Advances in Social Science, Education and Humanities Research, volume 451
Proceedings of the 2020 5th International Conference on Humanities Science and Society Development (ICHSSD 2020)

Education Mode of the Integration of Industry and Education Under the Background of New Engineering in Architecture Majors of Vocational Colleges

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ABSTRACT
The integration of professional engineering courses in vocational engineering is an important part of the college-enterprise cooperation talent training program, and it is a useful exploration to deepen the integration of production and education. The article analyzes the current situation of the higher vocational architecture engineering professional curriculum, and puts forward suggestions for the construction and integration path of professional courses, aiming at providing a reference for training high-quality applied skilled talents and cultivating the coordinated development of college-enterprise cooperation.
Keywords: *Education Mode; Integration of Industry and Education; Vocational Colleges*

1. AN ANALYSIS OF DEVELOPMENT OF ARCHITECTRURAL ENGINEERING COURSES

One of the important contents of higher vocational education is to let students acquire professional skills to serve the social economy. The quality of professional curriculum system is related to the output of high-quality application-oriented skilled talents. In recent years, China's policy proposes to improve the vocational education and training system, deepen the integration of industry and education, and school enterprise cooperation. Therefore, many provinces and colleges actively carry out and explore the Modern Apprenticeship of Vocational Education[1-5], and reform, design and integrate the new curriculum system in the talent training program. Both schools and enterprises have made active discussions in the process of professional curriculum revision, laying a foundation for the characteristic professional curriculum. In the education of both schools and enterprises, the modern apprenticeship has become an important label for the reform of vocational education in countries around the world, and is an inevitable choice for the construction of a learning society[6].

1.1. Lack of practical courses

The majors of architectural engineering in higher vocational colleges are generally composed of majors in architectural engineering management, engineering cost, architectural design, engineering technology and so on. Taking the construction engineering major set up by a private vocational college in Guangzhou as an example, although it actively carries out the modern apprenticeship to revise and integrate the curriculum system, in the process of promotion, the knowledge structure and learning ability of students are often not understood. In the talent training program, especially in professional courses, theoretical courses are emphasized, while practical courses are only formal auxiliary courses, lacking comprehensive practical training, and students appear helpless in the process of skill acquisition.

1.2. Weak coherence of professional courses

In the past, the emphasis on theoretical content in the setting of professional courses, and the lack of solid basic knowledge of some students, caused students to be unenthusiastic about the course and to cope with the credits by rote. Moreover, due to the weak continuity before and after the professional curriculum, students cannot form a clear knowledge network, few operation hours, and no substantive exercise, especially the implementation of the core curriculum is not in place, which makes it difficult for students to carry out independent work in the later post practice process. For example, the architectural drawing course is a basic course in many majors of architectural engineering. For vocational students, the course has been completed in the first semester, but the practical knowledge of engineering has not been given enough practical training, with the forgetting of professional knowledge, lack of revisiting and counseling before the internship and self-compensation still cannot keep up with the work in practice, resulting in a certain psychological gap and confusion.

1.3. Skills fail to meet the post standard

The standard requirements for companies to align employees are often higher than expected, and the overall quality of vocational students is also higher than the actual. Most professional courses are also offered during school, but the shortage of skills is still a weakness that is generally considered by enterprises. The application skills of students as employees or apprentices cannot effectively meet the enterprise's post standards, and the skill level is uneven. Of course, there are also excellent students who learn additional courses to enrich their own strength, but the professional post training is out of line, so the professional skills are limited.

1.4. Professional curriculum teachers fail to integrate in depth

Order training and modern apprenticeship are educational practice mode for the deep integration of school-enterprise cooperation in vocational colleges. No matter what stage it is in, it requires close and friendly communication between teachers and corporate instructors, so that the professional curriculum system can be deeply integrated, and then practical teaching can be carried out. The modern apprenticeship system is also being explored in many colleges and universities in China. As the process of cultivating the transitional order class of the modern apprenticeship system, many institutions only have order agreements, corporate tutors are merely nominal, and they are not involved in curriculum development and education. In addition, for the lack of application skills of the majority of young vocational teachers in schools, the professors of professional courses lack real cases.

2. FOCUS OF THE SCHOOL-ENTERPRISE COOPERATION COURSE SYSTEM

At present, in terms of applied skilled talents, the State advocates the training mode of modern apprenticeship in the process of higher education. The modern apprenticeship system in Germany, Britain, Australia, Japan and other countries that are worth learning from[7], one of which is that enterprises highly participate in talent training plan and curriculum integration and development. Both schools and enterprises should fully consider the quality of students and the target expectations of corporate talents in the setting of the curriculum system. Starting from the industry demand, the professional curriculum system focuses on practicality, which not only allows students to be confident during the internship process, but also accumulated the internal power of job position conversion, which is the cornerstone of sustainable talent development in the long run. For vocational students, the use of modular teaching in the process of implementing modern apprenticeship is helpful to reduce the difficulty of knowledge acceptance and facilitate the accumulation of operational experience. Therefore, in the overall arrangement of courses and knowledge points, it is necessary to teach according to time and place, according to aptitude, flexibly connect professional courses, and take a variety of forms such as work-study alternation, multi-semester, and segmentation to highlight the skills of the core courses, and practice makes perfect to increase the competitiveness of enterprises.

3. SUGESTIONS ON THE PATH OF PROFESSIONAL COURSE CONSTRUCTION AND INTEGRATION

3.1. Establish a general-purpose and practical curriculum system

In the process of implementing the two main physical education personnel in accordance with the mode of combination of work and study, especially from the enrollment of modern apprenticeship system, schools and enterprises should set up a professional development curriculum system, teaching standards and teaching materials, and teaching auxiliary products jointly with the needs of the job market and the needs of cooperative enterprise jobs, research and development professional standards to carry out professional construction. According to the positioning of the construction engineering professional training program, the establishment of a school-enterprise teaching and research working group should establish a generalized and practical curriculum system. For vocational students, adopting general, practical and landing courses, the purpose of which is not to require all courses to be comprehensive and systematic, but at least those are sufficient and capable of the skills required for the position; the academic ability of vocational students is relatively weak, however in terms of hands-on operation ability and trial-and-error attitude, they can well complete the landing engineering projects. On this basis, the general ability training courses, individual self-cultivation courses and cultural courses can fully integrate the curriculum system, conform to the purpose of the school’s purpose of nurturing and developing people, which further reflect the enterprise training objectives of professional ability, social ability and individual ability. For example, in general higher vocational colleges, the construction engineering management specialty in the direction of training builders and surveyors, during the course integration of school-enterprise cooperation, focuses on "*Architectural drawing and construction*", "*Engineering survey foundation*", "*Building Materials and Testing*, "*CAD Foundation*", "*Construction Organization Design*", and weakens "*Construction Mechanics*", "*Engineering Economics*", and "*Engineering Mathematics*". The direction of professional training is different, and the emphasis of strengthening and weakening courses is different, which is conducive to both

the school and the enterprise along the training program, to deliver truly talented and skilled talents to the enterprise.

3.2. Refine post skills and precisely deepen modular learning tasks of core courses

The purpose of the target job position segmentation is to meet the actual needs of different levels of skills in line with the industry. Even if the professional course system can be connected with the enterprise position, if it is not refined to the core point of technology, then there is also a shortage of skills during the internship of students. For example, the course of "*Basic CAD*" is widely used, and is often used by constructors, data clerks, supervisors, etc. Teachers in school are usually limited to school hours, generally only leading students to get started, mastering basic operations, and the requirements of the enterprise are to quickly and standard drawings, and can be collaboratively modified on the common case template format. For the cost engineer, it is necessary to not only master "*Basic CAD*", but also extend to BIM engineering measurement and pricing based on Revit software. All of these need to deepen the core vocational courses precisely. In the process of the integration of multiple professional courses, the course content is decomposed into multiple modules to determine the knowledge points and job skills of each module, and to integrate with actual job application points.

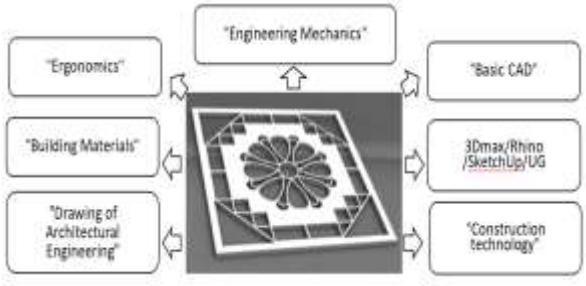

Figure 1. Integrated assembly ceiling module-case of creative design teaching module of light-transmitting inorganic high-strength sound-absorbing board

Take the teaching module of architectural design: integrated assembly ceiling module-creative design of light-transmitting inorganic high-strength sound-absorbing board as an example. The figure below is a student's design work (Figure 1). The first step requires students to have the ability of map recognition, establish spatial mapping thinking, determine the specifications of the ceiling module, and at the same time be able to understand the material properties and application scope of the inorganic high-strength sound-absorbing panels of the light-transmitting building materials. The second step is to determine the suitable lifting height according to the architectural aesthetics and ergonomics, combined with the performance of the material, determine the module's segmentation size and the integrated aesthetic of the molding; the third step is to calculate the perforation rate dues to the design and shape of the light-transmitting board, and make the correct size of the auxiliary connection accessories according to the mechanical structure of the node; The fourth step is to express the design concept in two dimensions with CAD, and further use 3Dmax / Rhino / Sketch Up / UG and other three-dimensional software to deepen and give ideas into the design drawings. The fifth step is to apply the mold CAD design course and complete the mold design of the ceiling module, then learning from the requirements of CNC engraving design and plate in order to make conceptual mold, and finally using molds to import GRG materials to make modular light-transmitting inorganic high-strength sound-absorbing panels. This process involves the integration of multiple courses such as *"Drawing of Architectural Engineering"*, "*Building Materials*", "*Ergonomics*", "*Engineering Mechanics*", "*Basic CAD*", three-dimensional effect software, etc. To accurately grasp the modules of the core courses and apply them to the actual engineering projects, so that students can be proficient in engineering design and technology application process.

3.3. Give full play to the advantages of the joint teaching and research office of schools and enterprises, and establish a laddered real project curriculum

The staff between the school teachers and the enterprises can take part in two-way job training and joint construction major, and further use the advantages of the school-enterprise teaching and research department to create an excellent "double-teacher" teaching team. Teachers from enterprises are close to the market and have rich enterprise experience. Using real projects as modules in teaching courses can greatly increase students' interest. Real projects allow students to increase their sense of responsibility and autonomy. With the improvement of the difficulty of project courses and the deepening of courses, a ladder between projects should be established. "Laddered" and "modularization" can highlight the level and professionalism of different apprenticeship projects, and also facilitate the apprentices to choose the appropriate personalized apprenticeship project that are suitable for one's own ability level and expectation [7].

In the basic stage, the curriculum design can be carried out in a project-based manner. The organization of the curriculum is to complete the specified curriculum tasks in groups and teams. Through the teaching methods of case teaching, task-driven, visit cognition and detection expansion, students can achieve the learning objectives of modular task list; In the advanced stage, based on real work tasks, in accordance with the standard process of the enterprise and industry, and then participate in the transformation and production of teaching achievements; in the advanced stage, based on professional basic knowledge and task-driven, which can carry out relevant

innovation research and development and patent activities. In the course of teaching practice, some colleges have integrated and modularized the design of professional courses according to the requirements of the national skill competition. Each module is equipped with multiple small modules to achieve small target tasks in sections. Some colleges and universities are based on game design, for example, in the course of "Landscape Design" course, divide "landscape architecture, architectural form, urban design, vegetation design, garden terrain, garden landscape, landscape evaluation and scale"[8] to implement the modular curriculum objectives, and to test the advantages and disadvantages of teaching results and the effect of engineering working and learning alternation from multiple perspectives. Furthermore, the laddered project of establishing apprenticeship is also a kind of path design of apprenticeship, which is the driving force for students to lead to high-level education.

4. CONCLUSION

The school-enterprise cooperation curriculum system should vary with majors and different teaching emphases. Through the construction of professional courses, the path exploration of integration with the professional courses of architectural engineering in vocational colleges is mainly as follows: first, through the joint development of the school and enterprise curriculum system, practical courses combined with general literacy courses make the training program closer to the job standards and provide high skilled talents; second, the content of professional courses can be divided into multiple modules to establish "laddered" program according to the difficulty of the knowledge, which can integrate with actual work application points and can also create an excellent "dual-teacher" teaching team; third, project ladder is a way to promote further education, which is conducive to encouraging students' confidence.

ACKNOWLEDGMENT

This work was supported by Research on the 2019-2020 Vocational Education Teaching Reform of the Teaching Working Committee of the Chinese Vocational and Technical Education: "*Exploration and Practice of the Integrative Production and Education Model of Green Assembly Interior decoration Technology and Construction Specialty under the background of new engineering*"(1910159); Guangdong Provincial Department of Education Research Platform fund: "*Green and Environmental-friendly Residential roof Modular Design and Research on the application of integrated assembly*" (2017GKQNCX 126)

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