

Countermeasures to Promote the Training of Prefabricated Construction Talents for Architectural Design Majors in Vocational Colleges

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Abstract: To concentrate on cultivating prefabricated construction talents for architectural design majors in vocational colleges in China, we should adhere to the basic principles of professional coordinated development and integration of production, teaching, and research to determine the teaching objectives and contents, set up a double-teacher teaching team, and provide sufficient resources and funds. Specifically, it is necessary to optimize the curriculum system with the guidance of professional groups, create teaching situations with information platforms, introduce Building Information Modeling (BIM) technology to connect with the actual situation, adhere to the combination of education and training to improve the practice mechanism of school-enterprise cooperation, deepen the integration pattern of post-course certificate competition, and follow the ideological and political teaching route of professional course to realize the comprehensive improvement of students' knowledge, skills, and professional quality.

Keywords: Architectural design major of vocational college; Prefabricated construction personnel; Training mode; Cultivation strategy

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1. Introduction

As vocational colleges play a role in training first-line skilled talents, they currently face problems in education such as disconnection between production, learning, and research, insufficient display and popularization of new technologies, and unscientific training mode for students. In particular, architectural design and other majors that emphasize the combination of theory and practice are more prominent, which is not only easy to cause students' unemployment after graduation, but also affect the innovation and development of majors and colleges. Therefore, it is necessary to adjust the countermeasures of personnel training based on the actual situation inside and outside the school, not only to grasp the new opportunities of educational innovation, but also to implement the fundamental task of national and social education.

2. Practical significance of promoting prefabricated construction talents training for architectural design majors in vocational colleges

2.1. Meeting the needs of professionals for national industrial upgrading

According to the guiding opinions of the Ministry of Education on the training of professional talents in vocational colleges, it is necessary for colleges and universities to keep up with the development trend of the industry and the demand for talents in the industry, and improve their own talent training mode. Therefore, architectural design majors need to see the inevitable trend of the transformation and upgrading of China's traditional construction industry to industrialization, interpret the core spirit of the country in promoting green building and sustainable development, and cultivate professional and technical talents who can engage in the new construction work of prefabricated buildings. In other words, it is necessary to make the knowledge and skills of students in this major meet the requirements of standardized design and intelligent application of prefabricated buildings, provide a steady stream of vitality guarantee for the industrialization of buildings, and promote the implementation of the responsibility and mission of building service ecological civilization construction.

2.2. Meeting the needs of teaching reform and innovation in vocational colleges

In order to change people's traditional cognition, vocational college education needs to have good teaching quality, which makes the teaching reform and innovation of colleges and universities become a general trend. Therefore, architectural design majors need to adjust the direction of personnel training and explore new teaching models from three aspects: what to teach, who to teach, and how to teach. Based on professional characteristics, colleges and teachers should enrich the teaching content around the production, transportation, and on-site assembly of building components on the basis of traditional courses such as building mechanics, building structure, and building materials, and introduce new teaching methods around assembly construction and integrated decoration. Through the above teaching optimization, we could force a comprehensive transformation of the teaching, management, and evaluation methods of the college, and make the education and teaching of vocational colleges adapt to the development of the industry.

3. Principles for promoting the training of prefabricated construction talents for architectural design majors in vocational colleges

3.1. Principle of professional collaborative development

Prefabricated building is a building form with diversified functions, personalized design, and integrated decoration, and emphasizes energy saving and green building, thus architectural design majors must first achieve professional collaborative development to train prefabricated building talents, and take "architecture" as the starting point and landing point. Through professional basic courses, core courses, and extension courses, vocational college students have a more stable cultural foundation of architectural design, and a higher social and humanistic taste. For example, considering the upper, middle, and lower reaches of the prefabricated construction industry, a professional map of talent training is built based on the industrial elements within the same chain system, so that students can get involved in multidisciplinary knowledge such as sales, property management, property maintenance, data monitoring, engineering transformation and monitoring, and use these knowledge to overcome their shortcomings or deficiencies in their professional learning^[1].

3.2. Principle of integrating production, education, and research

Talents should serve the industry and enterprises, hence the training of prefabricated construction talents should

promote the deep cooperation between schools, enterprises, and industries, and create an education network that integrates production, teaching, and research. Schools, enterprises, and banks can jointly develop talent training programs and exchange resources such as talents, technology, equipment, and facilities to build training bases. The cooperative mechanism of multi-subject education in the base was explored, so that students have been learning, practising, and experiencing the standard of prefabricated vocational positions in the learning activities of this major. At the same time, the school teachers will lead the establishment of an innovation group to carry out innovative exploration in the aspects of building materials and engineering technology, and the new inventions obtained will be applied to the engineering projects of enterprises and industries as another form of resource replacement, which will make enterprises and industries profit and make the subjects of integration of production, education, and research more active ^[2].

4. Basic mechanism of promoting the training of prefabricated construction talents for architectural design majors in vocational colleges

4.1. Determining teaching objectives and content

The basic teaching goal of colleges and universities in cultivating prefabricated construction talents is to enable students to meet the needs of vocational positions upon graduation and meet the requirements of industrial transformation and upgrading. For example, under the guidance of the national prefabricated building penetration rate of 30% during the 14th Five-Year Plan period, students will be trained to complete the prefabricated building design and management related work. Under this goal, the content of professional teaching should be adjusted around transforming students into enterprise employees, which can be divided into four stages, intersecting with curriculum ideology and politics, professional courses, and curriculum integration modes. For example, the teaching content of the first stage should include architectural drawing and construction, architectural mechanics and structure, and architectural engineering survey; the third stage of teaching content should involve reading of prefabricated structure construction drawing, prefabricated concrete structure component production, prefabricated steel structure construction, and so on. From the first to the fourth stage, teachers also need to investigate students' basic ability, special ability, core ability, and job ability in a timely manner, and optimize the teaching content of semesters, units, projects, and periods.

4.2. Setting up a double-qualified teaching team

In order to realize the integration of production, teaching, and research in the training of professional students, in addition to adjusting the direction of personnel training and teaching content, it is also necessary to promote the professional development of teachers, lead teachers with scientific research, and create a new teaching situation in which research promotes teaching and learning. For example, colleges and universities can cooperate with the regional equipment building collaborative innovation center, installation building application technology promotion center, and construction engineering units to build research and teaching research labs, and introduce technical talents and backbone talents from enterprises as part-time teachers or professional leaders based on assembly design, Building Information Modeling (BIM), construction testing, and other links, so as to deepen the teaching reform. The school can coordinate the teaching work of its teachers and encourage them to go to the front line of technological innovation of prefabricated buildings or project production, understand the latest professional knowledge and skills, and introduce the materials learned and seen into the classroom and textbooks.

4.3. Providing resource funding security

Personnel training, professional innovation, teaching, and research all require corresponding resources and funds, thus the college should make good use of national and local government policies, docking industries, and building resource-sharing alliances. For example, they should closely follow the government's policy of digital industry development, establish cooperative relations with relevant cutting-edge enterprises, and build an online and offline scientific research platform based on prefabricated professional co-construction bases; they should allocate special funds from the school administration funds for the promotion of the project; they should also adjust the introduction and management mechanism of teachers and talents, the evaluation model of teaching and research projects, and attract more professional teachers and part-time talents to invest in the research of the new topic of the training of prefabricated architecture students.

5. Feasible strategies for promoting the training of prefabricated construction talents for architectural design majors in vocational colleges

5.1. Optimizing the curriculum system with the guidance of professional groups

Taking into account the different types and levels of the promotion and development of prefabricated buildings in different regions, vocational colleges should comprehensively analyze their own characteristics, the environment of the region, and the industry, and optimize the course system around the architectural design professional group. For example, if the region has the industrial advantage of prefabricated building materials innovation, it can create a professional group with prefabricated building materials as the core, including building materials production, circulation, construction, sales, installation, testing, prefabricated building materials engineering technology, testing technology, intelligent building technology, and other professional groups. Under this, the course system can be divided into public basic courses, professional basic courses, core construction courses, etc., involving building materials, deepening construction and design of green building materials, intelligent construction of buildings, and so on. The course system, which is divided into prefabricated building materials major group, engineering technology major group, and comprehensive service major group, is open to all students of this major. In addition to completing the basic courses, students can choose courses within other major groups according to their professional needs, innovation, and expansion ability, which not only stimulates students' enthusiasm and autonomy in learning, but also allow them to improve their own industrial literacy ^[3].

5.2. Creating teaching situation with information platform

To improve the growth level of prefabricated construction talents, it is necessary to make good use of information software and hardware to create corresponding teaching situations and help students to get through the key nodes of learning; the application of these technologies is based on building an information-based teaching platform ^[4]. For example, the platform should include a large number of assembled professional group course cases and other teaching resources. It is necessary to support students to use real engineering projects to complete the cases and deepen the design of simulation practical training. Teachers should be able to provide students with online guidance, training, and evaluation on the platform, and support students to conduct mutual evaluation and learning summary. The platform will also record the track of students completing the tasks in class and provide intelligent analysis, and students can choose their own courses of drawing, construction, and management based on their own learning model. Corresponding to different teaching links or processes, teachers can also use platform resources to encourage students to realize pre-class preview, sand table simulation, and cognitive construction in class, transformation and upgrading of learning projects after-class,

and mixed exploration of online and offline, so as to ensure the teaching quality.

5.3. Introducing BIM technology to match the actual position

BIM technology is a new technical means widely used in prefabricated construction projects, so it is necessary for teachers to mainly rely on this technology to create digital core courses, and connect the information model of prefabricated projects with relevant teaching arrangements in professional groups, so that students can better learn the prefabricated project management and project deepening design ^[5]. For example, to create three-dimensional model display, design collision simulation + digital course of house construction, and map recognition, students can preview courseware or operate software by themselves before the class, and exchange preview results during the class, teachers and students jointly discuss and practise around typical problems, in order to cultivate students' spatial sense, intuitive cognition, and construction ability. After class, students are asked to use BIM model for modeling review, so as to cultivate self-learning ability and improve learning quality ^[6].

5.4. Combining education and training to improve the practice mechanism of school-enterprise cooperation

School-enterprise cooperation is one of the feasible methods for vocational colleges to improve the quality of talent training, which has been verified by practice ^[7]. In order to further improve the training quality of prefabricated construction talents, this school-enterprise cooperation mechanism should also deepen the basic requirements of the combination of education and training. If the school has a construction industry, it can rely on the industry to build a modern school-enterprise cooperation training base, with several key prefabricated construction technologies as nodes, engineering and technical personnel of the enterprise as lecturers, and teachers of the profession as guidance, jointly carrying out two-dimensional code identification construction process and technology, and other related teaching activities. If there is no construction industry in the school, the enterprise industry can build a training base for the real environment, and use the same teaching mode and teacher composition to guide the practical operation of students' job functions to create a new form of teaching. If the realistic environment permits, portable mobile terminals can also be used to display relevant cases and supplement teaching resources, and "double teachers" can timely give multiple evaluations in theory and practical training, thus bringing more real feelings and experiences to students ^[8].

5.5. Deepening the education and integration pattern of post-course certificate competition

The post-course certificate competition takes the certificate of 1+X Architectural Engineering Drawing Recognition Skill Level and other vocational fields as the main line, and aims to teach students knowledge, hone students' skills, and always let students complete the course tasks with the logic of assembly type deepening design and other jobs. For example, teachers can transform relevant projects in the national assembly vocational skills competition into actual teaching tasks, build course modules based on the competition as a teaching problem, and require students to work as a team to jointly analyze the requirements of the competition project. Students apply the connection between the requirements and the actual job standards, and the relationship between the need to obtain vocational certificates, comprehensively use the knowledge of architectural map recognition and construction, architectural mechanics and structure, and architectural engineering survey to design solutions to problems, apply AutoCAD, Revit, SDPC, and other software to test the feasibility of the solutions, and transform the solutions themselves until the problem is solved. Professional teachers and enterprise technology teachers should serve as judges to give team and individual evaluations, and help students

to analyze the causes of problems. If necessary, they can conduct online and offline demonstrations, and then allow students to analyze and summarize experiences and lessons according to different certificate standards and various job requirements ^[9].

5.6. Adhering to the ideological and political teaching route of professional courses

The first-line technical talents under the industrial upgrading should have compound qualities, including the professional morality and spirit of hardworking, daring to innovate and break through, so the architectural design profession should cultivate prefabricated construction talents, and the curriculum ideology and politics cannot be ignored. We can introduce cases including ideological and political elements into the teaching to carry out infiltration teaching; we can also take advantage of opportunities for internship and practical training in enterprises to carry out explicit ideological and political guidance ^[10]. For example, practical cases such as three-dimensional printing paving road and high-cold high-speed railway are used to introduce innovative technologies in the development of prefabricated buildings in China, so that students can observe the scientific and technological progress of the country and inspire national pride and self-confidence. Other than that, we could share the touching stories of industry leaders such as Wang Chengshan and Guo Hongmeng to cultivate students' love and professionalism. We can also allow students to form a one-to-one, one-to-many help group with their own enterprise teachers and job teachers, and learn the charm of hardworking and innovative workers in ordinary posts from the people around them.

6. Conclusion

Driven by the dual carbon goal and intelligent manufacturing policy, China's assembly industry is bound to usher in a large opportunity for development, which also puts forward higher requirements for the talents trained by vocational colleges, thus the architectural design profession should focus on the country. Social needs, based on colleges and professional reality, adjust the countermeasures of personnel training. It makes the personnel training objectives and training system right, implements the curriculum structure, teachers' team, and new, special, precise teaching methods of the training objectives, in order to help students to improve personal comprehensive quality.

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