Construction of Assembly Teaching Module Based on the Collaboration of "Certificate of Production Education"

Lili Huang

East University of Heilongjiang, Harbin 150000, China

Abstract: Despite the rapid development of construction industrialization, there is a serious shortage of prefabricated construction talents. Faced with this contradiction, this article takes the Civil Engineering major of Heilongjiang Dongfang University as the research object. By studying industrial demand and the "1+X prefabricated building component production and installation occupational level standards", a collaborative prefabricated education module of "production certification education" is constructed, which aims to cultivate the knowledge and abilities required by prefabricated talents for students, enabling them to adapt to the industry development needs of construction industrialization transformation and upgrading. At the same time, it provides a certain research direction for the reform of prefabricated teaching systems in other universities.

Keywords: Prefabricated buildings; "Property certification education" collaboration; Teaching modules

Introduction

In recent years, China's construction industrialization has developed rapidly, and the demand for prefabricated talents has grown rapidly. However, China's reserve of prefabricated construction talents is seriously insufficient, especially those trained by universities. At the same time, the country requires universities to achieve the integration of industry and education in their educational ideas, and cultivate applied technical talents. The talent training method of "workplace experience - practical training - on-the-job experience" can ensure that students can exercise their ability to meet industrial needs. The assessment content of the "1+X" certificate includes the main content of industrial construction, and promoting the "1+X" certificate system is an important measure to cultivate talents in the new era. Therefore, with the goal of cultivating prefabricated talents who can adapt to the background of building industrialization upgrading, and with the industry demand and the "1+X prefabricated building component production and installation professional level" standard as graduation requirements, by integrating, restructuring, and expanding the existing curriculum system, a prefabricated teaching module based on "industry certification education" collaboration can be constructed to create professional talents that meet the background of prefabricated buildings.

1. Integration of property certification and education

Prefabricated talents can be divided into three types: construction workers, professional technical talents, and senior management personnel. Applied technology oriented undergraduate schools should aim to cultivate prefabricated professional technical talents. The industry capabilities of prefabricated professional technical talents include deepening design and construction safety design ability, production and processing ability of components and molds, construction technology and operation ability, project management ability, etc. The main employment directions for prefabricated building professionals are deepening design personnel, prefabricated processing plant technicians, and on-site construction technicians. Different career directions have different emphasis on job requirements and ability requirements, and can correspond to the three levels of the "1+X prefabricated building component production and installation occupational level standard". Translate the needs of enterprises and vocational technical requirements into the knowledge and ability requirements that students should achieve under professional training, and form a knowledge and ability mapping matrix under the integration of industry certification and education as shown in Table 1.

Employment direction and job content	qualification certificate	Knowledge capability mapping	Knowledge List	Ability List
Prefabricated construction workers 1. Inspection and installation of prefabricated components 2. Preparation of prefabricated construction plan 3. Construction organization and project management of prefabricated building construction sites	primary intermediate senior	Knowledge: 1/4/5/ 10/11 Ability 1/2/3/4/ 8/10	 Types and Construction of House Structures Recognition of architecture and structure Recognition of equipment construction drawings CAD, Measurement, Building Materials 	 Construction drawing reading Construction and fabrication of prefabricated building components Installation and quality control of prefabricated building components

Table 1 Knowledge Capability Mapping Matrix under the Integration of Property Certification and Education

Component production technician			5. Prefabricated construction drawings	
1. Preparation and Inspection of		iate Knowledge 1/2/3/4/ 5/6/7/8/9 Ability 1/2/5/6/ 7/8/10	6. Mold preparation and installation	4. Construction
Component Raw Materials	intermediate senior		7. Pre embedding and pouring of	management of
2. Mold preparation and installation			prefabricated components	prefabricated buildings
3. Component embedding, fabrication,			8. Production and technology of	5. Calculation of raw
and pouring			prefabricated components	materials for prefabricated
4. Quality inspection of prefabricated			9. Loading, unloading and	concrete components
components			transportation of prefabricated	6. Mold preparation and
5. Loading, unloading and			components	installation
transportation of prefabricated			10. Prefabricated construction	7. Embedding, fabrication,
components			technology and methods	and pouring of
			11. Construction Plan	prefabricated components
Deepening design personnel 1. Conduct BIM modeling and performance analysis according to the construction drawings 2. Conduct information management	senior	Knowledge 1/2/4/5/ 10/12/13/14/15 Ability 1/2/5/8/ 9/10	12. Valuation of Bill of Quantities	8. Computer assisted
			13. Detailed Design of Prefabricated	drawing
			Buildings	9. BIM software
			14. Operation of BIM modeling	application
			software	10. Communication and
			15. Application of Prefabricated	language expression
			Engineering BIM	

2. Determination of talent cultivation mode

2.1 Talent positioning and training objectives

Taking the cultivation of prefabricated professional technical talents as the talent positioning, considering the characteristics of the BIM course in our college, we have formed a "civil engineering characteristic talent cultivation model based on 'BIM+prefabricated buildings'", and based on this, we have constructed an prefabricated education module. The goal is to cultivate applied technical and management talents who master the basic theoretical knowledge, professional knowledge, and professional skills of civil engineering and prefabricated buildings, and obtain the "1+X prefabricated building component production and installation vocational skill level" training and practical training.

2.2 Characteristics of Talent Cultivation

(1) Collaborative education between schools and enterprises, innovative talent cultivation models

To address the issue of the disconnect between traditional school education and enterprise needs, we need to carry out school enterprise co education by utilizing expert lectures, building intelligent prefabricated construction bases, and increasing practical training for enterprises. This will create a three in one training model of "school+enterprise+teacher".

Promote the teaching of "dual certification"

Integrating vocational qualification standards and industry employment requirements into talent cultivation standards, obtaining academic certificates and obtaining the "1+X Prefabricated Building Component Manufacturing and Installation Vocational Level" certificate, integrating prefabricated vocational certificates with prefabricated courses, and integrating job certification with job operation training courses, so that students have professional skills certificates upon graduation, and the requirement of quick mastery of professional skills, achieving a "zero distance" interface between education and positions.

(3) "BIM+prefabricated" dual core helps career development

The combination of BIM and prefabricated buildings conforms to the education and teaching reform of "thick foundation+refined skills".Integrating information technology tools such as BIM into the curriculum and practical aspects of prefabricated modules is more conducive to the transition from cast-in-place reinforced concrete teaching to prefabricated building teaching.Not only does it equip graduates with vocational skills in prefabricated construction, but it also expands their means of BIM technology skills, expands their employment channels, and is conducive to their career development.

(4) The construction of teaching resources for online and offline dual platforms, as well as on-site virtual double links

Utilize sufficient online learning resources to integrate resources such as prefabricated building design, construction, and management cases, and build an online learning platform; According to the "1+X" practical assessment content, a prefabricated construction method building can be constructed to form a training platform. Simulation software can also be used to form a simulation training platform, ensuring on-site training of component production, component lifting, component grouting, and exterior wall joint treatment as much as possible.

3. Construction of teaching modules

In order to meet the employment needs, cultivate students' vocational skills and business needs, and take into account the limited total professional course hours, the teaching module is divided into a universal module and a professional model. The universality module is

mainly applied to civil engineering students in other fields, aiming to enhance their level of prefabricated cognition. The specific adjustment plan is to target existing courses such as "Building Architecture", "Civil Engineering Construction", "Prefabricated Building Technology", and "Building Engineering Budget and Software Application", and add relevant chapters on prefabricated buildings in the content;At the same time, elective courses will be added in the areas of prefabricated design, production, construction, and management, such as "Prefabricated Construction Technology", "Prefabricated Building Component Production and Transportation", "Prefabricated Building Manufacturing Management", etc;Finally, utilize online resources to form a blended online and offline course content.

The professional module is aimed at students in the prefabricated direction, with three sub modules set up: knowledge field, practical training, and vocational ability improvement. Under different modules, the curriculum system is adjusted by compressing or replacing some of the original courses, adding prefabricated building related courses, and other methods to form a complete prefabricated building teaching module. The specific adjustment plan is shown in Table 2.

Sub module	Course	Course adjustment content					
	categories	Integration of existing courses	Add new courses	Course adjustment			
Knowledge domain	Professional basic skills courses	Building Architecture: Adding Prefabricated Building Structures	Introduction to Prefabricated Buildings	Integrate mechanics courses into one course, Building Mechanics Adjusting "Soil Mechanics" and "Engineering Geology" to "Soil Mechanics and Engineering Geology"			
	Professional core skills courses Professional Expansion Skills Course	Add content for prefabricated building drawing recognition in the "Construction Drawing Recognition Training" Design of Concrete and Masonry Structures: Adding Prefabricated PC Structure Design BIM Application Technology adds modular deepening design	Construction organization and management of prefabricated integral concrete structure engineering Production and Transportation of Prefabricated Building Components Detailed Design of Construction Drawings for Prefabricated Buildings Prefabricated shear wall structures Deepening Design of Prefabricated Buildings	Adjust "Construction Engineering Economics and Project Management" to "Prefabricated Building Project Management" Adjust Civil Engineering Construction to Prefabricated Building Construction Technology and Process Add elective course "Industrial Manufacturing"			
Practical training 14 ce	Practical courses	Add a practical training course on	Sandtable Practice for Prefabricated Building Projects Practical Training on Prefabricated Building Construction Course Design for Deepening Design of Prefabricated Building Construction Drawings	Course Design of Building Architecture has been adjusted to Practical Training on Drawing Construction Drawings for Prefabricated Concrete Structures Curriculum Design for Concrete Structures has been adjusted to Production Training for Prefabricated Buildings			
	Job training	Aut a practical training course on the production and installation of prefabricated components, and set up four practical training projects according to the requirements of the " $1+X$ " subject two exam, with the " $1+X$ " evaluation standard as the assessment standard.					
	Students can participate in the "1+X" Prefabricated Building Component Manufacturing and Installation VocationalI+X levelSkills Level Certificate for Junior and Intermediate level through the study of on campus courses, and capablecertificationstudents can participate in the Advanced Level Certificate. If the corresponding certificate is obtained before the course learning, the student's course learning can be waived						
Professional ability improvement	Internship (production training, graduation internship), graduation project, innovation and entrepreneurship competition, prefabricated competition, school enterprise cooperation project						

Conclusion

By analyzing the industry demand and the "1+X prefabricated building component production and installation vocational skill level certificate", the content of the integration of production, certification, and education was determined, forming a mapping matrix of enterprise demand, occupational requirements, and knowledge capabilities. A soil and wood engineering characteristic talent training model based on "BIM+prefabricated building" was determined, and talent training characteristics were formulated. On this basis, the prefabricated building teaching module was determined. This includes universal modules suitable for all civil engineering majors and specialized modules suitable for the direction of prefabricated construction, aiming to cultivate the knowledge and abilities required for prefabricated talents in students,



and enable them to adapt to the development needs of the construction industry transformation and upgrading.

However, this study has only integrated the three aspects of certification, industry, and education. Further research is needed in this area, and further exploration is needed to further integrate "BIM+modular" and reform teaching methods.

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