

Research on the Reform of Engineering Cost Professional Curriculum System Based on the Comprehensive Education of "Job Course Competition Certificate"

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Abstract: In response to the main problems in the current training of engineering cost professionals, based on the job requirements of enterprises and in collaboration with industry enterprises, we have optimized the talent training plan based on the comprehensive education model of "job course competition certificate", constructed a dual teacher team, built a professional course system, and implemented a diversified evaluation system to improve the comprehensive education model of "job course competition certificate". This provides reference value for cultivating high skilled talents in the field of engineering cost.

Keywords: Certificate of on-the-Job Course Competition; Curriculum System; Engineering Capability; Personnel Training

1. Introduction

The National Vocational Education Conference held in 2021 proposed to deepen the reform of the three education systems and promote comprehensive education through the competition of job courses and certificates; In the same year, relevant national departments issued the "Opinions on Promoting the High Quality Development of Modern Vocational Education" and proposed to improve the comprehensive education mechanism of "on-the-job course competition certification", designing and developing courses according to actual production and job needs. At the national level, exploring the comprehensive education of "job course competition certification" has been regarded as an important means to improve the vocational education talent training system and enhance the quality of talent training[1]. It has also pointed out the direction for us to promote the

reform of talent training models and curriculum systems in vocational colleges.

The comprehensive education model of "job course competition certificate" integrates resources from various sectors such as industry, enterprises, schools, social training and skill evaluation organizations, clarifies the connections between various elements of "job", "course", "competition" and "certificate", effectively integrates various aspects of education and teaching with social positions, industry standards, skill competitions, vocational certificates, etc., and achieves the goal of cultivating high-quality skilled talents that meet the needs of industrial development. Vocational positions are the core and the starting point for talent cultivation[2]; Curriculum is the carrier and the medium for implementing talent cultivation; Skills competitions and vocational certificates are the driving force and the booster for enhancing talent cultivation. The comprehensive education model of "on-the-job course competition certification" aims to improve the quality of talent cultivation in vocational education by determining courses based on positions, promoting positions through courses, leading courses through competitions, and verifying positions through certification.

Vocational colleges must adapt to social and economic development, meet the demand for engineering talents in the market, industry, and local economic construction, and better reflect professional characteristics. They must optimize and upgrade the professional curriculum system and teaching content according to the actual social production and job requirements, combined with professional talent training goals[3], and comprehensively promote the comprehensive education mechanism of "job course competition certification", To cultivate applied engineering

talents with a solid foundation, broad caliber, strong abilities, and high quality.

2. Current Status of Talent Training in Engineering Cost

The Engineering Cost major is a popular emerging discipline added by the Ministry of Education in response to the needs of national economic and social development. In order to meet the demand for engineering cost management talents in the construction market, some vocational colleges have successively opened engineering cost majors and related courses, providing a large number of engineering cost professionals for society and the construction industry. However, due to various factors such as the level of vocational colleges, experimental equipment, teaching ability, and examination mechanism, there are the following problems:

2.1 Issues with Talent Training Programs

The target positioning of talent training programs in vocational colleges often blindly imitates the academic talent training positioning of public research universities, which has many problems such as inaccurate training target positioning, unclear training characteristics, and incomplete training mechanisms. However, neglecting the cultivation of practical skills, innovation and entrepreneurship abilities, as well as lacking guidance for long-term life planning and lifelong learning, will lead to a lack of application skills among students[4], and they will not be able to adapt to their job positions as soon as they enter society.

2.2 Issues with the Teaching Staff Quality

As an emerging profession, it is difficult for the Engineering Cost major to have a high-quality teaching staff that can meet the demand for engineering cost talents in the construction industry in a short period of time. Especially in recent years, the continuous expansion of enrollment in various schools has led to a common shortage of professional teachers. However, newly graduated master's and doctoral students who have been introduced lack practical engineering training, resulting in a lack of scientific research ability, practical application ability, and innovation and entrepreneurship ability. It is difficult to provide high-quality practical courses and

cultivate urgently needed talents in the industry.

2.3 Issues with Existing Curriculum System

At present, the course system of engineering cost major in vocational colleges mostly adopts a course system structure of "public basic courses and professional compulsory courses and professional elective courses and practical links", which needs to control the total credit hours. Firstly, set the curriculum and class hours for public basic courses, then set the rated class hours for professional compulsory courses, determine the difference in the class hours for professional elective courses, and finally determine the practical course hours according to the proportional requirements. The ultimate result is that the proportion of public basic courses is too high, the proportion of professional courses is low, the proportion of various courses is imbalanced, and the course structure is unreasonable, which inevitably leads to the phenomenon of students having an unreasonable knowledge structure, lacking professional application skills, and insufficient practical abilities. In addition, the untimely updating of course content, inflexible teaching modes, and insufficient practical teaching in the curriculum system also constrain the quality of talent cultivation.

2.4 Issues with Evaluation Mechanism

Due to various constraints, the assessment methods for professional courses are still mostly written tests, with a relatively low proportion of assessing students' ability to analyze and solve problems, as well as their ability to operate and apply practical equipment. As a result, students have poor application abilities and the quality of practical teaching has been stagnant. Even under slogans such as "emphasizing process based assessment" and "adopting multiple assessment methods", some vocational colleges have increased the proportion of process based assessment and encouraged teachers to adopt multiple assessment methods. However, the final grades of most courses still play a decisive role, and most assessment methods are written exams. The phenomenon of "one test determines everything" still exists, which also leads to some students not paying attention to their daily learning and

accumulation, there is often a phenomenon of last-minute cramming before exams. This situation is bound to cause students to slack off in thinking, have low abilities, lack initiative and enthusiasm in learning, and also hinder their innovative spirit.

3. Exploration of the Reform of the Engineering Cost Professional Curriculum System Based on the Comprehensive Education of "Post Course Competition Certificate"

3.1 Based on the "on-the-job Course Competition Certificate", Optimize Talent Training Programs

In order to meet the talent needs of the enterprise industry and cultivate students' innovative practical abilities, the curriculum team has revised and improved the talent training plan for 2021 students based on the comprehensive education concept of "job course competition certificate". The plan aims to meet the job requirements of the enterprise, focus on the core competencies of the position, adhere to the integration of curriculum standards and vocational standards, encourage students to obtain vocational certificates and participate in various skills competitions, To enhance students' professional literacy and practical innovation ability.

3.2 Taking Multiple Measures to Strengthen the Construction of a Dual Teacher Professional Teaching Team

Teachers are the fundamental guarantee for achieving comprehensive education through "on-the-job course certification competition". Teachers will determine course design plans, adjust course content, interpret skills competition rules, and guide students in vocational certificate training according to the job requirements of enterprises, thereby completing the training of students' knowledge and technical abilities.

3.2.1 Promoting teachers' teaching practice ability through "training"

Our school conducts annual training for new teachers on "green peppers" and "spring shoots" to improve the teaching ability of young teachers; at the same time, professional teachers are regularly assigned to intern and train in enterprises every semester to complete the learning and training of practical skills and

professional ethics. In addition, we also select teachers to participate in various professional seminars, broaden their professional perspectives, update educational concepts, and establish a "four in one" training model of "on campus training, off campus practical training, enterprise internship, and special training". Building a comprehensive teacher training platform to comprehensively enhance the overall level of teaching and practical abilities of the teaching staff[5].

3.2.2 Training teachers' practical abilities through "posts"

On campus teachers and enterprise technical personnel implement "double recruitment and double hanging". Engineering cost professional teachers are required by the school to go to relevant design institutes, construction, pre settlement, consulting and other units for on-the-job training every year, and work together with practitioners in the cost industry to grasp the latest trends of enterprises, understand the actual needs of positions, improve practical skills, and achieve the integration of teaching and practice. In addition, teachers are encouraged to actively obtain relevant professional qualification certificates in accordance with enterprise job standards, improve their personal professional skills, and enhance the ability to train students to obtain qualification certificates. At the same time, the school has hired enterprise technical personnel to enrich the practical teaching team, better train and improve students' professional abilities, and promote the quality of talent cultivation.

3.2.3 Hone teachers' the teaching ability of teacher through "lessons"

After the school conducts intensive training for new teachers every summer, the college will arrange experienced and excellent teachers to adopt a one-on-one assistance system for new teachers. During the year, the college will organize teaching management personnel and teaching supervisors to conduct irregular classroom supervision to help new teachers improve their teaching level quickly. In addition, the college encourages teachers to participate in various teaching ability competitions through activities such as "lecture activities", "lecture competitions", "courseware production competitions", and "teaching ability competitions", in order to promote the improvement of teachers' teaching abilities.

3.2.4 Promoting teachers' research and innovation abilities through competition

The school also encourages teachers to participate in guiding various student competitions, and encourages teachers to participate in various teaching and skill competitions. In the process of guidance and competition, teachers, based on the requirements of their professional positions, study the content and evaluation rules of the competition[6], and according to the rules of the competition, exert subjective initiative, reconstruct teaching content, improve teaching methods and means. The comprehensive quality of teachers also continuously improves, and the knowledge level and practical ability of students continue to improve, thus forming a two-way improvement, truly realizing the promotion of teaching and learning through competition.

3.3 Integration of "on-the-job Course Competition Certification" and

Construction of a Modular Integrated Curriculum System

The course system of "job course competition certification" integration in the engineering cost major (such as Figure 1) is based on researching the job requirements of enterprises, decomposing the job tasks of cost engineers, budget engineers, construction engineers, supervision engineers, drawing engineers, etc., sorting out the job content and required professional knowledge, and then integrating the job content and professional knowledge into the professional course system[7]. According to the law of talent cultivation, the courses are divided into public basic courses, professional courses (including compulsory and elective), concentrated practical training courses, and expansion courses, in order to achieve the educational goals of determining courses based on job positions, promoting job positions through courses, leading courses through competitions, and verifying job positions.

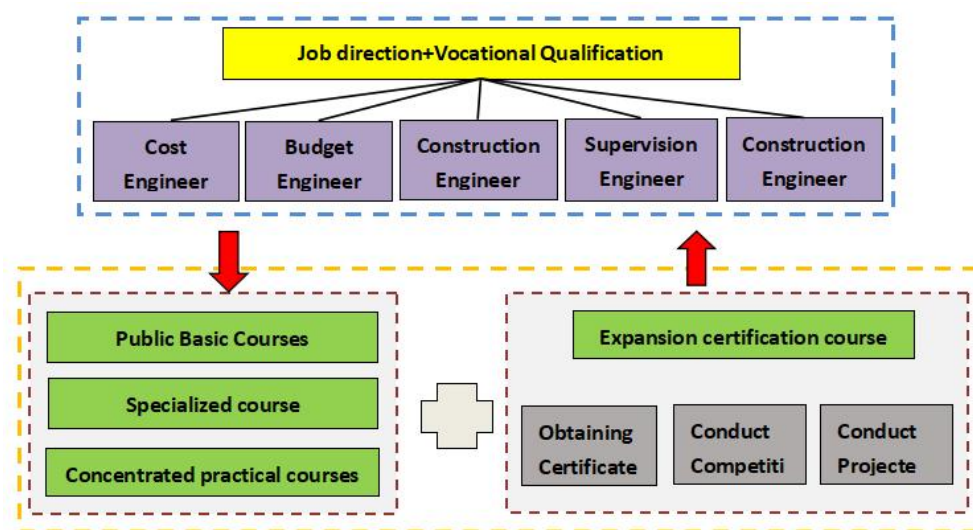


Figure 1. The Course System of Integrating "on-the-Job Course Competition and Certification" in the Engineering Cost Major

Taking the compulsory course "Architectural Engineering Drawing and AutoCAD" as an example, based on the job content of the position and benchmarking the course standards, the drawing knowledge, drawing standards, and AutoCAD drawing skills required for positions such as draftsmen and cost estimators are integrated into actual engineering project tasks. Through the integration and reconstruction of knowledge points, starting from the basic components of a certain actual project, relevant architectural

engineering drawing and AutoCAD drawing knowledge are introduced one by one, Gradually form a complete floor plan, then learn the corresponding elevations, sections, details, etc. of the project to form a complete set of building construction drawings, and then expand to structural construction drawings, water and electricity construction drawings, etc. In addition, according to the school's policy of "replacing exams with certificates", students are encouraged to obtain the "National CAD Skills Level Examination" certificate, and real

exam questions and requirements are interspersed in teaching cases to help students obtain vocational qualification certificates. At the same time, the skills competitions involved in this course, such as the Advanced Mapping Technology and Product Information Modeling Innovation Competition for College Students, the National 3D Mathematical Innovation Design Competition, the National Digital Building Innovation Application Competition, the National BIM Graduation Design Innovation Competition for Universities, and other related topics or enterprise actual project design drawings, will be used as expansion content for knowledge expansion.

The comprehensive curriculum system model of "determining courses based on positions, promoting positions through courses, leading

courses through competitions, and verifying positions" (such as Figure 2) is designed and developed according to job requirements, continuously updating teaching content, and timely incorporating new technologies, standards, and typical engineering cases from industries and enterprises into teaching content[8]. By integrating and complementing the concepts of "job, course, competition, and certificate", it can greatly tap into job demands, play a guiding role in courses, and utilize various skills competitions and vocational certificates to achieve a four stage ability improvement from basic ability to comprehensive ability, application ability, and innovation ability. This solidifies students' professional knowledge and vocational skills, thereby cultivating high skilled innovative and applied talents that meet social needs.

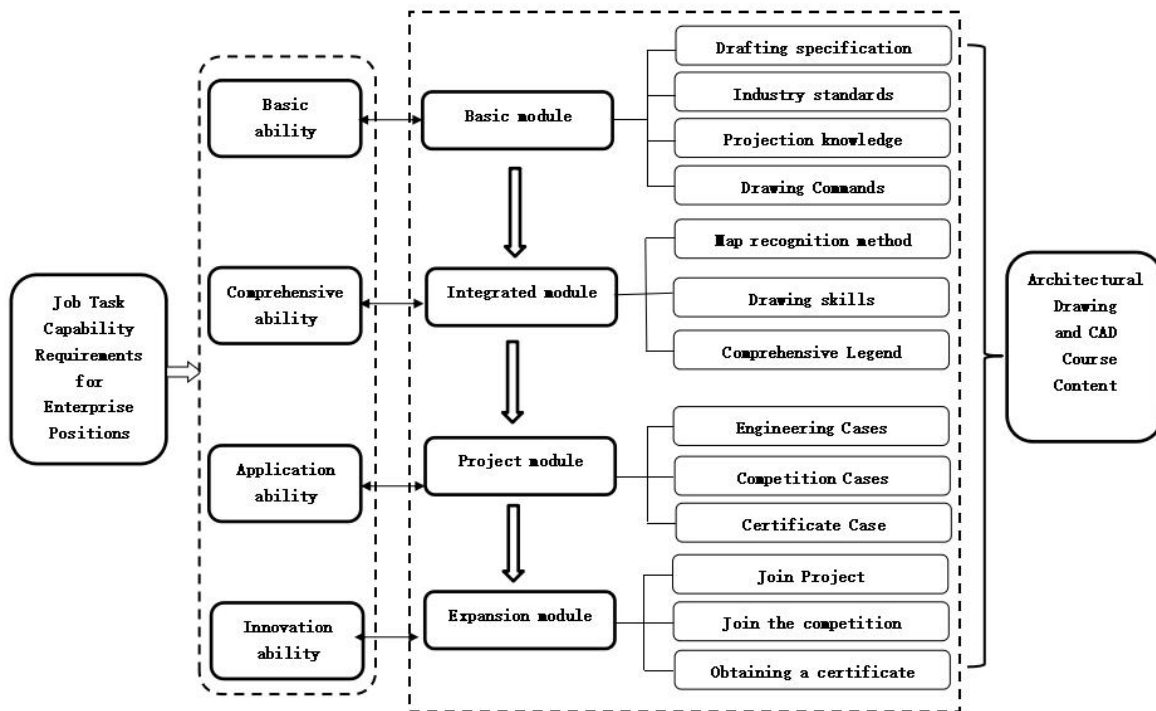


Figure 2. The Course System of "Architectural Engineering Drawing and AutoCAD" Integrating "on-the-Job Course Competition and Certification"

3.4 Linkage between Schools and Enterprises, Implementing Diversified Evaluation Mechanisms

The collaborative education between schools and enterprises is an important means of cultivating high-quality skilled talents. Focusing on the development of applied talents, we aim to achieve the goal of normalized and continuous improvement in teaching

management and teaching quality based on teaching methods, evidence-based evaluation, and effective diagnosis and improvement. We aim to cultivate students' independent practice, innovative application, and team collaboration abilities, and provide real-time feedback on teachers' teaching abilities and skill levels. We also establish a diversified evaluation mechanism that highlights application abilities in a process oriented manner..

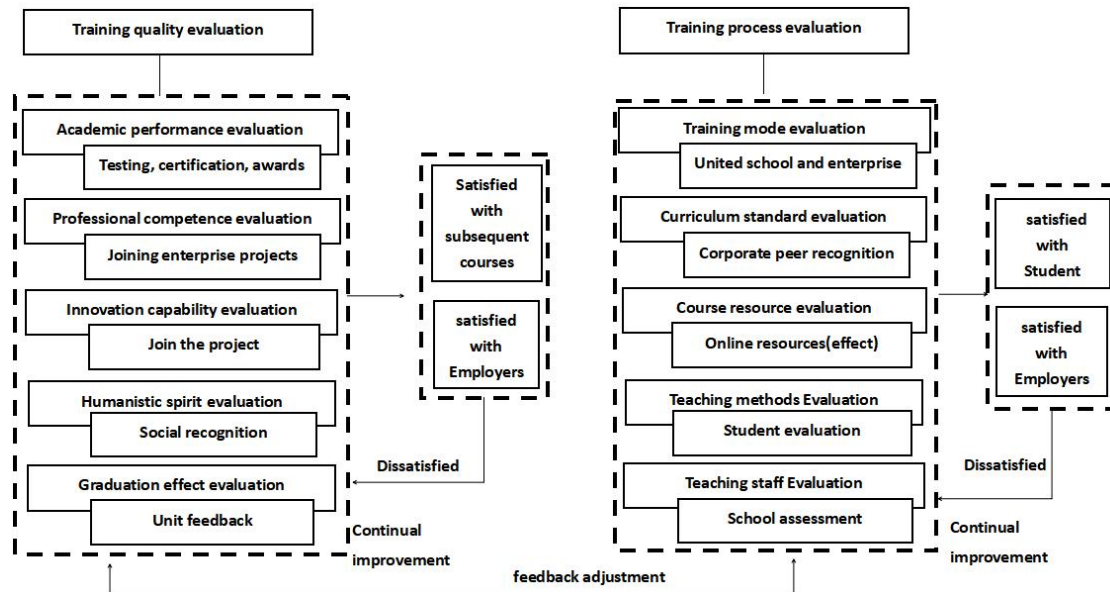


Figure 3. Implementation Path of Curriculum Evaluation in the Linkage of Schools and Enterprises

The diversification of course evaluation includes process evaluation, assessment content, and assessment methods. Process evaluation adopts a combination of student self-evaluation, student peer evaluation, teacher evaluation, industry evaluation, and enterprise evaluation[9]; In terms of assessment content, it not only emphasizes the assessment of knowledge, but also emphasizes the assessment of students' ability to comprehensively apply the knowledge they have learned to analyze and solve problems; In terms of assessment methods, teachers are encouraged to adopt diverse forms of assessment based on the nature and characteristics of the course, such as exams, defense, course papers, project design, on-site operations, using certificates to replace exams, and exchanging credits for certificates in competitions. For some practical courses, a third-party evaluation mechanism with industry enterprises as the assessment subject is established in conjunction with relevant industry enterprises, or enterprise job standards are directly used for assessment.

In order to objectively evaluate the teaching effectiveness of teachers and the learning effectiveness of students, the curriculum team monitors and evaluates the quality and process of curriculum training comprehensively based on the concept of "on-the-job course competition certification". The specific evaluation implementation path (such as Figure 3): The specific implementation of

curriculum system evaluation mainly focuses on two aspects: training quality and training process. The evaluation of cultivation quality mainly evaluates the quality and effectiveness from the perspective of students. Through the evaluation of final grades, certificate acquisition, participation in competitions, projects, topics, and the display of innovative thinking[10], it examines the cultivation effect on students' knowledge, abilities, innovative consciousness, professional quality, and other aspects. The evaluation of the training process is based on the content related to curriculum teaching, which involves the use of training modes, curriculum standards, utilization of curriculum resources, selection of teaching methods, and quality of teaching staff. It evaluates the training process through joint evaluation of schools and enterprises, online course quality, supervision and listening, student evaluation, and display of educational and teaching achievements. If the evaluation results do not meet the satisfaction of subsequent courses and employers, continual improvement is necessary. In this way, the quality of education and the training process are mutually feedback, adjusted in real-time, and continuously improve the quality of education and teaching.

4. Conclusion

In summary, under the background of the integration of "job course competition and certification", it is necessary to optimize the

training plan for engineering cost professionals, strengthen the construction of professional curriculum system, improve the level of teaching staff, adopt diversified evaluation mechanisms, continuously improve professional social service capabilities, and cultivate more innovative and applied talents for society.

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