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The Exploration of the Teaching Reform in the Course of "Drawings Recognition in Construction Engineering" for the Veterans Under the Background of "1+X" Certificate System: Take a Private University in Hainan Province as an Example

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Abstract. A private college in Hainan Province is exemplified to introduce the construction logic of the school's civil engineering group who is offered basic courses of "Architectural Drawing Recognition and Construction" and "Engineering Drawing". The veterans are faced with the dual pressure of both work and study, and how to get the veterans to pass the "1+X"construction engineering drawing examination is a difficult problem for the majority of educators. Due to the limited offline teaching hours, the veterans must actively promote the integration of course and certificate. The list introduces the comparison of the course setting and teaching content before and after the "1+X" course and certificate integration, which reflects the professional skill level standards for construction engineering drawings after the course certificate integration. At the same time, it constructively explore the practice of integrating Revit and BIM civil engineering measurement GTJ2021 software into the course of "Architectural Drawing and Construction". Finally, the dilemma and breakthroughs of implementing the "1+X"certificate of construction engineering drawing recognition are proposed from the level of students, teachers and enterprises.

Keywords. "1+X" certificate, professional group, drawing recognition of construction engineering, engineering drawing, course and certificate integration

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1.Introduction

The National Vocational Education Reform Implementation Plan was promulgated at the beginning of 2019. The case clearly stated that the pilot work of the "1+X" certificate system should be widely initiated and carried out in vocational colleges. The civil engineering major offers basic professional courses of "Architectural Drawing and Structure" and "Engineering Drawing". How to integrate professional basic courses with the "1+X"course certificate, and how to face the difficulties and breakthroughs in implementing the "1+X"construction engineering drawing certificate from students' level, teachers' level, and enterprises' level are the problems that the civil engineering professional group needs to solve .

Premier Li Keqiang stated in his government work report on March 5, 2019: "This year, higher vocational colleges will enrol 1 million people on a large scale." The main thing is to reform and improve the enrolment methods of higher vocational colleges, and encourage more recent high school graduates, veterans, laid-off workers, and migrant workers to apply for the exam [1]. Veterans are facing the dual pressure of work and study. Some of them perform the work which is related to the major that they apply for, while some are not related to the major that they apply for. Drawing is the language of engineering. It is the basic knowledge that veterans who apply for the civil engineering professional group must master. How to enable veterans to better learn the professional basic courses of "Architectural Drawing and Construction" and "Engineering Drawing", and strive to pass ""1+X" "Construction engineering drawing examination is a difficult problem faced by the majority of educators. The professional basic courses of "Architectural Drawing and Construction" and "Engineering Drawing" are the basic courses that veterans who apply for the civil engineering group must master. For the reason that veterans have limited offline teaching hours, it is therefore necessary to actively promote the integration of course and certificate. Moreover, teaching veterans to master architectural projection rules, architectural drawing standards, and the use of CAD drawing software during the limited offline teaching hours that veterans have. A set of small-scale construction engineering drawings acts as the carrier to complete the task of recognizing and drawing architectural professional drawings, and develop basic professional qualities through the knowledge and understanding of national technical standards and standards.

2.Literature Review

Kong Yuqin [2] , Emperor Yao [3] proposed A 3D model of small and medium-sized engineering drawings suitable for teaching is established by using BIM technology, which is applied to the understanding of architectural structure and the teaching of engineering drawings. The traditional teaching mode is reformed, gradually changing from the previous abstract and boring learning mode to the vivid three-dimensional learning mode with the help of computer, so as to meet the social needs of the major. BIM technology is introduced, and the information technology is organically integrated with traditional course teaching.

Zhao Yingying[4] proposed the traditional teaching method has been difficult to achieve the teaching goal of abstract architectural professional courses, and MR technology has brought new possibilities to education with its powerful advantages. Li Ke, He Lizhi, Zheng Qiaoling[5], Xu Lili[6] proposed to restructure course content

modules, introduce actual enterprise engineering projects, carry out project-based learning based on information technology, and jointly build online resources for courses by schools and enterprises, and explore "1+X" Curriculum construction model led by learning maps and a mixture of internal and external teaching. Tan Xiaoyan, Zhang Hongyao[7] proposed deepening the combination of "1+X"vocational skill certificate and curriculum construction in the reform of “teachers, textbooks and teaching methods” and puts forward some reasonable suggestions for this reform of relevant professional courses. Wang Jian [8] proposed to realize the intelligent learning of construction drawing recognition skills by combining IT technology and adopting modern scientific and technological means.

3.Construction logic of civil engineering professional group

In consideration of the life cycle of the real estate industry, majors in real estate operation and management, architectural design, architectural engineering technology, architectural decoration engineering technology, construction engineering supervision, engineering cost and property management have been set up focusing on the early stage of the project, bidding phases, construction phases, decoration phases, and operation phases in accordance with the professional group construction idea of "connecting the real estate industry chain, optimizing the real estate professional chain, building the real estate professional group, innovating the service chain, and activating the talent training chain based on the job chain". Real estate operation and management, and project construction cost will provide talent services for the real estate industry at different stages of the real estate industry’s life cycle throughout the entire industrial chain. Project construction cost provides services such as investment budget, design budget, construction drawing budget, base price, quotation, contract price, construction budget, settlement, and final accounts for the real estate industry chain. As shown in Figure 1. The solid ellipse indicates the major currently registered for the veterans, and the dotted ellipse indicates the major currently not registered or suspended. Among them, real estate operation and management, previously called Real Estate Operation and Valuation started in 2009 and its enrolment was stopped in 2014. The main reason for the suspension of enrolment was the decline in enrolment due to the constraints of the development of the real estate industry in Hainan Province. Construction project supervision started recruiting students in 2012 and stopped recruiting in 2017. The main reason was with the development of Hainan’s economy, vocational students and parents are more inclined to choose majors with technical content, available job vacancies and good development prospects. Construction engineering majors are more inclined to choose construction costs, construction engineering technology, resulting in the declining enrolment in construction project supervision. In 2017, the major of architectural decoration engineering began to recruit students to the scale of about one class a year. Architectural design and property management were not opened. After an early-stage market research and demonstration, property management enrolment was relatively small across the country, though property management companies can provide a large number of job vacancies. However, the low employment thresholds and low salary income led to poor students' willingness to apply for the exam. Architectural design majors are difficult to learn and require relatively high professional standards for students. Students who apply for majors in private colleges are subject to multiple considerations of their own learning status and employment, and their willingness to

apply for it is not high. Hence there is only one higher vocational college in Hainan Province that opens this major with a stable enrolment scale of about one class.

Drawings are the language of engineering, and drawing recognition and drawing are necessary skills for engineering majors. The three majors of engineering cost, construction engineering technology, and architectural decoration engineering technology all offer basic professional courses of "Architectural Drawings and Structures" and "Engineering Drawings". Since 2009, around 300 veterans have applied for three majors in engineering cost, construction engineering technology, and architectural decoration engineering technology.

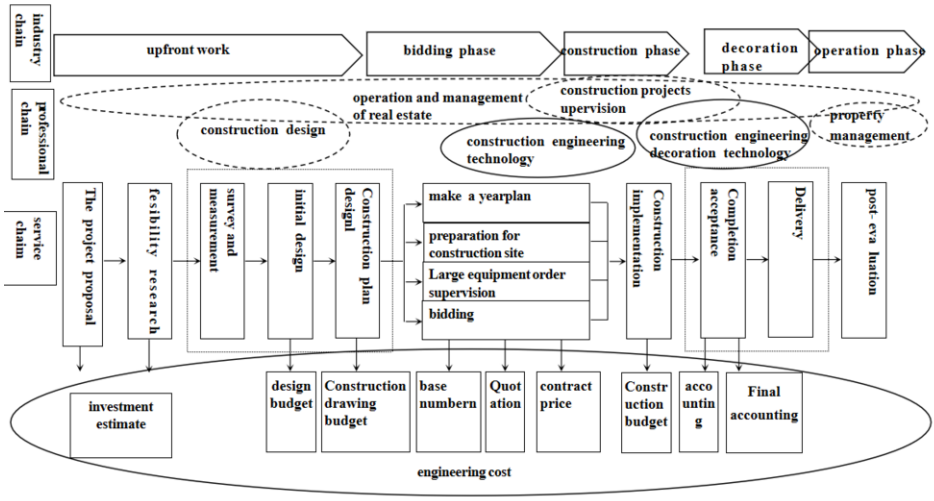

Figure 1 Schematic diagram of the correspondence between civil engineering professional groups and industries

4. Comparison of curriculum setting and teaching content before and after "1+X"course and certificate integration

Considering that the students are senior veterans who have weak abstract thinking, it is not appropriate to choose abstract declarative knowledge for the course content [9]. The course "Architectural Recognition and Structure" before the integration of course and certificate weakens the explanation of projection knowledge given the fact that their sense of three-dimensional space is not strong. It mainly teaches students to read design instructions, general layout, plan, standard floor plan, elevation, detailed drawing, stair plan, stair section, detailed drawings of stair nodes and independent foundations, strip foundations, raft foundations, pile cap foundations, pile foundations, stair reinforcement plane method, column reinforcement plane method, shear wall reinforcement plane method, beam reinforcement plane method, slab reinforcement plane method and other structural diagrams.

In accordance with the "1+X"vocational skill level standard for building engineering drawing recognition, the "Architectural Drawing Recognition and Structure" course after the integration of course and certificate strengthens the basic principles of projection, and adds the learning and reading of drawing specifications and axonometric drawings. By increasing the class hours of this part, the passing rate

of the elementary level and intermediate level of students has been increased and the foundation of drawing recognition has been laid.

Only the course of "Engineering Drawing (AUTOCAD)" was offered before the course and certificate were integrated. After a survey the veterans believe that the CAD software which is offered for only one semester, is forgotten later during the internship. It is recommended to set up a two-semester drawing course to consolidate the learning content. Considering the actual situation of the school's computer room, the course "Engineering Drawing (Zhongwang CAD)" was added after the course certificate was integrated. Two-semester teaching is convenient for veterans to better master the drawing software. At the same time, students are required to draw three-sided projections of points, lines, surfaces, and bodies, to draw the isometric and oblique two-dimensional drawings of the body, and to draw the construction drawings and detailed structural drawings of the construction engineering foundation, column (wall), beam, and slab. These have enriched the teaching content and improved the skill level of the students.

Vocational colleges and social institutions must take into account the essential feature between vocational education and vocational training when launching the "1+X" certificate system pilot program and avoid shortening the class and class hours or compressing the knowledge and skills that should be imparted in order to obtain the vocational skill level certificate. Otherwise vocational education becomes vocational training [10]. Table 1 shows the comparison of curriculum settings and teaching content before and after the course certificate integration.

5. Exploration of integrating Revit and BIM civil engineering measurement GTJ2021 software into the course of "Architectural Drawing and Construction"

The course of "Architectural Drawing and Recognition" is to cultivate students' imagination and shape conception ability from space to plane, and then from plane to space. For complex shapes, as well as the drawing of sections and cross-section, students are required to have strong space imagination which makes it difficult for them to understand [11]. Revit can facilitate teachers and students to compare the projection views in different directions of the model, which can effectively help students understand and master the projection law; it can facilitate teachers and students to observe the difference of projection graphics of different featured models, and help students to establish the mapping between projection graphics and three-dimensional models, thus improving students' ability to read drawings [12].

Through drawing by BIM civil engineering measurement GTJ2021 software, one can convert two-dimensional drawings into three-dimensional drawings. Students can combine learning with strong intuitiveness and achieve better teaching effects. At the same time, students can view the engineering quantity of the steel bar after the calculation, check the reinforcement situation and anchoring situation of the steel bar, learn more intuitively and understand more thoroughly. The combination of the abstract plane drawing with the three-dimensional drawing makes it more visual and effective to solve the problem of poor spatial imagination of students and contribute to the study of veterans in higher vocational colleges.

Table 1 the comparison of curriculum settings and teaching content before and after the course certificate integration

The comparison of the course setting and teaching content before and after the "1+X" course and certificate integration					
	Before course and certificate integration		After course and certificate integration		
Course setting	Architectural Drawing and Construction	Engineering Drawing	Architectural Drawing and Construction	Engineering Drawing (AutoCAD)	Engineering Drawing(Zhongwang CAD)
class	64	64	64	32	64
Semester	First Semester of the freshmen year	First Semester of the freshmen year	First Semester of the freshmen year	First Semester of the freshmen year	Second Semester of the freshmen year
Key points	Know about basic principles of projection		Master basic principles of projection	Master drawing specifications	
			Know drawing specifications well	Master the drawing methods and formation principles of axonometric drawings	
			Master the basic knowledge of axonometric drawings	Master the drawing methods and formation principles of cross-section	
	Know about the notes and types of section and cross-section	Master the drawing methods and formation principles of construction plan	Know about the notes and types of section and cross-section	Master the drawing methods and formation principles of construction plan	
	Know about the basic knowledge of construction drawings and relative regulations	Master the drawing methods and formation principles of elevation	Know about the basic knowledge of construction drawings and relative regulations	Master the drawing methods and formation principles of elevation	
	Master the basic knowledge of structural construction drawings and relative regulations and now about the basic knowledge of reinforced concrete	Master the drawing methods and formation principles of section	Master the basic knowledge of structural construction drawings and relative regulations and now about the basic knowledge of reinforced concrete	Master the drawing methods and formation principles of section	
			Recognize projections of axonometric, isometric and oblique	Draw the isometric and oblique two-dimensional drawings of the body	
	Recognize and distinguish section and cross-section	Copy the construction plan according to the given	Recognize and distinguish section and cross-section	Copy the construction plan according to the given drawings	
	Recongnize the design instructions, general layout, plan, standard floor plan, elevation, detailed drawing, stair plan, stair section, detailed drawings of stair nodes	Copy the construction plan according to the given drawings	Recognize the design instructions, general layout, plan, standard floor plan, elevation, detailed drawing, stair plan, stair section, detailed drawings of stair	Copy the construction plan according to the given drawings	
Points of skills	Recognize the independent foundations, strip foundations, raft foundations, pile cap foundations, pile foundations, stair reinforcement plane method, column reinforcement plane method, shear wall reinforcement plane method, beam reinforcement plane method, slab reinforcement plane method	Draw a section as required	Recognize the independent foundations, strip foundations, raft foundations, pile cap foundations, pile foundations, stair reinforcement plane method, column reinforcement plane method, shear wall reinforcement plane method, beam reinforcement plane method, slab reinforcement plane method	Draw a section as required	
	Proficiency in the analysis of civil building structures: foundations and basements, walls, floors, doors and windows, stairs, roofs, deformation joints, industrial buildings	Draw a cross-section as required	Proficiency in the analysis of civil building structures: foundations and basements, walls, floors, doors and windows, stairs, roofs, deformation joints, industrial buildings	Draw a cross-section as required	
					Draw basic construction drawings of construction projects; Draw column (wall) construction drawings of construction projects; Draw beam construction drawings of construction projects; Draw slab construction drawings of construction projects; Draw detailed structural drawings of construction projects

6. Difficulties and breakthroughs in implementing the "1+X"construction engineering drawing recognition certificate

So far the "1+X"construction engineering drawing recognition certificate is in its infancy and there are some problems such as low student participation, lack of enthusiasm, high pressure on teacher training, and low corporate recognition.

The school has mobilized students to sign up for the training on many occasions, but the willingness of students to sign up is not high. The main reasons are as follows: First, the training time is mostly evenings and weekends, and students are struggling to cope. Due to different classes having different class hours, students are encouraged to sign up on their own, and because training is only at night and the weekends; students feel it is tiring and are not willing to participate. The logic of subject courses can easily lead to the lack of motivation, low interest, and low learning performance of vocational education learners [13]; second, the content of the primary examination is out of touch with work practice and students are not motivated. For higher vocational students, we tend to allow students to understand construction drawings and structural construction drawings. The emphasis is on understanding the drawings. The three-sided projection method is tested in the drawing part, which is relatively abstract and inconsistent with the students' focus. It is of great difficulty in learning; third, it has a low recognition of enterprises compared with the Seven Workers certificates, thus the willingness of students to participate in the examination is low. Students also hope to obtain graduation certificates and partial post of the Seven Worker's Certificates. For the "1+X"construction engineering drawing recognition certificate, the company's recognition is currently low in the promotion stage. Students are more willing to review the contents of the Seven Workers Certificates in their spare time rather than participate in the "1+X"construction engineering drawing training. Fourth, the examination time is relatively rigid, and it is impossible to substitute certificates for examinations. As the "1+X"construction engineering drawing is in the national unified examination, there are about 4-5 examinations per year. The student has not finished the class and cannot take the exam. Arranged at the end of the semester, the students' school exams are over, and then they will take the "1+X"architectural engineering drawing test. It is impossible to substitute the certificate for the exam and improve the enthusiasm of the students. It is recommended that the primary drawing part of the "1+X"construction engineering drawing examination is still based on simple construction drawings, distinguishing architectural design, structural construction, building plumbing, and building electrical. It is recommended that the test time is to be flexible, so that the certificate can be used to replace the test and improve the enthusiasm of students. It is recommended to increase publicity, and increase enterprises' awareness of "1+X"construction engineering drawing recognition, and increase the industry's recognition of "1+X"construction engineering drawing recognition certificate, and strive to be comparable to the Seven Worker's Certificates.

Due to the heavy burden of class hours, teachers will take up a lot of time for evening and weekend training. In addition, the teacher training organized by Zhongwangongteng Software Co., Ltd. is offline, which usually takes 4-5 days. The teachers in private colleges are relatively tight, and it is difficult to have enough training time. The focus of teacher's training is to understand the pictures, which weakens the explanation of the projection, resulting in mediocre training effects. It is recommended that teacher training should be changed into online training. Only when

the teacher understands the points for the test, will they be able to review and guide students in a targeted manner.

7. Conclusion

Taking a private college in Hainan Province as an example, this article first introduces the construction logic of the school's civil engineering professional group. The civil engineering professional group provides basic courses of "Architectural Drawing and Construction" and "Engineering Drawing". Then the list introduces the comparison of the course setting and teaching content before and after the "1+X"course certificate integration, which reflects the professional skill level standard for building engineering drawing recognition after the course certificate integration. At the same time, this article constructively explores the practice of integrating Revit and BIM civil engineering measurement GTJ2021 software into the course of "Architectural Drawing and Construction". Finally, from the level of students, teachers, and enterprises, the dilemma and breakthroughs of implementing the "1+X" construction engineering drawing recognition certificate are proposed.

Only certificates recognized by the industry will have lasting vitality, and will truly be highly valued by teachers and students. In the later stage of the research, it is recommended to send some questionnaires to enterprises and industry organizations to introduce the "1+X" construction engineering drawing recognition certificate. In addition, to solicit opinions from enterprises and industry organizations on how to make the "1+X" construction engineering drawing recognition certificate more popular, and how to encourage more corporate practitioners to apply for the exam.

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