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Localization Exploration of the German Dual-system Model under the Background of Vocational Education Reform: Taking the New Energy Vehicle Technology Major of K College in Jiangxi Province as an Example

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Abstract: Driven by the global energy structure transformation and the "dual-carbon" strategy, China's new energy vehicle industry has experienced explosive growth, posing new challenges to the supply of technical and skilled talents. The traditional vocational education model faces problems such as lagging curricula, insufficient practical training, and disconnection between schools and enterprises. The German dual-system vocational education system is renowned for its unique training model and high employment rate, which is of great significance for the development of the new energy vehicle technology major in Chinese higher vocational education. This paper analyzes the characteristics of the German dual-system model, combines it with the actual situation of Chinese vocational education, and explores its localization application and innovation. The research shows that by deepening school-enterprise cooperation, optimizing curriculum settings, strengthening practical teaching, building a "double-qualified" teaching team, improving the assessment system, seeking policy support, and promoting international exchanges, the education quality and employment rate of this major can be effectively improved, and more high-quality technical and skilled talents can be cultivated for the new energy vehicle industry.

Keywords: Vocational Education; New Energy Vehicle Technology; German Dual-system; Localization

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1.Introduction

With the rapid development of China's economy and the transformation and upgrading of the industrial structure, vocational education has become increasingly prominent in the national strategy[1]. In recent years, the government has successively introduced policies such as the "Implementation Plan for the Reform of National Vocational Education" and the "Opinions on Promoting the High-quality Development of Modern Vocational Education" to promote vocational education reform and improve the quality of talent cultivation. Germany's manufacturing industry ranks among the world's top in terms of development level. It rapidly cultivates professional and technical talents through the dual-system vocational education model, which is widely recognized as an advanced example of vocational education globally[2]. Against this background, the German dual-system vocational education model, with its high employment rate and practice-oriented teaching

characteristics, has become an important reference for China's vocational education reform[3]. As a national strategic emerging industry, the new energy vehicle industry has an increasingly urgent demand for high-quality technical and skilled talents. However, there are still problems in the current talent cultivation of this major, such as insufficient in-depth school-enterprise cooperation, lagging curriculum settings, and insufficient practical teaching. Therefore, exploring the localization application and innovation of the German dual-system model is of great significance for improving the education quality and employment rate of the new energy vehicle technology major[4].

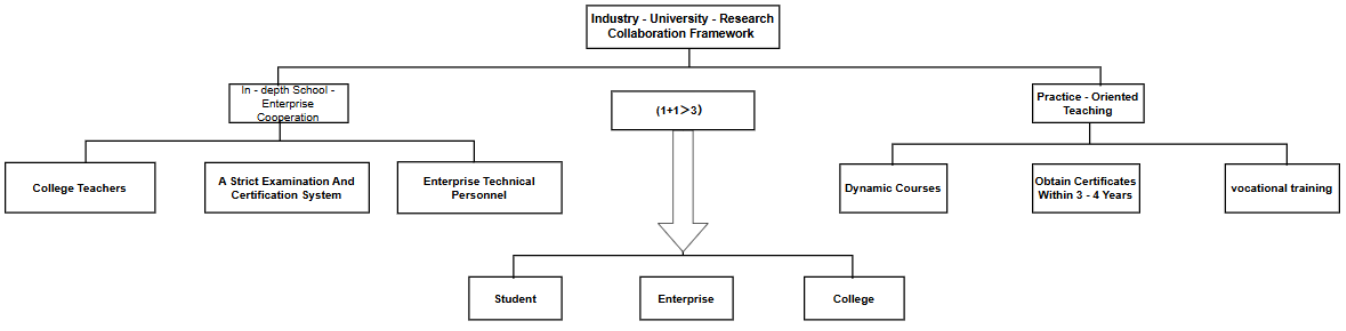
2.The Connotation of the German Dual-system Vocational Education Model

Different from the traditional education model, the German dual-system is basically positioned to cultivate high-quality technical and skilled talents (applied talents)[5] who meet market demands. In the context of the rapid development of globalization and technological innovation and the ever-changing demands of the labor market, such talents have significant advantages in market competition, can distinguish themselves from ordinary labor forces, and stand out. Its advantages are mainly reflected in three aspects:

2.1 In-depth School-enterprise Cooperation and the Construction of a "Double-qualified" Teaching Team

The core of the German dual-system is the close cooperation between enterprises and schools. Enterprises are not only the demand side of education but also the provider of education[6]. The teaching team consists of school teachers and enterprise technicians, ensuring the practicality and advancement of teaching content. Through cooperation agreements, enterprises participate in curriculum design, provide internship positions, and dispatch technicians to serve as part-time teachers to ensure that teaching is highly consistent with industry demands. The graduation projects of higher education are jointly set by enterprises and university professors, focusing on the research of actual enterprise problems, realizing the direct transformation of production-learning-research（as shown in the following figure1). Graduation theses are jointly supervised by professors and enterprise supervisors[7]. At the same time, relying on a strict assessment and certification system, the quality of education and students' abilities are guaranteed.

Figure1



2.2 Practice-oriented Teaching and Curriculum Design Centered on Vocational Needs

The German dual-system emphasizes the cultivation of practical abilities. Students spend a high proportion of time interning in enterprises, during which they receive systematic vocational training, master practical operation skills and problem-solving abilities, and there is a strict assessment and certification system. In the curriculum model of dual-system universities, students can obtain both a university graduation certificate and a vocational training completion certificate in 3-4 years, saving time costs[7]. Theoretical courses select materials centered on vocational activities, with a wide range of knowledge, appropriate depth, and strong comprehensiveness, which is conducive to cultivating students' comprehensive analysis and problem-solving abilities. The courses are subdivided by semester, expanding from general to specific and from shallow to deep around the major. The settings are flexible and can be adjusted in a timely manner according to industry changes. Moreover, they are arranged by experts with rich industry experience, paying more attention to direct vocational experience.

2.3 The Win-win Cooperation Effect

The cooperation model of the dual-system can achieve an effect of 1 + 1 > 3. In the German dual-system university vocational

education model, enterprises participate in talent cultivation, achieving a win-win situation for themselves, universities, and students[8]. Through cooperation, enterprises obtain high-quality skilled reserve talents. Statistics from the University of Duisburg-Essen show that approximately 80% of students stay to work in the signed training companies after graduation[7]. Many students can become independent and competent in their jobs in the later stage of vocational training and can start working upon graduation[9]. Compared with ordinary fresh graduates, they save a relatively long adaptation period and are familiar with the enterprise environment and culture, which is conducive to cultivating a sense of belonging.

3.The Current Situation and Challenges of the New Energy Vehicle Technology Major under the Background of Vocational Education Reform

With the increasingly severe global energy crisis and environmental problems, the new energy vehicle industry has developed rapidly and become an important direction for economic transformation and industrial upgrading in various countries. The new energy vehicle technology major has emerged as the times require, aiming to cultivate high-quality technical and skilled talents to meet the needs of industrial development.

The policy environment has a profound impact on the development of this major. Driven by China's vocational education reform, the new energy vehicle technology major is developing positively, and the employment rate of graduates is rising steadily, which benefits from the country's strong support for the new energy vehicle industry and the strong market demand for related technical talents. The new energy vehicle industry in Jiangxi Province is growing at an impressive rate. As a major base for university cultivation in the country, the province has a large-scale cultivation of technical talents in the new energy industry. However, as an emerging major, its employment situation and development prospects still have uncertainties.

To explore the matching degree between the quality of talent cultivation and industrial demands, this paper conducts a questionnaire survey among 160 students majoring in new energy vehicle technology at K College in Jiangxi Province, focusing on four dimensions: the depth of school-enterprise cooperation, the rationality of curriculum settings, the teaching quality of teachers, and employment competitiveness. The reliability and validity of the survey scale are good (as shown in the following table1):

Table1

Dimension	Number of Items	Cronbach's α	KMO Value
School - enterprise Cooperation	5	0.894	0.965
Curriculum Settings	4	0.839	
Teaching Staff	4	0.819	
Employment Competitiveness	4	0.858	
Total Scale	17	0.958	

Industrial development is a key factor determining the employment rate. With the increase in the market penetration rate of new energy vehicles, enterprises' demand for technical talents continues to grow, providing broad employment space for graduates. However, some factors in the talent cultivation process have affected the employment situation.

3.1 External Influences on Education Quality

Some schools have deficiencies in major settings, curriculum systems, practical teaching, etc., resulting in a gap between the skill levels of graduates and industrial demands. Problems such as weak teaching staff and insufficient training equipment also restrict the improvement of talent cultivation quality. First, school-enterprise cooperation is not in-depth, with shallow cooperation levels and imperfect mechanisms. Second, curriculum settings are lagging, and practical teaching is insufficient. The curriculum content cannot keep up with industrial development, the proportion of practical class hours is low, and students' practical operation and problem-solving abilities need to be improved. Third, there is a lack of a "double-qualified" teaching team, and teachers' practical abilities and industry experience are insufficient.

3.2 Internal Influences of Students' Qualities

In addition to insufficient professional teaching support, some students lack professional awareness and learning motivation, resulting in an unsteady grasp of professional skills and affecting their employment competitiveness. At the same time, some students have biases in their employment concepts, overly pursuing high salaries and stability and being unwilling to start

from grassroots positions, thus missing employment opportunities.

4.Enlightenments of the German Dual-system Model on the New Energy Vehicle Technology Major during the Localization Process

The German dual-system vocational education system is world-famous for its unique training model and high employment rate, and it has important reference significance for the development of the new energy vehicle technology major in China. The following are several enlightenments of the German dual-system vocational education system on this major:

4.1 Deepen School-enterprise Cooperation and Strengthen the Construction of a "Double-qualified" Teaching Team

The new energy vehicle technology major can draw on the German dual-system model to strengthen cooperation with new energy vehicle enterprises and deepen the integration of industry and education. Schools should establish long-term and stable cooperative relationships with enterprises, jointly formulate talent cultivation plans, develop professional courses, and build "factory-in-school" training bases. Through order-based cultivation, modern apprenticeship and other models, seamless connection between talent cultivation and industrial demands can be achieved. Through cooperation agreements, enterprises are enabled to deeply participate in curriculum design, provide internship positions, and dispatch technicians to serve as part-time teachers to ensure that teaching content is in line with industry demands.In terms of teaching staff construction, on the one hand, training and further education should be carried out for existing teachers, and they should be encouraged to take temporary positions in enterprises to improve their professional levels and teaching abilities. On the other hand, enterprise technical backbones should be hired as part-time teachers to bring the latest technologies and management experience into the classroom, and a high-level "double-qualified" teaching team should be built to provide guarantee for cultivating high-quality technical and skilled talents.

4.2 Adhere to Practice-orientation and Optimize Curriculum Settings

The new energy vehicle technology major should increase the proportion of practical teaching, set up more training courses and internship links, arrange students to rotate and intern in new energy vehicle manufacturing plants, maintenance service centers, charging facility operation companies, etc., increase investment in training equipment, and improve students' practical operation and problem-solving abilities. At the same time, a dynamic curriculum update mechanism should be established, communicate regularly with enterprises, keep up with industrial demands, and adjust the curriculum system according to technological development trends and changes in job requirements. For example, for emerging fields such as battery technology and intelligent networking, relevant courses should be added to update teaching content in a timely manner and cultivate students' competitiveness in emerging fields.

4.3 Improve Career Planning Guidance and Improve the Assessment and Certification System

Schools should attach importance to students' career planning and employment guidance, helping students clarify their career goals and development paths. From the beginning of enrollment, students should be guided to understand the industry development trends and employment prospects, and personalized employment guidance services should be provided. A dynamic talent demand database should be established to let students perceive the current workplace situation in advance. A sound employment guidance system should be established to provide students with all-round services such as career planning, job-seeking skills, and psychological counseling.

Vocational quality education should be integrated into the whole process of professional teaching to cultivate students' professional ethics, teamwork ability, and innovation and entrepreneurship spirit. Students should be encouraged to participate in various skill competitions and innovation and entrepreneurship activities to improve their practical abilities and comprehensive qualities. A strict and complete assessment and certification system should be established. In addition to traditional theoretical examinations, practical operation assessments and comprehensive ability evaluations should be included in important assessment parts. Industry certifications such as new energy vehicle maintenance technician certification should be introduced to improve students' vocational competitiveness. In addition, a progressive career guidance of "vocational cognition-job experience-internship" should be carried out, resources should be integrated to expand employment channels, special job fairs should be organized, and a school-enterprise cooperation platform should be built to create more employment opportunities for graduates.

5.Conclusion

The German dual-system vocational system provides valuable experience for the development of the local new energy vehicle technology major. Adopting this talent cultivation model helps to improve the quality of talent cultivation, meet the industry's demand for high-quality technical and skilled talents. By optimizing curriculum settings, strengthening practical teaching, and deepening school-enterprise cooperation, students' professional skills and vocational qualities can be effectively improved, and their employment competitiveness can be enhanced. At the same time, it provides practical guidance for the professional construction and teaching reform of higher vocational colleges, helps colleges formulate scientific development strategies, and improves the pertinence and effectiveness of professional construction. It can also provide a reference for the government to formulate industrial and education policies, promoting the healthy development of the new energy vehicle industry and the continuous progress of vocational education.

It is worth noting that, for a long time, Chinese higher vocational colleges have been committed to cultivating high-quality technical and skilled talents. However, their efforts have mainly been self-initiated reforms within the institutions[10]. To build a new energy vehicle technology talent cultivation system with Chinese characteristics, it is necessary to break through institutional barriers, establish a market-driven collaborative innovation mechanism, draw on the essence of the dual-system rather than simply copying it, and form a closed-loop ecosystem integrating the education chain, talent chain, and industrial chain, so as to provide high-quality technical and skilled talent support for the development of new industrialization.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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