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Reform and Exploration of Modular Teaching Methods in Higher Vocational Education

-- Taking Mechatronics Integration as an Example

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Abstract: In the deepening of modular teaching talent cultivation mode, the traditional teaching concepts in vocational colleges are challenged. It is necessary to integrate the theoretical content, practical skills, and professional qualities of traditional teaching, emphasizing the shift from cultivating students' adaptability to cultivating students' participation ability, and emphasizing the cultivation of students' independent innovation ability. This puts higher requirements on the curriculum system that emphasizes application ability as the standard. This article takes the mechatronics integration major as an example, and combines the work tasks and processes of the relevant job groups in the professional enterprise. Through typical work tasks, the original course system has been reconstructed into 13 modules. Taking one of the modules as an example, this paper deeply analyzes the advantages and characteristics of the theoretical level, practical level and professional quality level, and integrates the three levels into each other to infiltrate, connect and match, and organically combine, ultimately achieving the development and improvement of students' comprehensive ability and quality.

Keywords: Vocational Education; Modular; Curriculum System; Application Ability.

1. Introduction

The State Council issued the "Implementation Plan for National Vocational Education Reform", on January 24, 2019, which proposed to "take multiple measures to create a 'dual teacher' teaching team", explore the formation of high-level and structured teaching innovation teams, enhance teachers modular teaching design and implementation capabilities, and innovate modular teaching models [1]. Vice Premier of China Chunlan Sun proposed at the conference on deepening vocational education reform to reverse the teaching situation of "more theoretical indoctrination and less practical training" in April, strengthen the integration of theory and practical training, and popularize modular teaching methods. The Ministry of Education and nine other departments issued the "Action Plan for Improving the Quality and Excellence of Vocational Education (2020-2023)" in September 2020, which drives teachers to connect teaching with professional standards and work processes, and improve the quality of curriculum teaching through modular teaching organization [2]. In the process of reform, due to the constraints of ideas, systems, and resources, the reform and innovation of talent cultivation models remain weak links in the cultivation of applied talents [3]. Therefore, it is particularly important for vocational colleges to innovate teaching models, break the traditional mode of subject teaching, and achieve modular teaching research and practice that integrates and unifies the cultivation of technical skills.

For the teaching content of vocational colleges, modules, as the basic teaching unit for professional ability cultivation, are an organic combination of ability cultivation and related teaching activities within a profession. Studying and analyzing modular teaching can achieve the training goals of vocational and technical education better and improve teaching efficiency, thereby deepening the reform and development of vocational and technical education [4]. Modular teaching is a continuous and progressive approach to cultivating students' abilities, integrating theory and practice. It not only adjusts and changes the original curriculum structure, but also reflects the educational ideas that vocational colleges should possess through screening and integrating teaching content. With students as the main body, the theoretical learning of the course better serves practical learning, so that students can achieve precise integration with future employment positions, Promoting one's own sustainable development [5,6].

2. Implementation Path of Talent Cultivation Mode based on Modular Teaching

(1) Constructing school enterprise collaboration and comprehensively enhancing the construction of modular teaching faculty

In 2016, the Ministry of Education and seven other departments issued the "Regulations on Enterprise Practice for Vocational School Teachers", which stipulated that professional course teachers in vocational schools must accumulate no less than 6 months of practice at the enterprise or production service front line every 5 years. This provides institutional guarantees for teachers to enter the enterprise for practical training and technical exchange. At the same time, it also hires frontline enterprise experts to attend classes and hold salon lectures, providing an interactive environment for activities such as school enterprise linkage. At the same time, schools and enterprises continuously adjust their modular talent cultivation plans, incorporating new cases, ideas, technologies, trends, and norms in the field of mechatronics into teaching standards and content in a timely manner, promoting talent cultivation and industrial needs, training plans and vocational standards, curriculum practice and

enterprise production, teaching and production processes, graduation certificates and vocational qualifications, vocational education and lifelong learning, Mutual support and docking matching.

(2) Reconstruct talent cultivation plan and fully implement modular and connected teaching mode

According to the German regulations on the learning field and enterprise training of mechatronics integration, combined with the Chinese vocational qualification standards and basic theoretical knowledge involved in the mechatronics industry, combined with the work tasks and processes of relevant job groups in the enterprise, the course system was reconstructed through typical work tasks. Based on the actual production cases of the enterprise, 13 learning modules were selected, and all modular courses were composed of corresponding 13 learning scenarios, The content is concretized through learning contexts as follows: Module 1: Functional analysis of electromechanical integration system; Module 2: Manufacturing and assembly of mechanical systems; Module 3: Electrical equipment installation based on technical safety regulations; Module 4: Construction, control, and testing of pneumatic systems; Module 5: Application of data processing system; Module 6: Planning and organizing the work process; Module 7: Construction of mechatronics integration subsystem; Module 8: Project design and optimization of electromechanical integration system; Module 9: Construction and inspection of complex electromechanical integration systems; Module 10: Planning for assembly and disassembly; Module 11, troubleshooting of mechatronics integration system; Module 12, Preventive Maintenance of Mechatronics Integration System; Module 13: Handover of mechatronics integration system. The teaching context is constructed based on typical tasks in actual job operations, running from simple to complex tasks or comprehensive projects. Typical job task analysis is a work process oriented vocational education curriculum development method that makes it possible to learn knowledge implicit in actual vocational work. Through modular teaching content learning, students can complete a typical work task in a certain profession. By learning through several interrelated tasks, students can obtain professional competence qualifications for a certain profession, form a series of projects that run through the teaching process, break traditional subject teaching models, innovate teaching methods that serve modular teaching models, and easily cultivate students' professional work thinking and professional action ability guidelines.

(3) Establish a modular curriculum for integrated ideological and political education, and comprehensively promote the "Three Comprehensive Education"

Adhering to the principles of "being virtuous and skilled" and "cultivating both virtues and skills", focusing on the core content of "industrial spirit" and "craftsmanship spirit", we will deeply explore the ideological and political education elements in the field of electromechanical integration technology, including "industrial culture, corporate culture, and professional culture", optimize course content, and explore the path of constructing ideological and political teaching resources that integrate "Ouyue culture, cultural inheritance, great country craftsmanship, intelligent manufacturing, red tourism culture, and ideal beliefs", Following the growth pattern of vocational college students' learning and cognition, exploring methods and approaches that students love and are willing to accept, silently transforming the connotation of industrial culture into curriculum ideological and political resources, and constructing an integrated modular curriculum based on industrial resources and curriculum ideological and political resources. According to the latest component, a modular integrated curriculum based on local industrial resources and curriculum ideological and political education. According to the latest component, a modular integrated curriculum based on local industrial resources and curriculum ideological and political education. Through professional courses, we aim to cultivate students' correct labor concepts, correct labor attitudes, cultivate good labor habits, hone their willpower, enhance their ability to resist setbacks, enhance their sense of ownership, social responsibility, and competitiveness, and cultivate a simple and hardworking style and entrepreneurial spirit. Promote the comprehensive development of college students and become high-quality technical and skilled talents with comprehensive moral, intellectual, physical, aesthetic, and labor development. Through the exploration of school enterprise integration, combined with advantageous resources such as equipment research and manufacturing enterprises, enterprise industrial design alliances, machinery manufacturing guilds, and government supported projects, by introducing enterprise equipment technology upgrade projects, new intelligent manufacturing equipment and other research projects, excellent students' technological innovation ability and project implementation ability are trained, and the innovation awareness and entrepreneurial spirit of students are cultivated through technological practice innovation. Employ human resources specialists, model worker and other personnel of cooperative enterprises to carry out corporate culture education for students, strengthen the education of integrity, professionalism, responsibility and law-abiding awareness, and run professional quality education through the whole process of talent cultivation.

3. Optimization Analysis of the Specific Implementation of Modular Teaching Curriculum Plan

In deepening modular teaching, the logical system of subject knowledge is broken, and knowledge is integrated according to the development needs of professional abilities to form a modular teaching course. Taking Module 2 "Manufacturing and Assembly of Mechanical Systems" as an example, the systematic problem of curriculum design is solved, including the connection between theoretical teaching and practical teaching, and the integration of quality education and professional teaching. Through the organic combination of teaching content, cultivate students' comprehensive qualities and strive to achieve the development of overall comprehensive abilities.

(1) Improve students' understanding and mastery of basic theoretical knowledge

In the teaching of the "Manufacturing and Assembly of Mechanical Systems" module, students need to master the following precautions: standards, annotations, tolerances, etc. for drawing engineering drawings; The use and maintenance of steel rulers, vernier calipers, universal angle rulers, and square rulers; Preparation and planning of work plans (production processes, part testing methods, and working hours); Environmental awareness in safety precautions and accident prevention measures at work; The unity of opposites between cost and efficiency in work execution, and this

knowledge needs to be dispersed into different theoretical classrooms in traditional teaching, such as mechanical engineering fundamentals, engineering drawing, mechanical manufacturing technology, tolerance and measurement technology, etc. Most students have a good grasp of simple knowledge, but it is difficult to accept complex and abstract knowledge. The modular teaching method divides the teaching content again and combines it with projects. This teaching method can not only enable students to learn new knowledge through hands-on learning, but also enable students to review previously learned knowledge in different projects. In addition, teachers can dynamically adjust the content of subsequent module teaching based on students' mastery of module teaching knowledge, ensuring that students can achieve the teaching goal of mastering knowledge by completing this module content.

(2) Enhance students' ability to train hands-on practical operation techniques

In the teaching of the "Manufacturing and Assembly of Mechanical Systems" module, guided by specific projects, a small car model is machined based on engineering drawings to enhance students' hands-on skills, including the design and manual production of small car component drawings. During the mechanical machining process through a small car, tools such as vernier calipers, universal angle rulers, hand saws, files, hammers, sample punches, flat chisels, scribes, table vice, and table drilling machines are used correctly for measurement and processing. Through modular practical teaching, students will ultimately acquire the ability to draw small car machining drawings; The ability to select and use different tools and measuring tools mentioned above, and process parts according to the work plan; Inspect and evaluate the quality of production, as well as the interrelationships and execution capabilities between environmental protection, cost, and efficiency. In traditional teaching, this knowledge needs to be dispersed into different training stages, such as CNC machine tool operation, mechanical drawing large-scale homework, metalworking training, etc. Students can only operate in the training courses, and it is difficult for them to achieve proficiency through short-term operations. However, the module 2 teaching method is planned to have 126 class hours, which better combines theoretical knowledge with practical skills through brain thinking and hands-on operation.

(3) Improving students' overall level of professional ethics and cultivation concepts

In traditional teaching methods, the classroom is dominated by teachers, who mainly give lectures in the classroom. When combining knowledge with professional competence, they are relatively rigid, which leads to students having mastered knowledge but generally having low levels of professional competence. The modular teaching method utilizes a project-based approach to create a real work environment for students, solving theoretical problems through consulting materials and manuals, solving work methods through team discussions, and improving work quality through self-evaluation. As the modular teaching content comes from real engineering projects in enterprises, students can master the professional qualities covered by this project during the process of completing the project. By accumulating the number of completed projects, The professional literacy level of students can achieve a qualitative leap, effectively improving their communication, organization, and discipline. At the same time, in the process of practical guidance, ideological and political education elements such as core values, corporate culture, craftsmanship spirit, and professional spirit will be gradually integrated into student modular teaching.

4. Summary

This study takes the mechatronics integration major as an example to explore the specific implementation plan of modular teaching reform in the context of applied talent cultivation. In the process of teaching reform in the field of mechatronics technology, 13 learning modules were reconstructed based on the actual production cases of enterprises, referring to the learning field of mechatronics in Germany and combining with the Chinese vocational qualification standards and the work tasks of relevant job groups. Through modular learning, theoretical and practical content can be effectively connected in an orderly manner, and quality and professional education can be integrated and permeated, forming a series of projects that run through the teaching process, breaking the traditional subject teaching mode, and ultimately students can obtain professional competence qualifications for a certain profession. By innovating modular teaching models, it is easy to cultivate students' professional work thinking patterns and professional action ability guidelines, build a modular curriculum system that aligns with professional standards and regional industrial resources, and form a modular teaching curriculum transformation and development guide based on professional job abilities, providing path references for the reform of modular teaching models in other majors.

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