

Research on the Curriculum Reform of Engineering Drawing Based on "1+X" Certificate System

Shanshan Wu^{1*}, Yinhe Wang¹, Bolin Jiang²

¹ Chongqing Vocational College of Public Transportation, Chongqing, 402247, China

² Chongqing Vocational Institute of Engineering, Chongqing, 402260, China

* Corresponding author: Shanshan Wu

Abstract: Under the background of "1+X" certificate system, we have new opinions and ideas on the training mode of talents, and put forward the research on the curriculum reform of Engineering Drawing under the integration of curriculum and certificate from the aspect of teaching. By clarifying the relationship between BIM vocational grade certificate and Engineering Drawing, this paper puts forward the methods and ideas of Engineering Drawing course around BIM vocational skill reform, from reconstructing knowledge network and clarifying learning objectives; Reform teaching methods and pay attention to learning efficiency; This paper studies the curriculum reform under the integration of curriculum and certificate from the three aspects of overall evaluation mechanism and stimulating learning interest, so as to provide new ideas for new talent training.

Keywords: BIM; Integration of class and certificate; Curriculum reform; Engineering Drawing; 1+X certificate system

1. Introduction

With the development of the information age, the requirements of society for information talents are becoming increasingly prominent. BIM Technology has become the mainstream of information technology in the current engineering construction industry. The Ministry of Education, the National Development and Reform Commission, the General Administration of Market Supervision jointly deployed and launched the pilot work of the "academic certificate + several vocational skill level certificates" (hereinafter referred to as 1+X certificate) system. The introduction of the 1+X certificate system provides a new way for the cultivation of national technical talents in the new era and opens up a new path for students' better and more comprehensive development. Among them, the Building Information Modeling (BIM) certificate is one of the five certificates in the first batch of "1+X" pilot projects.

BIM Technology integrates many disciplines, and its learning requires students to have a solid foundation of professional courses. Engineering Drawing is one of the

more important professional basic courses. Integrating the assessment standard of vocational skill level certificate into the curriculum is an effective measure to improve students' technical skills. As the pre curriculum of BIM vocational skill level assessment, engineering drawing course has its unique curriculum status. However, at this stage, the integration of BIM vocational skill level certificate and Engineering Drawing course is not enough. Under the background of 1+X certificate system, students do not have a clear understanding of the status of Engineering Drawing course. Because of this environment and background, it is necessary for higher vocational colleges to study the curriculum reform of Engineering Drawing course [1].

How to integrate the Engineering Drawing course with the BIM vocational skill level certificate, so as to achieve the purpose of learning for application and the integration of course and certificate, is an important direction of curriculum reform research. This integration is not simply to increase the knowledge and content of the curriculum, but to organically integrate the existing curriculum and BIM curriculum, so as to achieve point-to-point echo, make the curriculum design more logical and make the knowledge system more hierarchical. Under the 1+X system, curriculum standards, curriculum teaching plans, teaching design and other aspects should be studied in a planned way.

2. Relationship between BIM Certificate and Engineering Drawing Course

2.1 Overview of "1+X" BIM Professional Grade Certificate

BIM Technology is a key and revolutionary technology for the transformation from traditional two-dimensional design and construction mode to three-dimensional design and construction mode. It is a basic technology to promote the development of green buildings, improve the informatization level of construction industry, promote the construction of smart city and realize the transformation and upgrading of construction industry. The modeling personnel should have both theoretical and practical skills, as well as certain BIM management skills.

Building Information Modeling (BIM) refers to the process of creating and managing building information in the whole life cycle of the planning, design, construction and operation and maintenance of construction projects and facilities. The whole process applies three-dimensional, real-time and dynamic models, including geometric information, spatial information, geographic information, property information of various building components and labor and material information. Building Information Modeling (BIM) vocational skill is a general term for the technical ability to create, apply and manage three-dimensional digital models suitable for the planning, design, construction, operation and maintenance of construction projects and facilities through the use of various BIM software. The "1+X" BIM vocational grade certificate is subject to the national unified organization proposition and assessment. The Central Research Institute of the Ministry of education reviews the certificate, and entrusts Langfang Zhongke construction industrialization innovation research center to evaluate BIM vocational skills and issue certificates. BIM (Building Information Modeling) vocational skill test scores are divided into three levels: primary, intermediate and advanced, which are BIM modeling, BIM professional application and BIM comprehensive application and management. This paper only deals with the primary part of BIM certificate and the part related to the curriculum reform of Engineering Drawing.

2.2 Relationship between Engineering Drawing and BIM Grade Certificate

According to the requirements of the evaluation outline of primary BIM certificate, the evaluation content mainly includes two parts, basic knowledge and professional skills.

The basic knowledge of drawing recognition involved in the basic knowledge and professional skills of BIM certificate evaluation is the content covered by the Engineering Drawing course and the basic knowledge that must be mastered for BIM modeling. The specific evaluation contents are shown in Table 1.

Table 1. Primary requirements for professional skills of BIM engineering drawings' reading and drawing

Number	Skill Requirements
1	Drawing standards for Architectural Specialty (drawing sheet, font, line type, annotation, etc.)
2	Map recognition and drawing method of orthographic projection, axial side projection and perspective projection
3	Reading and drawing methods of plan view, elevation view, section view and section view
4	Reading of architectural drawings (structural construction drawings, architectural construction drawings, etc.)
5	Read assembly and comprehensive project drawings

3. Thoughts on the Reform of Engineering Drawing Course

3.1 Objectives and Requirements of the Course

Engineering Drawing course is a professional compulsory course for Civil Engineering majors. It aims to enable students to read the engineering drawings of relevant majors after mastering the basic knowledge of engineering drawing, and draw the engineering entity drawings by using the current specifications, procedures and relevant standards of national drawing.

At present, under the "1+X" system, the curriculum standard of Engineering Drawing should be revised with pertinence and guidance. The main purpose is to meet the new requirements for students under the background of "1+X" BIM vocational skill level certificate through the curriculum reform of Engineering Drawing, improve students' comprehensive quality, broaden students' employment channels, improve students' practical ability, and realize the cultivation of professional compound talents.

This also establishes the new position of Engineering Drawing course under the background of "1+X" system. This course is a pre-course for students to obtain BIM vocational skill level certificate in the learning stage. It is a compulsory course for docking with vocational skill level certificate and the key to whether students can successfully obtain vocational skill level certificate.

3.2 Methods and Ideas of Course Certificate Integration

Course certificate integration refers to that the course setting corresponds to the vocational examination certificate, and the course teaching materials and teaching contents are consistent with the examination contents. Through course learning, students can directly participate in the examination of relevant vocational certificates. The form of linking teaching with skills pushes vocational education to another thinking framework. It is different from the teaching method of complete teaching. It emphasizes practical operation and application, so that students can directly participate in work after graduation [2].

This training mode not only reduces the training cost of enterprises in the initial stage of employment, but also improves the learning efficiency of students, so that students can truly achieve the purpose of integrating knowledge with practice and applying learning.

Attaching importance to the operability research of course certificate integration is the most important link to ensure that students can really benefit from the idea of course certificate integration. To realize the operability research, we need to re-integrate the teaching methods and ideas under the integration of curriculum and certificate, deeply analyze from the three aspects of knowledge network, teaching methods and evaluation mechanism, and deal with the relationship between teaching and learning, learning and examination, so that the integration of curriculum and certificate is not only a superficial form, but deep into the classroom teaching activities [3].

3.2.1 Reconstruct knowledge network and determine learning objectives

In its origin, any discipline is composed of simple knowledge, and each discipline has its own unique knowledge system and context, but there are countless relationships between different disciplines. The curriculum reform urgently needs teachers to clarify this internal relationship.

Under the background of "1+X" system, realize the curriculum reform of course certificate integration, and reorganize and integrate the knowledge system of engineering drawing course and BIM Technology course, so as to achieve the following purposes:

a. Clarify the connection of knowledge points between the two courses. In depth summary, for the common knowledge plate of lessons and certificates, we should focus on the common knowledge points, focusing not only on the knowledge itself, but also on the application of this knowledge in BIM Technology. For example, the knowledge of axial projection in engineering drawing is often applied to the drawing of families in BIM level examination. It is necessary to analyze and solve problems through the method of axial projection. For example, the minimum requirement for reading architectural professional drawings in comprehensive modeling is the minimum requirement of this kind of problems.

b. Put forward different requirements and objectives for different contents. The elements of skill level certificate are integrated into the curriculum teaching activities, so different requirements and objectives should be put forward for different contents. For common knowledge points, the curriculum standards should be adjusted according to the evaluation outline of the certificate [4].

c. Grasp the boundary between class and certificate, and clarify their different emphases and directions. In the integration of class and certificate, we should grasp the fundamental principles and boundaries, and never suspend class and certificate research. The two should complement and promote each other. The primary purpose of promoting the integration of curriculum and certificate is to give full play to the curriculum knowledge and improve students' mastery of knowledge through the acquisition of certificate skills.

3.2.2 Reform teaching methods and pay attention to learning efficiency

In the form of teaching, it is proposed to take the test questions of "1+X" BIM grade examination as a supplement to classroom teaching materials. This integration not only enables students to understand and learn the direction and content of skill evaluation in advance, but also jump out of the original teaching textbooks and apply the professional knowledge directly to practice.

In the teaching method, the integration of BIM model and PPT teaching is introduced. The learning of Engineering Drawing course requires students to have good spatial imagination ability, and BIM creates three-dimensional models. The combination and introduction of BIM modeling can well supplement

students' deficiencies in spatial imagination, so that students can not only be familiar with BIM models, but also exercise their spatial imagination, and greatly improve the teaching effect of the course.

3.2.3 Overall evaluation mechanism to stimulate learning interest

Based on the reform of Engineering Drawing course under the "1+X" BIM certificate system, the improvement of its course evaluation mechanism is also one of the important aspects. While coordinating the evaluation mechanism, it should also stimulate students' interest in learning. Consider incorporating the method of exchanging credits for vocational skill level certificates into the students' curriculum evaluation system [5], and exchange equivalent credits for students who pass the certificate examination. This can not only reduce the pressure of students' course examination, but also stimulate students' learning enthusiasm, make students understand that the purpose of class and examination is to master skills rather than just obtain credits, and eliminate the negative thought that credits are greater than everything in students' mind.

4. Conclusion

Under the background of 1+X certificate system, it is a direction worth exploring to realize the integration of BIM vocational skill level certificate and Engineering Drawing course through curriculum reform. By integrating the elements of vocational skill level certificate into teaching activities, we can lay a solid foundation for cultivating compound talents. This paper expounds the curriculum reform of Engineering Drawing from the aspects of basic knowledge, learning methods and evaluation mechanism, so that students can not only master knowledge and skills, but also obtain vocational skill certificates, so as to help students better study and obtain employment.

Acknowledgement

This paper was supported by Chongqing Higher Education Teaching Reform Research Project "Exploration on the Training Path of Compound Talents of Higher Vocational Majors under the 1+X Certificate System - Taking the Specialty of Construction Engineering Technology as Example" (Grant No.203764), Chongqing Vocational Institute of Engineering research project (Grant No.JG221001).

References

- [1]Chen Hongjie, Li Gaofeng, Zhang Lanlan, Zhang Weiwei, Research on BIM curriculum teaching reform in Higher Vocational Colleges under "1+X" certificate, Education and Teaching forum, 2021, (45): 92-95
- [2]Tao Xiaoqing, Analysis on the construction of curriculum teaching resources and the reform of assessment system under the background of "1+X" certificate system, Science and Technology Wind, 2021, (27): 21-23
- [3]Jiang Zhengrong, Liu Xiaofeng, Reform of architecture curriculum system based on BIM Technology, Architecture and Culture, 2021, (03): 38-39

[4]Zhu Junjie, Research on the application of BIM Technology in the teaching of building architecture, Engineering Technology Research, 2020,5 (12): 229-230

[5]Nan Xuguang, Zhang Pei, Construction of vocational education curriculum system based on 1+X certificate system: problems logic and approach, China Vocational and Technical Education, 2020, (32): 5-10