Research on the method based on the combination of BETC and BIM

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Abstract: The virtual simulation model building (BIM) of civil engineering is used more and more widely. Based on the platform of "cost workshop" of civil engineering and the BETC method of "BIM virtual construction + actual engineering information + industry standard comparison", this paper emphasizes the integration of "virtual construction technology", "information pricing technology" and "industry standard requirements" of civil engineering. This method is conducive to the research of civil engineering BIM Technology and the development of cost information.

1. Introduction
Since the 13th five year plan, the construction industry has a good momentum of development, the total output value of the construction industry has repeatedly reached new highs, and the engineering cost consulting industry has maintained a healthy and good momentum of development. At the end of 2018, the operating revenue of engineering cost consulting enterprises was 172.145 billion yuan, an increase of 17.2% over the previous year, with 537,015 employees, an increase of 5.8% over the previous year. [1] The increase in the number of employees can not meet the demand of output value growth for talents, and the industry is in short supply of talents. Project cost is a major with strong policy and practice. Since 2016, great changes have taken place in the cost industry, including the cancellation of the post certificate of "cost engineer", the new establishment of the qualification of "second level cost engineer", the reform of replacing business tax with value-added tax, and the adjustment of 2018 quota pricing rules, With the implementation of BIM calculation technology, the promotion of assembly industry and the rise of whole process consulting management, great changes have taken place in industry qualification, work basis, work means and work scope. The engineering cost industry urgently needs a large number of skilled talents who can skillfully use the means of information technology and quickly work. At present, there are still some problems in the integration of production and education

1.1. Theory and practice teaching did not work together, and the construction of teaching resources lagged behind.
In the existing curriculum system, the practice teaching link is still weak, which is not arranged according to the ability requirements of the industry and the market, resulting in the poor matching between the practice teaching and the ability requirements. [2] Full time teachers are short of practice platform, lack of practical experience, inadequate guidance and assistance, teaching resources are inconsistent with the development of the industry, content update is slow, practice and theoretical teaching content are assimilated, and the ability goal is convergent. Although students are arranged to take teachers for internship in cost enterprises, because enterprises think it is difficult to retain talents and enterprise masters are busy with their own business, and many enterprises have not established corresponding incentive measures, the enthusiasm and responsibility of enterprise masters are not high.
1.2. The cooperation between school and enterprise is not deep, and the support of collaborative education is not enough.

At present, the channel of school enterprise cooperation of Architecture Specialty in higher vocational colleges is single, and the level of cooperation is shallow. The form of cooperation is mainly limited to internship [4]. The teaching work of enterprise part-time teachers in school enterprise cooperation is mainly reflected in the guidance of students' internship, while the guidance of teaching or training in the school is less. In addition, there are many problems, such as "fragmentation" of school enterprise cooperation content and "short-term" of cooperation cycle. The core forms of school enterprise cooperation, such as "order training", "participation in professional construction, curriculum development and teaching evaluation", are not favored by enterprises.

1.3. The combination of professional quality cultivation and post ability requirements is not close.

"Craftsman spirit" is a kind of professional spirit, which is the key content and core value embodiment of technical talents training. However, the spirit of craftsman's falsification is common in vocational education, which is reflected in the disconnection between the cultivation of technical talents and social needs. There are many problems in the graduates, such as "weak spirit of hard work and dedication, unwilling to take responsibility; indifferent quality awareness, inaccurate project pricing, often under counting phenomenon; poor sense of cooperation, slow speed of work" and so on.

2. On the mechanism of collaborative education of production and education in school

The comprehensive ability of the cost industry is required to be higher. The key ability training of cost talents can be achieved by setting up "workshop platform" in the school to serve the real project of the enterprise. After the students enter the workshop, they will be transformed into "employees". Taking the actual project as the carrier, through the integration of teaching and doing, they can fully explore the potential of students and cultivate the cost information skilled practical talents. Workshop teaching is a teaching method based on the platform of school workshop and the integration of theory and practice. It is a comprehensive skill training method with "students as the main body, ability as the guidance and problem-solving as the activity". The teaching in the workshop takes the ability module as the guidance, decomposes the actual work tasks of the workshop, and solves the problem of mismatch between skill training and professional teaching. Construction ideas: according to the four steps of building platform (setting up "workshop"), building curriculum (Curriculum Development), strengthening implementation (implementing teaching), reevaluation (multiple "assessment"). "Workshop" platform is the foundation, through the cost "leading class", the professional construction and ability education are integrated, and the engineering cost skilled practical talents are cultivated.

2.1. Improve the cost "workshop" of industrial nature and carry out multi angle operation evaluation.

As an industrial platform, the workshop will expand the scale of the original studio, solve the problem of small number of trainees and small influence; solve the problem of the practice platform of the integration of production and education of project cost from the internal source; distinguish "power, responsibility and benefit", introduce multi angle evaluation method, promote the long-term development of the workshop, and agglomerate and train the teaching staff.

2.2. Develop the cost backbone Modular Course Based on post ability with the concept of BETC.

BTEC (British Technology Education Council) practical education concept "employment oriented, ability oriented, student-centered", teachers from "teaching" to "guiding" learning, strengthen the cultivation of students' innovative spirit and practical ability, create professional talents with excellent professional skills, strong practical ability and high comprehensive quality. [2] The existing curriculum content of engineering cost specialty is old, the supporting teaching method is backward, and the students' interest in learning is low. The curriculum developed and transformed with BTEC concept
takes the actual project of the workshop as the carrier, and the students take the initiative to require the students with professional quality, so as to change the original phenomenon of high score and low ability, and really take the professional post ability as the curriculum evaluation index, so as to stimulate the students to learn theory and practice To provide resource guarantee for zero transition post after graduation.

2.3. Explore the long-term interaction mechanism between school and enterprise to realize the real collaborative education of industry and education.

Cost major is an interdisciplinary practical subject, which comes from the needs of engineering construction. It is impossible to talk about professional teaching without the development of the industry. The major should explore how to effectively attract outstanding students to join in the form of cost workshop "leading class", participate in the construction of cost workshop, form a good cycle of teaching resources, promote the deep integration of industry and Education Association in the school, and promote the overall level of engineering cost major, so as to expand the industry influence in the province and improve the employment quality of students.

3. The construction of collaborative education mechanism of production and education in school

3.1. Upgrade the studio to an enterprise cost "workshop", improve the platform operation mechanism, implement the "project leader system under the leadership of the chief engineer", and carry out the construction of project resource database.

Cost "workshop" enterprise operation, can use the existing professional cost studio, expand the scale of the studio, improve the platform operation mechanism. Based on the previous operation experience of the studio, the management system of the workshop was formulated, the organizational structure of each department, job responsibilities, selection and exit mechanism and standardized internal workflow were formed. After upgrading the cost workshop, the professional studio will set up five professional departments, including BIM calculation department, Valuation Department, project audit department, data department and finance department. The staff are all composed of students. The workshop will implement the "project leader system under the leadership of the chief engineer" according to the professional environment. The project leader can be temporarily selected by the chief engineer according to the characteristics of the project and combined with the expertise of the staff, so that each staff in the workshop can get the professional support training, have the opportunity to grow into skilled management personnel. Each project is calculated independently, and the income Commission is allocated to individuals by the project leader according to the contribution of each department team combined with the characteristics of the specific project, and the allocation results are recorded in the chief engineer's office; the workshop is set as a complete workflow from "task" distribution to "Filing" in the project process design, and the income can be approved and issued to the project team only after the process is verified to be correct.

3.2. Carry out in-depth research, divide ability modules, formulate personnel training plan, develop main courses in combination with new technical requirements, integrate craftsman spirit, and build a training curriculum system for skilled practical talents.

3.2.1. Divide ability module and make talent training plan.

According to the ability standard system of the cost industry, the engineering cost specialty reexamines the school running orientation and service, faces the post vocational education goal, adjusts the curriculum based on the working process, and explores the establishment of a new mechanism for the cultivation of skilled talents. The ability of engineering cost students is divided into three ability modules: calculation ability, pricing ability and comprehensive ability. The ability element units from low to high, students' ability can be trained layer by layer to ensure the professional ability required by the industry and enterprise's main business.
3.2.2 Analysis ability module, shape project teaching module.
Combined with the analysis of professional ability, the design of teaching module is progressive according to knowledge, considering the level of difficulty, and in line with the education law from general to special, from simple to difficult, so as to realize the requirements of systematic and comprehensive training for students. Integrating the main courses to form three professional project modules: calculation ability, pricing ability and comprehensive ability. The implementation process takes the early, implementation and post evaluation process of the whole life cycle of the construction project as the carrier, takes the task stage type as the object, defines the task point, and integrates into the module course teaching.

3.2.3 Based on the concept of BTEC, develop the main course content.
BTEC Teaching Philosophy mainly reflects "student-centered". In the course reform, the key points are to clarify the task items, highlight the achievement assessment, and finally take the overall completion quality of the task as the students' academic performance according to "excellent, good, medium, pass and redo". The main course syllabus in the "professional teaching project module implementation schedule" should integrate the project resource library according to the BTEC Teaching Concept and the professional ability of the post, so as to facilitate the implementation of the course.

3.3 Take the "leading class" of cost workshop as the carrier, explore the "leading class" teaching process docking with production process, and establish the talent echelon training mode of "pass, help and lead".

3.3.1 The cost workshop "leading class" was established to improve the personnel training program.
The first batch of students can be selected in the freshman of the engineering cost specialty to enter the leading class of the cost workshop. In accordance with the principles of professional mobilization, students' willingness and the college's overall planning, 30 students are initially selected as the pilot. The members of the leading class must be approved by their parents and signed in writing before they can enter the study. In addition to the policy education module and the general education required by the school, the teaching of the leading class is carried out in the workshop by the tutor group, and the teachers and students are trained in pairs. The freshman year's goal is to master the calculation module, the sophomore year's goal is to master the valuation module, and the junior year's goal is to master the comprehensive module. [6] The final elimination system is implemented in the assessment. If the assessment requirements cannot be met, the leading class will be eliminated into the normal teaching class. The workshop module course is carried out at the same time as the normal class teaching, so as to ensure that the eliminated students can successfully complete their university studies even if they enter the ordinary class.

3.3.2 Teachers and apprentices are paired to implement the "pass, help and lead" talent echelon training mode.
Before the specific theoretical study of the leading class, the tutor group and apprentice group were paired, and then the course was strengthened by groups and modules. The leading class carries out theoretical study under the guidance of the tutor group, and at the same time enters the Department to carry out project follow-up training. The staff of the cost workshop department is responsible for the implementation of the practical operation link of the apprentices in the leading class, evaluates the practical quality and effect of the apprentices, and undertakes the specific project implementation guidance, so as to realize the talent echelon training of "pass, help and lead". After learning the module course and passing the BTEC standard assessment, "students" will officially become "apprentices". When they enter the cost workshop, they will first complete the project tasks with lower difficulty. After completing certain project block tasks with quality and quantity guaranteed, they will become formal "employees" to complete the project tasks independently. If they are outstanding, they can get the training opportunity of the project leader and further improve their ability.
Table 1 Comparison of effect before and after project implementation

| entry name          | Pre class task completion rate | Achievement accuracy | Satisfaction |
|---------------------|-------------------------------|----------------------|--------------|
| Before implementation | 20%                           | 45%                  | 80%          |
| After implementation | 85%                           | 78%                  | 95%          |

4.Conclusions
It is necessary for the engineering cost specialty to operate the workshop scientifically by BIM method combined with BETC method. It is also a powerful measure for the civil engineering industry to promote BIM Technology and support the development of informatization.

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Reference
[1] Ministry of housing and urban rural development,(2019). issues statistical bulletin on project cost consultation. http://www.sohu.com/a/323195864_204505.
[2] Zhao, YJ, etc.(2007). Exploring BTEC Teaching Mode and cultivating students' professional ability. Vocational Education Research, 02:03-06.
[3] Wang, X,X, etc.(2018). Research on the promotion of studio talents training based on Engineering Cost Specialty. Management and technology of small and medium sized enterprises, 02:124-126.
[4] Pan, H,S,etc.(2013). Analysis on the current situation and influencing factors of school enterprise cooperation in Higher Vocational Education in China. Research on Higher Engineering Education,( 3) :143-148.
[5] Xiang W,etc.(2019). Research on Integration of Multi-source BIM Models Based on GIS Platform. In: International Conference on Information Management (ICIM). Cambridge: IEEE, 40-44.
[6] Zhang, Y,etc.(2019). Research on Application of railway project management system based on BIM. Journal of Railway Engineering, 36:98-103.