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Research on the Existing Problems in the Training Mode of Engineering Cost Professionals in Higher Vocational Colleges

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Abstract: *This paper takes the talent training mode of higher vocational colleges under the background of the construction of vocational education highland as the research object, and takes the engineering cost specialty as an example. It selects 17 higher vocational colleges in Shandong Province and several employers in the construction industry for research. Based on the statistical analysis of the survey data, this paper expounds the problems existing in the talent training mode of the engineering cost specialty, and puts forward corresponding countermeasures and suggestions, aiming at promoting the reform of the talent training mode of the engineering cost specialty, and comprehensively improving the school running level and education quality of higher vocational colleges.*

Keywords: *Vocational education highland, engineering cost discipline, talent training mode*

1. Research background

As a traditional industry in China, the construction industry has a large scale and a large number of employees because of the complexity, comprehensiveness and long-term characteristics of its construction product production process. Under the background of the construction of "two districts" in Shandong Province, how to transform and upgrade the construction industry to adapt to the new normal of economic development is a topic of necessity and urgency. The development of the construction industry from high energy consumption to green intensification must take the road of ecology, industrialization and informatization. Improve the environmental friendliness of the construction industry, and replace traditional building materials with energy-efficient building materials that are environmentally friendly, sound insulation, antifouling, thermal insulation; Improve the assembly level of the construction industry, and replace the cast-in-place concrete with prefabricated components produced in the factory[1]. Improve the degree of mechanization in the construction industry, and replace the simple and repetitive manual labor of workers with standard mechanized operations on the construction site[2]. Improve the informatization degree of the construction industry, replace the traditional paper drawings with visual and digital BIM 3D model design, and replace the traditional inefficient management mode with scientific and reasonable informatization organization and management mode[3]. Based on this, we can really reduce industrial energy consumption, improve production efficiency, and realize the modernization of the construction industry. The transformation and upgrading of the construction industry is bound to put forward higher requirements for practitioners. The migrant workers who engage in single and repetitive work will gradually fade out of the stage of the construction industry, and will be replaced by industrial workers and other highly skilled talents with a certain level of knowledge, operational skills and professional quality. In 2017, Shandong Province issued policies to promote the development of the construction industry, which explicitly proposed to reform the employment model of the construction industry, comprehensively promote the transformation of migrant workers to industrial workers, and improve their professionalism and professionalism[4].

As a training and export base for highly skilled talents, higher vocational colleges must update their school running concepts and actively innovate their talent training models to meet the new needs of social and economic development for the talent training of higher vocational colleges in the face of the gap of highly skilled talents in the transformation and upgrading of the construction industry in the

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context of the construction of the "Comprehensive Experimental Zone for the Transformation of New and Old Kinetic Energy and the Free Trade Zone" (hereinafter collectively referred to as the "two zones") approved by the State Council in Shandong Province. On January 14, 2020, the Shandong Provincial People's Government of the Ministry of Education pointed out in the Opinions on Promoting Quality Improvement and Excellence in the Whole Province and Building a Highland of Innovation and Development of Vocational Education (hereinafter referred to as the Opinions) that "to achieve self improvement, self-development and self innovation of vocational education, better serve high-level development and promote high-quality employment"[5]. The construction of vocational education highland is an important measure to promote the construction of "two districts", and also a good environment and good opportunity for the development of vocational education in our province in the new era. As the main body of cultivating highly skilled talents, higher vocational colleges should actively respond to the call of the Opinions, fully investigate the current and future talent needs of society and industry enterprises, fully understand the changes and updates of knowledge and skills brought about by the transformation of new and old kinetic energy and industrial upgrading, fully grasp the favorable policies of the government and the intention of enterprises to cooperate deeply with schools and enterprises, update the concept of running schools, identify the characteristics of running schools, and optimize talent training, Better and more comprehensively serve regional economic development. Taking the engineering cost specialty in the construction industry as an example, this paper, based on the survey, statistics, summary and analysis, proposes a "two body four drive" higher vocational education talent training mode and curriculum system reform and exploration under the new situation of social and economic development and the background of the construction of the in-service education highland, aiming to better serve the regional economic construction and meet the talent needs of the transformation and upgrading of the construction industry.

2. Professional research

This survey plan is based on the seminar on the teaching guidance plan for the engineering cost specialty of Binzhou Vocational College. After detailed discussion, the division of labor of the survey team is determined, the main principals of the participating school units, as well as the survey content, survey objects, survey forms and survey meeting records. The survey covers 17 vocational colleges across the province. All participating units actively and earnestly completed their own research tasks and submitted perfect research reports. The main methods used in the survey are: telephone interviews, field trips, and online questionnaires. The organization process of the survey includes: preliminary preparation, meeting discussion, collaborative survey, data collection, analysis and drafting. The research contents are as follows:

2.1. Application of professional posts and qualification certificates

The posts involved in the survey mainly include: cost officer (civil engineering, decoration, installation, pipeline), budget officer, construction officer, documenter, quality inspector, etc. Post promotion mainly includes: secondary constructor, primary constructor, cost engineer, asset appraiser, etc. Investigate the occupational standards, national policies in the industry, and the regulatory requirements of industry enterprises corresponding to the above occupational positions. In addition, this survey also investigated vocational qualification certificates that are highly recognized by the industry and are of interest to students, mainly including: Cost Engineer (Level II), Constructor (Level II), "1+X" Building Information Model (BIM) Vocational Skill Level Certificate, "1+X" Building Engineering Drawing Recognition Vocational Skill Level Certificate, and "1+X" Fabricated Building Component Production and Installation Vocational Skill Level Certificate.

2.2. Curriculum system reform

The investigation takes the cost engineer's job as an example, starting from the cost engineer's work field and actual work content, to decompose the specific work tasks of the job and corresponding work skills, and then match the specific teaching tasks of related courses. In the course setting survey, the 17 higher vocational colleges surveyed basically provided the latest project cost professional training program, and the courses offered can be summarized into the following types of courses: public basic platform courses, professional general platform courses, professional core platform courses, elective module courses, innovation and entrepreneurship module courses and expansion module courses. According to the current survey, only a few mathematics schools have trained students in different

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directions, and have formulated independent talent training programs in all directions. In terms of curriculum, the following 15 professional courses are generally offered. The specific statistics are shown in the figure 1 below.

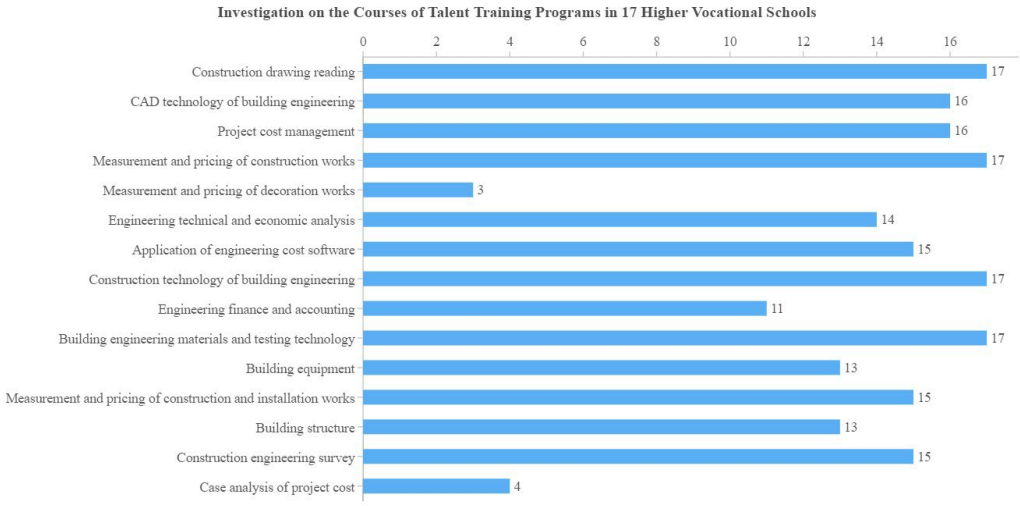

Figure 1: Statistics of major professional courses offered by 17 higher vocational colleges in Shandong Province

2.3. Employment of engineering cost graduates

The higher vocational colleges participating in the survey conducted a detailed survey on the employment of 458 graduates (including post placement internships), and conducted a survey and statistics on the initial employment positions and current employment positions of graduates (including post placement internships) in the past five years. The statistical results show that the main initial employment positions of graduates from 2016 to 2020 (including post placement internships) include budget officers, cost officers, construction workers and documenters. The professional counterpart rate of supervisors is more than 87.5% every year. In recent five years, the professional counterpart rate of graduates in their current jobs has changed to varying degrees compared with that in their initial jobs, but the change is small and generally stable. The specific statistics are shown in the figure 2 below.

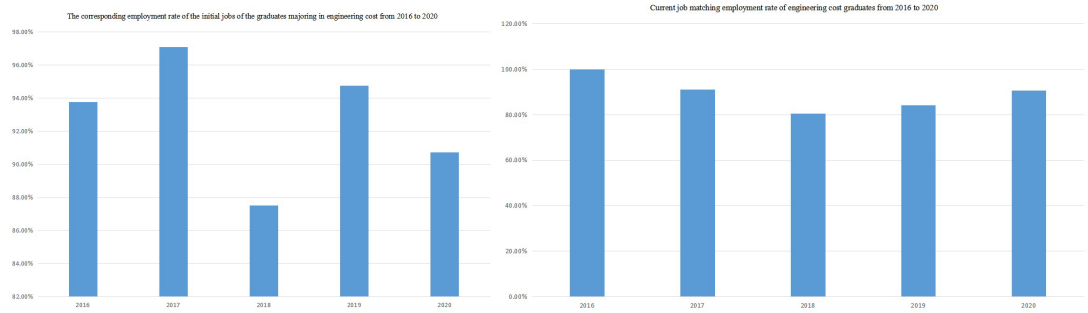

Figure 2: Statistics and comparison between the initial job and current job of engineering cost graduates from 2016 to 2020

2.4. Talent demand of employers

Investigating the talent demand of the employers related to the project cost discipline, we received 16 research reports from their respective research areas and 59 research discussion records. All enterprises showed strong demand for highly skilled and high-quality talents. In this survey, there are 108 enterprise survey samples, including 1 school, 16 state-owned enterprises, 81 private (joint venture) enterprises and 10 others. The business scope of the enterprise survey sample includes 39 construction enterprises, 34 project cost consulting enterprises, 15 real estate development enterprises, 9 construction project supervision companies, 4 construction project bidding agencies and 5 others. The statistical results of the nature and business scope of the employer are shown in the figure 3 below.

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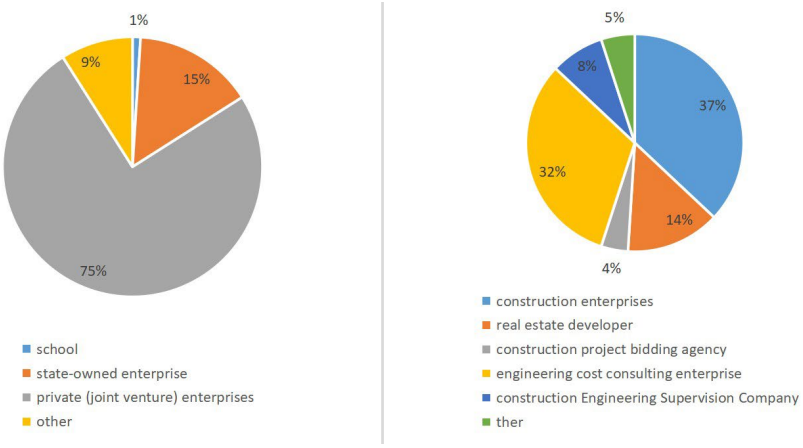

Figure 3: Nature and business scope of the employer

2.5. Current situation of teachers and talent training mode

In the survey of the teaching staff of the engineering cost specialty, 13 schools were counted, including 210 full-time teachers and 105 part-time teachers, basically in a 2:1 structure. In the age structure, the majority are 31 to 35 years old, accounting for 28.83%, the majority are 36 to 40 years old, accounting for 27.76%, and the least are over 46 years old, accounting for 12.46%. It shows that the major of engineering cost is mainly composed of teachers under 40 years old, who are energetic, receptive to new things, and innovative. In the structure of professional titles, the middle level accounts for 47.04% at most, the senior level accounts for 9.4% at least, and the proportion from junior to senior level is 2:4:2:1. Among the degrees, the master's degree accounts for 69.85%. Among the enterprise work experience, 40.43% have less than one year of work experience, and 197 people have obtained the professional qualification certificate of this major. The average age of professional leaders is 42 years old, and they are basically the main leaders of the profession. The above higher vocational colleges are equipped with on campus training bases, which are equipped with basic training conditions such as measurement, building materials, engineering calculation software, etc. Some colleges have built training entities with financial support. The talent training of Shandong higher vocational colleges is mainly based on the "2+1" (two years of school study, one year of post practice) mode, and other provinces also have a 2.5+0.5 training mode. The cultivation mode of 2.25+0.75 will also appear in the situation of autonomous control and flexible regulation in schools. The goal of talent training is basically the same, which aims to cultivate talents with both theory and skills.The specific statistics are shown in the figure 4 below.

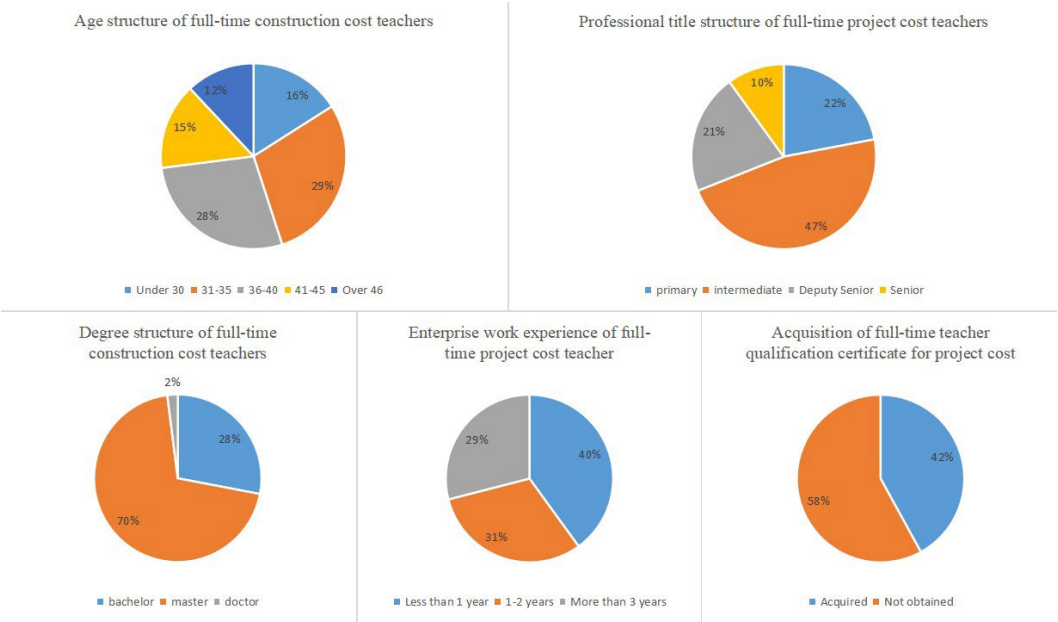

Figure 4: Teachers of engineering cost specialty

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3. Existing problems in the training mode of engineering cost professionals

3.1. Under the background of industry transformation and upgrading, it is urgent to establish a dynamic management and correction mechanism for curriculum provision

From the perspective of professional post capacity requirements and professional curriculum settings, at this stage, the engineering cost specialty in higher vocational colleges basically sets courses and decomposes teaching tasks based on post capacity requirements. In the period of transformation, upgrading and rapid development of the construction industry, all higher vocational colleges should closely grasp the pace of industrial upgrading, master the new technologies, new technologies and new methods at the forefront of the industry, update the curriculum system settings of the cost specialty in real time, establish a dynamic management and correction mechanism for curriculum settings, cooperate deeply with industry enterprise experts, and improve the curriculum system to adapt to the pace of industrial upgrading.

3.2. The construction of the "double qualified" teaching team needs to be further improved

According to the situation of teachers and the construction of the training base, the full-time teachers of the engineering cost specialty in higher vocational colleges are mainly young and middle-aged teachers under the age of 45. The proportion of full-time teachers with master's degrees and intermediate professional titles is the largest. This part of teachers is characterized by strong learning ability, strong plasticity and remarkable ambition. However, according to the work experience of the enterprise and the acquisition of professional qualification certificates, the practical ability and project experience of full-time teachers need to be further improved, and the construction of the "double qualified" teaching team is still on the way. From the perspective of training base construction, although the current training bases in higher vocational colleges have basic training conditions, the integration of production and teaching is not high. We should fully absorb social resources, share with industrial enterprises to build training sites, and truly realize the integration of production and education.

3.3. Professional talent training program still needs to be continuously optimized

From the perspective of talent training programs, most of the training programs are in the form of "2+1". The training model lacks flexibility and autonomy, and there is less classified and targeted training within the specialty. In the first two years of school study, students lack the opportunity of enterprise practice, and the practice link should be interspersed in each stage of professional curriculum study on the basis of the deep cooperation between schools and enterprises. There are quality objectives in the talent training objectives, but how to effectively achieve the quality objectives, how to rely on the teaching content and scene are not discussed, and there is a lack of systematic measures to implement the talent quality objectives. Ideological and political education should be integrated into each link of cost professional talent training to form a systematic, organic, methodical and content oriented ideological and political teaching system for cost professionals.

3.4. There is a strong demand for talents in the industry, and higher vocational colleges should actively improve the quality of education

Judging from the employment situation of cost graduates in the past five years and the demand for enterprise talents, the professional counterpart rate of graduates' employment is very high. The professional counterpart rate of first-time employment is about 90%. Tracking the job situation of graduates in the past five years, it is found that more than 80% of the graduates are still engaged in work related to their majors. In combination with the strong demand for highly skilled talents expressed by the enterprise side in the enterprise survey, the demand for knowledge, skills and quality practitioners in the construction industry is huge and urgent. In addition, graduates can achieve continuous self-improvement in the professional field when they are employed in this major, and have good room for growth and career prospects. Based on this, higher vocational colleges should actively improve their educational model, improve their educational quality, and provide more highly skilled talents for the society.

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3.5. It is necessary to further improve the certificate system and truly promote teaching and learning through certificate

From the survey of qualification certificates, the students in school showed strong interest and desire for vocational qualification certificates. In particular, the "1+X" skill level certificate that students can obtain at school has a great attraction for students. How to organize, train and make good use of the "1+X" certificate examination work, and promote teaching and learning through certificate is an important topic that should be considered by current vocational colleges. Take the examination work as an opportunity to mobilize the enthusiasm of students to learn professional knowledge and skills and improve the teaching quality. In addition, the "1+X" certificate can also be included in the assessment and evaluation system to establish a sound multi-dimensional talent training evaluation system.

4. Suggestions on the Reform of the Training Mode of Engineering Cost Professionals

4.1. Deepen the integration of production and teaching, and enhance the participation of enterprise teachers in teaching

The age and educational background of the teaching team are reasonably matched, and the construction of a dual qualified teaching team has begun to take effect. However, the participation of off campus instructors, enterprises and industry experts in talent training and daily teaching is low. This requires deepening the integration of industry and education and school enterprise cooperation under the leadership of the government, establishing and optimizing the teaching team with the organic cooperation of full-time and part-time teachers, and establishing a dynamic updating mechanism of the professional curriculum system.

4.2. Attract social resources and jointly build a shared training base

The construction of the training base is booming, but the actual effectiveness of the training base needs to be improved. The integration of production and education and social service of the training base are poor. Combined with the current industrial upgrading of the construction industry and the huge demand of enterprises for highly skilled talents in the survey, this paper believes that higher vocational colleges should fully absorb social resources, jointly build and share practical training projects, expand the degree of open education, and improve their own social service.

4.3. Improve the certificate system and incorporate "1+X" certificates into the evaluation system

The implementation and promotion of the "1+X" certificate system is very popular, but the integration of the certificate system and the talent evaluation system is not high. Based on the "1+X" certificate system, higher vocational colleges actively explore the teaching reform of promoting teaching and reform with certificates. Bringing the certificate system into the evaluation system is an important link to improve the talent training evaluation system, and also lays a foundation for the international exchange of certificates and skills training and the international mutual recognition of vocational qualifications in the future.

4.4. Focus on ideological and political education to ensure the achievement of talent training quality objectives

The talent training goal keeps pace with the times, but the achievement of the quality goal lacks a specific guarantee system. Compared with knowledge goals and ability goals, the implementation of quality goals is difficult to assess quantitatively, but the importance and necessity of quality goals are even greater than the former two. This requires the establishment of the ideological and political education resource pool for professional talent training, the improvement of the evaluation system for talent training quality objectives, and the guarantee for the achievement of quality objectives through complete ideological and political resources and excellent ideological and political teaching.

5. Conclusion

This paper takes the talent training mode of engineering cost specialty as the research object, and conducts a systematic professional investigation based on 17 vocational colleges and many civil

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engineering enterprises in Shandong Province. According to the survey, it is still necessary to further reform and improve the talent training mode for the engineering cost specialty in higher vocational colleges. In terms of teachers, we should give full play to the role of enterprise teachers to enhance the breadth and depth of the integration of industry and education; In terms of the construction of training bases, we should expand the degree of open education and attract social resources to jointly build and share training bases and training projects; In terms of certificates, further improve the integration of "1+X" certificate system and talent evaluation system; In terms of talent training objectives, the quality of education can be improved through the construction of ideological and political education resource library and the construction of quality target evaluation guarantee system. The research results of this paper are intended to promote the reform of the training mode of engineering cost professionals, comprehensively improve the school running level and education quality of higher vocational colleges, and provide a mode of thinking and theoretical reference for the reform and innovation of the training mode of engineering cost professionals in Shandong Province.

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