

Analysis on the Construction of Professional Group and Post Group of Construction Engineering Technology Based on Industrial Development

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Abstract: With the modernization transformation and upgrading of the construction industry, the construction projects are showing a trend of comprehensiveness, diversification and complexity, and the horizontal correlation between different majors is gradually increasing. In the face of new business forms, new models and new challenges in the development of the construction industry, the construction of the professional group of construction engineering technology needs to consider many construction approaches, such as group logic, talent training mechanism, post group establishment, curriculum system, supporting and platform construction of vocational qualification certificates and post certificates.

1. Introduction

With the implementation of high-level vocational schools with Chinese characteristics and the construction plan of specialties, in order to further build a community of shared future integrating industry and education, the specialty group of architectural engineering technology needs to cope with the change of student source structure, improve the adaptability of vocational education, and promote talent training to adapt to industrial development to lead the reform of specialty construction. The traditional construction industry cannot meet the national green development requirements due to high energy consumption and high pollution. In 2011, the Ministry of Housing and Urban Rural Development issued the Outline for the Development of Building Industry Informatization 2011-2015, which requires accelerating the application of new technologies such as building information model (BIM); In 2016, the State Council issued the Guiding Opinions on Vigorously Developing Fabricated Buildings, which defined that we should vigorously develop prefabricated buildings and promote the adjustment and upgrading of industrial structure; In 2020, the Ministry of Housing and Urban Rural Development and other nine departments issued Several Opinions on Accelerating the Industrialization of New type Buildings, proposing to train high-quality talents who meet the development trend of the industrialization of new type buildings and meet the needs of enterprises. However, the lack of high-level professional and technical talents in China's prefabricated buildings seriously restricts the high-quality development of the construction industry.

2. Establishment of professional group of construction engineering technology

Under the development background of prefabricated buildings and green buildings, the construction engineering technology specialty group is to adapt to the development of the construction industry chain, focus on the needs of the transformation and upgrading of the current construction industry, and face the development of intelligent construction, green buildings and smart cities in the future. We should take the construction engineering technology specialty as the core, take the architectural design and construction engineering management specialty as the support, and establish a professional group of construction engineering technology oriented to the whole industrial chain of the construction industry for professional integration and coordinated development.[1]

2.1. Correspondence between professional groups and industries

The field of construction engineering mainly includes the planning, design, production, construction, management, operation and maintenance of construction projects and other aspects of the whole industrial chain of construction. With the emergence of new technologies such as "cloud and big things moving intelligence", building Internet and 5G+, the traditional building industry is undergoing tremendous transformation. Digital design, intelligent construction, green construction and intelligent management are in the ascendant. Urban construction is becoming more intelligent.[2] All kinds of buildings are becoming more intelligent, digital, networked and environmentally friendly. In line with the transformation and upgrading of the construction industry, it is necessary to build a major with construction engineering technology as the core, architectural design and construction engineering management as the support, and radiate the development of mapping geographic information technology, prefabricated construction engineering technology, intelligent construction technology, smart city management technology and other majors. Covering design, construction, management and other related technical fields, the specialty within the group has a high degree of horizontal correlation, similar posts for vertical sustainable development, and the technical fields are interlinked, so as to achieve a high integration between the talent output of the professional group and the talent demand of the industrial chain[3].

2.2. Orientation of professional talents training

The professional group of construction engineering technology is oriented to the design, construction, management and other posts in the construction engineering industry, emerging industries and green industries. With equal emphasis on morality and technology, it aims to cultivate composite high-quality technical and innovative talents with good professional ethics and innovation awareness, the spirit of craftsmanship of excellence, professional technical capabilities such as "digital design, intelligent construction, intelligent management", and services for industrial development and regional economy.

2.3. Logicity of specialty within the group

According to the principle of "two integration, three intercommunication and three sharing", that is, integration of supply side and demand side of construction engineering technology specialty group, and integration of specialty group courses; The professional clusters have the same industrial background, similar professional posts and similar professional bases, and the clusters are built by chains; Sharing of teaching resources, training bases and teaching teams among professional groups. A professional group of architectural engineering technology for architectural design, architectural engineering technology and construction engineering management will be set up, so as to achieve

deep integration, close communication, high sharing, coordinated development and maximize the gathering advantages of professional groups (As shown in Figure 1).

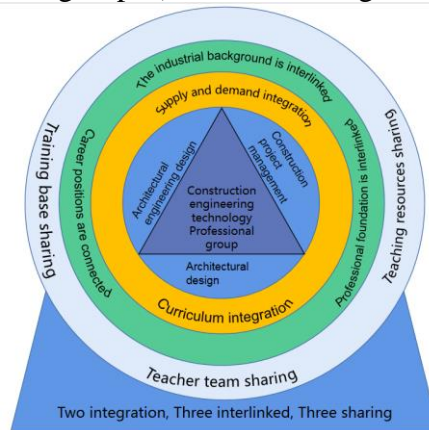


Figure 1: Corresponding relationship between professional groups and construction industry chain

3. Construction path of construction engineering technology specialty group based on post group

We can integrate the talent training program of professional groups with "three certificates" (1+X+N: academic certificate+skill level certificate+other vocational qualification certificates), and finally realize the comprehensive education of professional groups with "post course competition certificate" based on post groups.

3.1. Deepening the talent training mechanism of "integration of production and education"

We can implement the concept of multi participation and win-win cooperation, build a school enterprise community, inter school collaboration, and establish a professional group construction committee; Adhering to the principle of "cross integration and achievement sharing" and based on the demand of market posts, we will deepen the "industry education integration" talent training mechanism of "training platform, discussing teaching plans, organizing guiding teams, jointly managing the practice process, jointly promoting teaching quality, jointly grasping employment quality, and sharing graduation results", and dynamically adjust the talent training program(As shown in Figure 2).

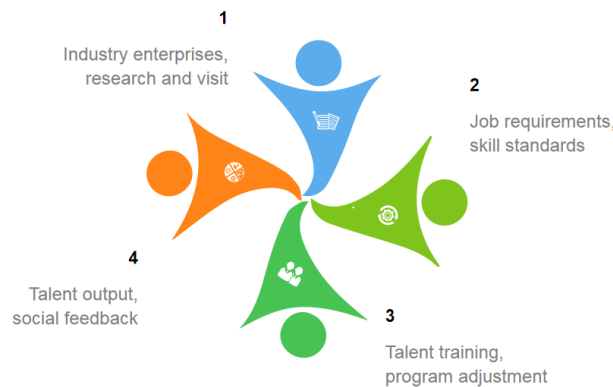


Figure 2: Dynamic adjustment of talent cultivation based on integration of production and education

3.2. Building "1+1+N" talent training mode

Focusing on intelligent construction technology, we will build a modern technology industry college, coordinate the training objectives of the construction engineering technology specialty group, accurately position the training direction, build a "1 specialty group+1 industry college+N cooperative enterprise" school enterprise multi subject talent training mode, and achieve three combinations: professional construction docking with industry standards, academic education combining with vocational skills, and practice teaching combining with post skills. In accordance with the five steps of "research benchmarking diagnosis improvement feedback", we will optimize the order training program, promote it within the group, improve the synergy of professional talent training, and improve the employment benchmark of students, in order to expand the scope of employment, and achieve the precise docking of skills and posts [4].

3.3. Building a platform+module+curriculum system based on the needs of post groups

The specialty group curriculum system breaks the original discipline logic organization mode, organizes the curriculum content according to the action orientation, that is, develops the teaching design according to the six step universal working process of "information plan decision implementation inspection evaluation", and develops a task-based curriculum system that is suitable for the post group occupation of the construction engineering technology specialty group, so as to form a prefabricated architecture curriculum group integrating key abilities and professional qualities, curriculum standards and vocational skills standards, teaching content and job skills into a post demand+platform+module curriculum system. Specifically, the common modules shared at the bottom include general post courses and general education courses; Course of post group direction permeated in the middle; the professional expansion module and quality training of the top expansion correspond to the post group in the construction engineering technology professional group. At the same time, we should attach importance to the integration of post certificates, vocational skill grade certificates and professional competition standards in the curriculum, and achieve the integrated development of "post course competition certificates"(As shown in Figure 3).

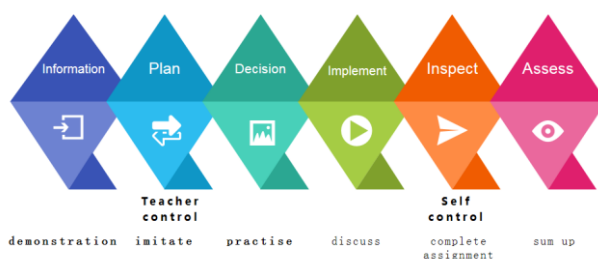


Figure 3: Action oriented curriculum development process

Specific methods, relying on the prefabricated construction industry information service platform, starting from the job demand, docking industry enterprise certification, skills competition ability training and literacy requirements, integrate curriculum system into "basic, special, core, post" four modules, modules, embedded in stages in course vocational skill level certificate, competition standards and post requirements, implement "course teaching-skills competition-qualification certificate-job demand" advanced talent training. Promote the construction of courses, teaching materials and resources as a whole, build high-quality online courses at provincial level and above, compile teaching standards and teaching materials, and form the teaching resource database of prefabricated buildings such as teaching texts, digital courseware, micro-courses and animation videos.(As shown in Figure 4)

Job requirements + Terrace + Module + Curriculum	Professional standards		Graduation design, post internship				Corporate culture		1 + X Vocational skill level certificate and post certificate		
	Quality training	craftsmanship spirit / labor culture	Labor education activities	Moral, intellectual, physical, aesthetic and labor courses + practice	Innovation and entrepreneurship	Intelligence formation	Education of civic morality, world view and aesthetic feeling	Top expansion		Building Information Model BIM Skill level Certificate	
	Professional development module	BIM intelligent application	Introduction to intelligent construction	Professional skills competition	Engineering big data and application	Intelligent construction and intelligent management	Wisdom city				
	Post general course platform	Building CAD	Architectural drawing recognition and structure		BIM Modeling	Building materials		The bottom of the sharing		Construction Engineering Drawing Recognition Skills Certificate	
	General course platform	Ideological and political courses	Computer application technology	English	Sports	Situation and policy	Career planning and employment guidance	Applied writing			
	Post group direction course module in the professional group (Example)	Architectural design		Construction engineering technology		Construction project management				Central penetration	Certificate of fabrication and installation of prefabricated building components
	Industrial chain location	Design		Production and construction		Production, operation and maintenance				Construction engineering technology professional group post professional field	The Professional group corresponds to the post group and the correlation between the major and the industrial chain
	Industrial chain positions	Assistant Architectural Designer / Architectural Model Renderings Maker / Architectural Animation Designer / Interior Designer Assistant / Assistant Engineer / Real Estate planner, etc		Prefabricated deepening designer/Project manager /Construction Crew/Material member/ Inspector/Supervisor/Documenter /Safety officer /Component craft member/Component quality Inspector/Prefabricated building builders, etc		Construction Engineer / Chief Engineer / Project Manager / Professional Supervision Engineer / Chief Supervision Engineer / Party A / Site representative / Cost personnel / auditor / operation and maintenance personnel / equipment maintenance staff / system debugger, etc					
	Professional and relevance	Architectural design (relevant and covered)		Construction Engineering Technology (relevant and covered)		Construction Project Management (related)					

Figure 4: Construction of platform+module+curriculum system based on post group requirements

3.4. Construction of intelligent + practice teaching base

The first is the construction of a productive training place covering the whole industry chain of prefabricated buildings. It mainly includes one-stop experience area for prefabricated buildings, deepening design training room, production operation platform, virtual simulation training room, key technology training area, operation and maintenance training room, construction method building, etc., to meet the training needs of all positions in the skill system. The second is to build a smart teaching platform. Joint industry enterprises, to form a professional teaching team, developing the whole industry chain of teaching resources, the construction of teaching resources cloud, intelligent attendance, teaching resources sharing platform, online examination, classroom quality monitoring, autonomous learning and evaluation system of intelligent teaching platform, in the real scene and virtual environment for prefabricated building knowledge map, deepen the design, production, construction, operations and the whole industry chain practice teaching, realize intelligent + "teaching". Finally, it is to build an intelligent management platform. Using the Internet of Things, big data and other technologies, buildings and teaching facilities are connected to the cloud platform, and practical teaching management, BIM comprehensive management, data collection and analysis, mobile intelligent central control, intelligent central control and other systems are established, so as to implement the digital and intelligent control of teaching process and buildings, and realize intelligent + "management".

3.5. Construct the teacher ability development mechanism of "practicing the postgraduate entrance examination"

First, we need to promote education through training, carry out a special project of teacher ability development by category, build a high-level innovation team, and cultivate teachers' ability of practice innovation, teaching research and social services. The second is to promote teaching through practice, establish a two-way exchange and cooperation community between school and enterprise personnel, build a "double-qualified" teacher training and training base " teacher training and enterprise practice base with enterprises, and attract industry mentors. Through the teacher enterprise post, the forefront of industry development, the enterprise, the workshop, the team, improve the professional practice ability. The third is to promote teaching by examination, encourage teachers to obtain the qualification certificate, promote teachers to obtain the national registered qualification certificate, obtain the prefabricated construction senior appraiser, "1 + X" vocational skill training teacher certificate, so as to improve their professional ability. Fourth, to promote teaching through research, adhere to the

teacher development concept of scientific research, relying on the national-provincial-university scientific research platform, to build a research team of "BIM, design, construction, testing, and economy" of prefabricated buildings. Deeply research the cutting-edge application technology, undertake prefabricated architecture teaching and scientific research projects, promote teaching and scientific research complement each other, effectively improve teachers' scientific research innovation, education and teaching ability, and support the training of high-quality technical and skilled personnel in prefabricated buildings.

4. Conclusion

After a series of prefabricated construction talent training reform, the main innovation is that one is the scientific research teaching resources, relying on different levels of prefabricated building innovation center, building prefabricated construction research team, follow the industry to carry out the application technology research and promotion, the scientific research resources, scientific research for education, "prefabricated housing construction key technology integration and demonstration" and other projects into teaching resources. Second, the teaching resources of the construction process. In the construction of the modern training base of the construction industry, the whole process of architectural design, deepening design, component production, assembly construction, commissioning and installation, completion and acceptance is digitized to form the teaching resources for the whole process of prefabricated building construction. Third, the teaching resources of advanced technology in the industry, and the achievements of new technology, new process, new materials and new equipment of leading enterprises in the industry are treated by pedagogy and transformed into teaching resources of cutting-edge technology of prefabricated buildings. Fourth, the teaching of the innovation and competition project is resource-oriented. Relying on the participating projects, the resources such as competition ability, literacy requirements and competition process are integrated into the curriculum system to form teaching resources. We always adhere to the concept of talent training throughout the whole process of talent training, and integrate the vocational skills of the whole industrial chain of prefabricated buildings into the post standards on the basis of the industrial chain, so as to realize the implementation of talent training reform.

Teaching content and enterprise post requires accurate docking, the next step should explore cooperation ideas, innovation cooperation mode, establish and improve the production docking mechanism, multiple input mechanism, technology and repair, engineering integrated education mechanism, to the western region characteristic vocational education development model play a leading role, for transformation and upgrading of construction industry, high quality development to provide strong talent guarantee and technical support, help with the implementation of "carbon peak carbon neutral" strategy.

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