can draw on the research results of other majors in the reform of practice teaching mode to adopt a variety of teaching modes, establish the objectives of practice teaching, teaching plans and a clear management system, and prepare the teaching plan of engineering majors of Xizang colleges and universities that are oriented to application-oriented talents, so as to effectively stimulate the students' interest in practice, realize the organic combination of theoretical knowledge and practice, and thus improve the quality of practice teaching.

5.2 Strengthen the construction of practical teaching conditions

It is necessary to increase the cooperation between Xizang colleges and universities and social practice organizations from various aspects to improve the venue and supporting facilities, to provide students with more convenient conditions for practice. At the same time, on the basis of teacher training to improve the students' daily practice courses, the school should optimize the mechanism of practice equipment management, to meet the students' requirements for practice tools in the practice courses, to enhance the students' enthusiasm to participate in the practice courses, and ultimately to achieve the purpose of improving the quality of teaching.

5.3 Strengthen the analysis of practical teaching process

The teaching level needs to be evaluated effectively, which is roughly divided into three aspects: before practice teaching, during practice teaching and after practice teaching. At the same time, strict requirements on the quality of teaching, can be analyzed through the collection of students' practical courses and teachers' listening to the classroom data to understand the operational status of practical teaching, and timely understanding of the classroom situation. At the same time, problems in practical teaching are found, which need to be solved in time and relevant departments are set up to provide timely feedback on teaching information to ensure that the quality of teaching is improved.

5.4 Insist on the improvement of practical teaching effect

At present, the overall level of teachers in the practice teaching activities of engineering majors in Xizang colleges and universities basically meets the requirements of practice teaching, but the performance of students' subject position is insufficient, and the interaction between teachers and students is not active enough, which is the focus of concern for the improvement of the quality of practice teaching, and therefore the quality of practice teaching can be promoted through the mutual evaluation of the students' groups, practice reports and other methods and means.

6. Conclusion

With application-oriented talents as the research object, we analyze the factors that affect the quality of practical teaching of engineering majors in Xizang universities. Through research and analysis, we have established the quality evaluation system of practice teaching of engineering specialty. Through the actual application of the evaluation system, combined with the current situation of the practice courses of engineering majors in Xizang colleges and universities, it summarizes and

puts forward excellent improvement strategies. The results show that the evaluation system of practice teaching quality of engineering majors in Xizang can truly reflect the actual situation of engineering majors in Xizang universities oriented to application-oriented talents.

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