

Research on the Optimization Path of the Industry-Education Integration and Collaborative Education Mechanism in the Cultivation of High-Skilled Talents for Green Building Operation and Maintenance

Feng Han¹, Danzeng Long Duo²

¹School of Smart City Management, Shanghai Construction Management Vocational College, Shanghai 201702, China

²Rikaze (Shigatse) City No.2 Secondary Vocational and Technical School, Shigatse 857000, China

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Abstract: The report of the 20th National Congress of the Communist Party of China proposed the strategy of “integration of general education and vocational education, integration of industry and education, and integration of science and education,” which provided clear guidance for the high-quality development of vocational education. It is an inevitable choice for vocational education to achieve high-quality development to promote the integration of industry and education in vocational education and carry out the strategic matching between vocational education and major industries. From the perspective of the integration of production and education, this paper expounds its importance in vocational education, analyzes the current situation of the cultivation of high-skilled talents in green building operation and maintenance, and puts forward the optimization measures of talent cultivation, hoping to achieve the goal of cultivating high-skilled talents in green building operation and maintenance.

Keywords: Integration of industry and education; Collaborative education; Green building operation and maintenance; Personnel training

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1. Introduction

Under the guidance of the “double carbon” goal, the green building operation and maintenance industry has ushered in a golden period of development, with rapid market expansion, new technologies and new models emerging endlessly, and the demand for highly skilled talents is very urgent. However, at present, the labor supply of the industry is threatened, such as the lack of special operation and maintenance personnel, uneven skill levels of employees, and other issues, which hinder the development of the industry. At the same time,

the traditional teaching methods cannot keep up with the actual needs of the industry, and the students' practical operation ability trained by the school is not strong, so it is difficult to adapt to the changes of green building operation and maintenance working environment. For vocational colleges, it is necessary to establish a perfect production and education integration education system to cultivate a large number of highly skilled and capable talents, which is a fundamental problem to be solved.

2. The importance of integration of industry and education in vocational education

With the vigorous development of vocational education, the integration of production and education is of great significance. Vocational education aims to cultivate applied talents, and the integration of industry and education can break the barriers between education and industry. The school is closely connected with the enterprise, which can gain timely insight into industry dynamics, let the specialty setting closely follow market demand, and avoid the disconnection between talent training and reality. Enterprises participate in vocational education, bring real projects and cases, and build a practice bridge for students. Students can quickly master practical skills, improve the ability to solve practical problems, accumulate valuable practical experience, and quickly integrate into the workplace after graduation to shorten the employment adaptation period. For schools, the integration of production and education promotes the innovation of teaching content and methods. Enterprise feedback helps optimize the course, making the teaching more targeted and practical. At the same time, the technical backbone of enterprises enters the campus to enrich the teaching staff and improve the teaching level. From the perspective of enterprises, participating in vocational education can reserve talents in advance and inject new vitality into the development of enterprises. Through the integration of industry and education, the scientific research achievements of the university can be quickly transformed into enterprise productivity, promoting technological innovation and industrial upgrading. In a word, the integration of industry and education is the only way for the development of vocational education to achieve win-win results for schools, enterprises, and students, and to cultivate more high-quality technical and skilled talents for economic and social development.

3. Analysis of the current situation of high-skilled personnel training for green building operation and maintenance

3.1. The docking between industry and education is not close, and the training objectives are biased

Vocational education should closely meet the needs of the industry, but at present, some colleges and universities lack communication with enterprises and lag behind in mastering the dynamics of the green building operation and maintenance industry. When the school sets the training objectives, it mostly relies on its own experience and imagination, fails to fully investigate the actual needs of the enterprise, the curriculum is disconnected from actual work, the proportion of theoretical knowledge is large, and the training of practical skills is small. For example, students have learned a lot of abstract green building theories, but they do not have enough practical skills such as energy-saving equipment operation and building energy consumption monitoring. Enterprises need interdisciplinary talents who can quickly solve the operation and maintenance problems, and the students trained by schools often need a long time to adapt to the post. As a result, talent training and market demand are mismatched, students' employment competitiveness is

weak, and it is difficult for enterprises to recruit suitable talents, which seriously affects the high-quality development of the green building operation and maintenance industry. In the face of the urgent demand for highly skilled talents brought about by the global industrial chain reconstruction and technological revolution, the integration of vocational and general education has become the key path to solve the structural contradiction in talent cultivation ^[1]. Against the backdrop of the digital and intelligent transformation of global manufacturing, highly skilled talents have become the core element of industrial competition ^[2].

3.2. Lack of practice platform, inefficient school-enterprise resource sharing

Due to the limitations of funds, venues, and other factors, it is difficult for vocational colleges to build a perfect green building operation and maintenance practice platform. The training equipment is old, insufficient in quantity and single in type, which cannot meet the diversified practical needs of students, and it is difficult for students to obtain a real and comprehensive operation and maintenance experience. At the same time, although many colleges and universities have established cooperative relations with enterprises, the effect of resource sharing is not good. Due to technical confidentiality, cost considerations, and other factors, enterprises are reluctant to fully open the advanced operation and maintenance equipment and technical data to schools; Although the university has scientific research achievements, it lacks effective channels and mechanisms to promote its transformation and application in enterprises. The lack of in-depth interaction and collaboration between schools and enterprises, and the failure to achieve complementary advantages in resources, have led to students' inability to access industry-leading technologies and practical projects in the process of practical learning, and the limited improvement of practical ability, making it difficult to meet the needs of the rapid development of the green building operation and maintenance industry. Core competencies are not only an important indicator of the quality of talent cultivation in higher vocational colleges but also a cornerstone guarantee for high-skilled talents in higher vocational colleges to adapt to future development ^[3]. Highly skilled talents, as an important part of the national strategic talent force, are not only key elements for enhancing comprehensive national strength and core competitiveness but also the backbone force for promoting the transformation of scientific and technological innovation achievements into real productive forces, which is of great significance to the construction of a modernized strong country ^[4]. School-enterprise cooperation practice bases, as an important part of the modern vocational education system, play a significant role in cultivating highly skilled talents ^[5].

3.3. The structure of teachers is unbalanced, and the strength of “double qualification” is weak

At present, most of the teachers engaged in the teaching of this major in vocational colleges are direct teachers after graduating from colleges and universities. They have a solid theoretical foundation but lack practical experience. They do not have enough understanding of the practical problems and new technology applications in green building operation and maintenance sites. It is difficult to combine theory with practice in teaching. However, engineers with rich practical experience in enterprises are less involved in school teaching due to a lack of teaching experience, busy work, and other reasons ^[2]. As a result, the number of “double qualified” teachers is scarce, and the overall teaching staff is in an unbalanced state of more theoretical teachers and fewer practical teachers. In the process of learning, students cannot get enough practical guidance, and it is difficult to master the key skills and practical operation methods of green building operation and maintenance. There is a gap between the students and the actual needs of the industry,

which is not conducive to the high-quality training of high-skilled talents in green building operation and maintenance.

3.4. Single evaluation mechanism and lack of skill certification system

At present, the evaluation of students in Colleges and universities mostly depends on the final examination and other theoretical assessment methods, and the lack of attention to practical operation and project experience makes it difficult to comprehensively measure students' ability. Although enterprises participate in some evaluations, they lack unified standards and are arbitrary. Moreover, China has not yet built a perfect green building operation and maintenance skills certification system, and the industry lacks authoritative certification standards and institutions. This makes it difficult for students to obtain officially recognized certificates to prove their level even if they master certain skills. At the time of employment, it is difficult for enterprises to judge students' skills according to unified standards, and students are at a disadvantage in the competition due to the lack of effective certification. The single evaluation mechanism and the lack of a skill certification system cannot accurately reflect students' ability, which is not conducive to encouraging students to improve their skills, but also hinders the precise selection and rational use of high-skilled talents in the green building operation and maintenance industry.

4. Optimization paths of collaborative education based on the integration of industry and education

4.1. Strengthening the precise docking of production and education, and scientifically adjusting the training objectives

The cultivation of high-skilled talents in green building operation and maintenance should strengthen the precise docking of production and education, and scientifically adjust the training objectives. Colleges and universities should take the initiative to establish a normalized communication mechanism with green building operation and maintenance enterprises, regularly carry out field research, discussion and exchange, deeply understand the industry dynamics, enterprise needs and technology development trends, and master first-hand information. According to the survey results, the talent training specifications are accurately positioned, and the skill requirements of enterprises for green building operation and maintenance talents, such as accurate debugging of energy-saving equipment, intelligent monitoring and analysis of building energy consumption, and efficient formulation of green operation and maintenance schemes, are refined into specific knowledge and ability indicators and integrated into the training objectives^[3]. At the same time, we should pay attention to the cutting-edge technologies in the industry, such as the application of new green building materials and the operation of intelligent operation and maintenance management systems, and update the teaching content in time to ensure the forward-looking training objectives. It is also necessary to invite technical backbones and industry experts of enterprises to participate in the formulation and revision of talent training programs, and put forward targeted suggestions on curriculum and teaching arrangements from the actual needs of enterprises and industry development trends, so as to make the training objectives more scientific and practical. In addition, a dynamic adjustment mechanism is established to flexibly adjust the training objectives according to market changes and enterprise feedback, so as to ensure that talent training always closely matches the needs of the green building operation and maintenance industry, and provide strong support for the smooth employment of students and the sustainable development of the industry.

4.2. Facing the new trend of industry transformation, building a new platform for the integration of industry and education

At present, green building technology is developing rapidly, and the industry-university research cooperation platform is the link between the school and the industry, which can drive talent training and the common development of the industry. In order to bring new vitality to the cultivation of high-tech talents and establish a new platform to adapt to the industry situation, schools and green building operation and maintenance enterprises can jointly establish an integrated production and education platform integrating practical training, scientific research, and vocational training. From the practical level, specific cases of enterprises can be introduced to enable students to learn vocational skills in a real or simulated environment, so as to ensure the continuity of learning activities and the smoothness of work cohesion. In terms of technological innovation, the University and enterprises set up a special team to carry out specific and in-depth research on energy-saving technology and automatic monitoring technology in the process of green building operation, so as to promote the transformation of scientific research achievements. In terms of vocational training, a highly targeted training plan is formulated in combination with the latest industry specifications to provide continuing education services for enterprise employees and enable students to access the most cutting-edge technologies. In addition, with the help of digital technology, an online production and education integration platform is built to integrate high-quality teaching resources and enterprise practice cases to realize resource sharing and real-time interaction between schools and enterprises. Through the combination of online and offline, we can break the time and space constraints, broaden the breadth and depth of the integration of production and education, enable colleges and universities to timely grasp the industry transformation dynamics, and enterprises to deeply participate in the talent training process, so as to jointly cultivate high skilled talents with innovative thinking and practical ability that adapt to the new trend of the transformation of green building operation and maintenance industry ^[4].

4.3. Strengthening the construction of teachers and building a “double qualified” team

Teachers have a decisive impact on the growth of students. The key to the realization of the integration of production and education is to establish an excellent “double qualified” teaching team. The college should adopt effective policies and measures to recruit technical personnel for the operation and maintenance of environmental protection buildings in enterprises as part-time teachers and bring their rich practical work experience to teaching. Similarly, colleges and universities should select teachers to practice in enterprises, actually participate in the operation and maintenance work, improve the level of teachers’ operating skills and the ability to solve practical problems, and accumulate teaching materials. Teachers’ training centers are jointly established by schools and enterprises to regularly arrange teachers to go out to learn new technologies and improve their knowledge level. Teachers are encouraged to participate in the research and development of topics and the secondary development of technologies in enterprises, and convert the research and development of these topics and technologies into teaching materials to achieve the goal of joint promotion of teaching and research. In addition, we should optimize the evaluation and reward mechanism for “double qualified” teachers, and give preference to “double qualified” teachers in terms of professional title promotion, evaluation and selection, and salary, so as to stimulate their enthusiasm for practical work. The above measures can create a “double qualified” teaching team with a certain theoretical foundation and practical operation ability, and lay a good foundation for the cultivation of advanced technical application-oriented talents in green building operation and maintenance.

4.4. Establishing a diversified evaluation system and improving the framework of skill certification standards

A scientific and reasonable evaluation system and authoritative and standardized skill certification standards are important guarantees for the quality of high-skilled talent training in green building operation and maintenance, and also the key link of collaborative education in the integration of production and education. Colleges and universities should cooperate with enterprises, industry associations, and other multi-subject entities to build a multi-dimensional evaluation system covering theoretical knowledge, practical skills, professional quality, and other dimensions. Theoretical assessment focuses on students' mastery of the basic knowledge of green building operation and maintenance, practical operation assesses students' operation and maintenance ability in real or simulated scenes, and professional quality assesses students' qualities such as teamwork and responsibility. At the same time, the introduction of enterprise evaluation and third-party evaluation involves enterprises evaluating students' ability according to actual work needs, and third-party institutions providing objective and fair evaluation references. In terms of improving the framework of skill certification standards, according to the green building operation and maintenance industry norms and the actual needs of enterprises, the skill certification standards for different levels are formulated, and the corresponding knowledge, skills, and literacy requirements for different levels of skills are clarified. Encourage industry associations to play a leading role, organize enterprises and colleges to jointly develop certification courses and examination syllabi, and ensure that certification standards are closely integrated with industry dynamics. By establishing a diversified evaluation system and improving the skill certification standard framework, comprehensively and objectively evaluate students' abilities, provide clear career development paths for students, and provide a reliable basis for enterprises to select talents, so as to promote the high-quality development of the cultivation of high-skilled talents in green building operation and maintenance.

5. Conclusion

In the context of the integration of industry and education, by strengthening the precise docking of industry and education, building a new platform for integration, building a "double qualified" team and establishing a diversified evaluation system, we can effectively break the barriers between education and industry, deepen school enterprise cooperation, keep up with industry trends, constantly improve the collaborative education mechanism, cultivate more suitable high skilled talents for the green building operation and maintenance industry, and promote the high-quality development of the industry.

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Disclosure statement

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