



Reconstruction of the Practical Teaching System in Higher Vocational Education Based on the Background of “Double High-Levels” Plan

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Abstract. Both the advanced “Dual Education System” education concept in Germany and the newly launched “National Vocational Education Reform Implementation Plan” in China have highlighted the essence of vocational education, which is “deep integration of enterprises with vocational schools and universities, cultivating students’ comprehensive quality with both morality and technical skills”. Both the “all-around education to all people through the whole process” and the “reform to teacher, textbook, teaching method” are focused on improving students’ technical skills, but one of its ultimate important foothold lies in constructing the practical teaching system of modern vocational colleges. In view of the “three inadequacies” in the practical teaching system of vocational education at present, this paper takes manufacturing majors as an example, and reconstructs the modern practice teaching system. In addition, this paper innovatively puts forward the reform scheme of the practical teaching system of higher vocational colleges, which is “cooperation between industrial parks and campus, complementarity between virtuality and reality, and unity of knowledge and practice”, and provides a reference example for the practical teaching of vocational colleges.

Keywords: Practical teaching system · Reconstruction · “Double High-levels” Plan

1 Introduction

The Plan for the Construction of High-level Higher Vocational Schools and Majors with Chinese Characteristics clearly stated that “we should concentrate on building about fifty high-level higher vocational schools and about one hundred and fifty high-level majors (groups), so as to create a highland for training technical and skilled talents”. Practical teaching in higher vocational colleges is an important part in the cultivation of high-tech skilled talents, which provides an important way to cultivate talents for the implementation of the national strategy of “Made in China 2025” and the transformation

and upgrading of modern manufacturing enterprises. However, from the overall perspective of national vocational colleges [1–7], the curriculum system of most colleges and universities had failed to make adaptive and fundamental changes according to the new development of the industry and the new national strategy. The teaching content lagged behind the latest development of industry science and technology and the demand of enterprise intelligent manufacturing technology. There were few innovative measures to the introduce engineering problems into classroom for project-based teaching, and few links with design, practice and research were added to curriculum implementation, which were meant to improve students' understanding and practical ability, as well as cultivating students' engineering consciousness and innovative ability.

Based on the national development strategy of “Made in China 2025” and the new requirements of industry development for personnel training, and through investigating the actual job requirements of enterprises, as well as combining with the key problems in school-enterprise cooperation, this paper reconstructs the modern practice teaching system aiming at the common phenomenon of “three inadequacies” in the practice teaching system of vocational education at present. Also this paper innovatively puts forward the reform scheme of the practical teaching system of higher vocational colleges, which is “cooperation between industrial parks and campus, complementarity between virtuality and reality, and unity of knowledge and practice”, and provides reference for solving the practical teaching problems in vocational colleges. During this process, the advanced manufacturing specialty group in Chongqing Vocational Institute of Engineering was taken as an example.

2 Existing Problems of the Current Practical Teaching System

2.1 Insufficient Connection Between the Practical Teaching Projects and the Industrial Technology Development

The development of intelligent manufacturing industry is the key link to realize the transformation from a big manufacturing country to a powerful manufacturing country. The practical teaching projects in core aspects, such as industrial control system, intelligent sensing, industrial network and industrial software in higher vocational schools cannot fully meet the technical demands of industrial transformation and upgrading. The campus training equipment lags behind the renewal speed of the real production equipment of enterprises, and the campus practical teaching projects are out of sync with the development of industrial technology.

2.2 Insufficient Connection Between the Practical Teaching Conditions and the Enterprise Production Conditions

Under the background of intelligent manufacturing, the digital and intelligent upgrading of production equipment puts forward new requirements for practical teaching conditions in schools. The existing teaching conditions such as practical training teaching content, teaching equipment and teaching faculty cannot fully meet the new requirements of technical skills training and vocational literacy enhancement for students.

The teaching conditions of practical training in schools cannot fully improve students' ability of job innovation and creation. The existing practical teaching conditions of the school are not well connected with the transformation and upgrading of the industry, technological transformation and other aspects. Also, the fit in cultivating students' innovative and creative ability is not strong, which cannot well meet the needs of posts for innovative and creative ability.

2.3 Insufficient Connection Between Practical Teaching Evaluation and Enterprise Assessment Standards

The evaluation of practical teaching in schools lacks the assessment of students' adaptability to changes. The software and hardware conditions of practical teaching in schools are different from those of the actual engineering scenes of enterprises, so the students can't fully understand the real engineering atmosphere of factories. Also, there are differences between the contents of practical training in schools and the solution of actual engineering problems, which makes it difficult to effectively train students' adaptability to cope with unexpected actual engineering problems.

On-campus practical teaching evaluation lacks the assessment of students' ability to control the whole process of solving practical engineering problems as well as their professionalism. Students are usually assigned relatively single production positions in on-campus internship or enterprise internship, which makes it difficult for them to obtain systematic and comprehensive exercise and cultivation of typical job skills. Students are slightly insufficient in the project-based management to solve engineering problems, professional quality and the ability to solve engineering project problems.

3 The Path Analysis of Solving Problems

3.1 With the "Four Synergies" of Industrial Parks and Campus, Docking with Industrial Development to Develop Practical Teaching Projects and Deepen Practical Teaching Reform in All Aspects

Relying on the overall coordination of local government competent authority of industry, around the surrounding industrial parks and related enterprises, the community of coordinated development between industrial parks and campus should be built, forming a "five-in-one" platform of research, production, training, learning and teaching for modern manufacturing industry. Based on this platform, the following work will be carried out: Firstly, the industrial parks and campus cooperate in research and development of the training projects, and jointly connect with R&D of training teaching projects of new technologies and new processes, so as to form workbook-type loose-leaf teaching materials and workbook-type teaching materials; Secondly, the industrial parks and campus cooperate to develop training equipment, and jointly develop training equipment based on the demands of the industrial parks and campus in "CNC machining" and "PLC control", which are shared by the industrial parks and campus as well as the enterprises; Thirdly, the industrial parks and campus cooperate to carry out the training of enterprise employees and students, and teachers and qualified workers are employed by schools

and enterprises reciprocally; Fourthly, industrial parks and campus cooperate to implement practical teaching reform, jointly undertake the practical teaching reform issues and jointly carry out teaching research.

3.2 With the “Three Complementation” Between Virtuality and Reality, Docking with Production Conditions to Improve Practical Teaching Conditions and Promote the Integration and Development of “Theory, Virtuality and Reality”

Adopt various ways, such as introducing enterprises into schools and running schools in enterprises, to establish a “double base” with dual functions of teaching and production, so as to improve the practical teaching conditions. Implement the integrated teaching implementation of “virtual and real” projects with deep integration of production and education through “complementation between virtuality and reality”. Firstly, “make up for virtuality with reality” in the school. Establishes a productive training base on campus by introducing Huawei, Weichai and other enterprises, so as to enhance the real situation of teaching in the workplace and the real production experience of learning; Secondly, “make up for the reality with the virtuality” in schools and enterprises. Establish a virtual simulation training base by entering enterprises such as heavy tooth machinery and Dongke Mould, thus carrying out “understanding rationality” training for internship students and enterprise employees; Thirdly, “balance between virtuality and reality” in teaching. Through the whole process and all-round cooperation between schools and enterprises, the whole process and all links of personnel training with combination of theory and practice are realized, and the integrated development of “integration of theory and practice” is achieved.

3.3 The “Two in One” of Knowing and Doing. Reform Practical Teaching Evaluation by Connecting with Enterprise Standards, and Introduce a Third-Party Evaluation Mechanism

Through the introduction of enterprise post ability standards and production assessment standards, the academic evaluation index system of students practical course learning and the method of school-enterprise collaborative implementation evaluation were developed to promote the development of students’ unity of knowledge and practice. The first is to develop the evaluation system of unity of knowledge and practice. Construct evaluation indexes and observation points including three dimensions of quality, knowledge and ability for students’ post recognition, post follow-up, post placement, comprehensive training and graduation design, and form a guide manual for students’ practical curriculum learning evaluation; The second is to implement the evaluation system of unity of knowledge and practice. Implement the evaluation in cooperation with school and enterprises, and fully involve students in evaluation. It is necessary to adopt intelligent evaluation tools to make objective and fair evaluation results, and differentiate the results by credits, and banking the credit management; The third is to introduce a third-party evaluation mechanism. Give full play to the role of the Professional Construction Steering Committee, and make targeted diagnosis and evaluation on the teaching behavior

and quality of teachers and qualified workers, as well as the learning behavior and effect of students and employees in practical teaching.

4 Reconstruct the Practical Teaching System of Modern Vocational Education

4.1 Establish Industrial Alliance to Realize “Industrial Parks and Campus Collaboration”

Taking advantage of geography, the campus keeps close contact with the surrounding industrial parks and establishes an intelligent manufacturing industry alliance. Based on the alliance, the enterprise obtains the talent support provided by the school. Also, the school obtains the latest post ability requirements from the enterprise, and refines the engineering project into the teaching practice content. Give full play to the role of intelligent manufacturing industry alliance as the link between schools and industrial enterprises. The coordinated development of industrial parks and campus builds a platform for the deep integration of production and education between schools and enterprises, and realizes the collaborative education between industrial parks and campus.

4.2 Strengthen School-Enterprise Cooperation to Achieve “Complementation Between Virtuality and Reality”

Based on the practical teaching system of industry-campus cooperation, school and enterprise jointly set up a teaching faculty group of practical teaching. According to the real project of the enterprise, school and enterprise jointly develop practical teaching projects that meet production needs. By carrying out practical teaching highly imitating “reality” (real environment, real equipment and real projects of enterprises) in schools, the “virtual” projects of practical training in schools are constantly close to the “real” needs of enterprises, and a practical teaching system of “virtual and real complementarity” between schools and enterprises is formed. It not only cultivates students’ practical skills for actual production of enterprises, but also provides pre-job skills training bases for employees. At the same time, through the cooperation between industrial parks and campus, the enthusiasm of enterprises in the park is fully mobilized, so that the enterprises can deeply participate in personnel training. According to the post requirements of automation majors, real project of post-replacement training for students is carried out in enterprises, so that students can feel the enterprise atmosphere in advance and strengthen practical skills in the process of completing the real production tasks of enterprises. The two sides of the university and enterprises continuously strengthen cooperation, forming the talent training pattern of “dual” practical teaching. Based on the principle of “complementation between virtuality and reality”, the students’ practical skills and comprehensive ability to solve practical engineering tasks were cultivated from two levels of school-enterprise.

4.3 Reform the Evaluation Model to Achieve “Unity of Knowledge and Practice”

- (1) Establish a “process-oriented” dynamic evaluation mechanism. The evaluation of professional quality and knowledge and skills runs through the practical teaching process of students, and a dynamic and process-oriented “dual system” evaluation mechanism between schools and enterprises is adopted. Combine professional quality with post skill assessment, give full play to the enthusiasm and autonomy of school-enterprise “dual teachers” in evaluation activities, and make evaluation continue in the whole process of school training and enterprise practice.
- (2) Construct the three-dimensional evaluation content of “professional skills, ethics and social ability”. After general summary according to the typical professional work, the practical teaching content is established. Each teaching project is taught according to the working process. The evaluation content of students includes three aspects: professional skills, implementation process and social ability. The all-round three-dimensional evaluation content makes the dynamic evaluation “evidence-based”.

4.4 Integrate New Technologies into Practical Teaching Projects

Strengthen the innovation of practical teaching content, upgrade the practical equipment in the school and improve the teaching methods. Integrate the new technologies demanded for industrial transformation and upgrading in the industrial park into the design of practical teaching projects in campus. Firmly grasp the pulse of the development of the times, and constantly update the teaching content, so that students can understand the latest trend of enterprise job skills demand and master the latest job skills. Optimize the content of practical courses, and firmly grasp the latest demands of enterprises for talents. Adjust the emphasis of practical teaching content according to the requirements of post groups for job skills training of automation majors, so as to ensure the synchronization of practical teaching content and post requirements.

4.5 Improve the Practical Teaching Conditions of Complementation Between Virtuality and Reality

Integrate the virtual simulation practical teaching based on the real projects in the school with the real positions in the production line of enterprises, strengthen the students’ ability to solve the actual engineering problems, so as to help the students really become the technical skill talents to meet the demands of the enterprises. Through the complementation between virtuality and reality inside and outside the school, students’ understanding of the “real demands, real projects and real scenes” of enterprise positions will be enhanced, and the zero-distance change from graduation to employment will be realized, so that students can directly jump the “internship period” and save the retraining time of enterprise positions; Optimize the employment pattern of graduates, so that students can enter the core technical positions or high-end technical positions of enterprises after one to two years of work, and become the technical backbone of enterprises.

In addition, it is necessary to reconstruct the guarantee mechanism of modern practical teaching system and guarantee it in terms of policy, fund and management.

5 Conclusion

Vocational colleges should attach great importance to the reform and innovation of modern practical teaching system, and combine with the “Double High-levels” construction plan and the “Made in China 2025” strategy. Also, they should dock with the talent demands of industrial enterprises to reconstruct the practical teaching system, and develop practical teaching projects so as to create teaching and training conditions that meet the production requirements of enterprises, as well as formulating a practical teaching evaluation system that meets the requirements of enterprise post ability. At the same time, vocational colleges should strengthen the guarantee of policies, funds and management, which contributes to cultivate contemporary college students with strong practical ability, high comprehensive quality and strong sense of innovation, so eventually provide strong talent support for the vigorous development of current social economy.

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