A Review of Research on the Reform of Higher Vocational Education Model Based on Job Competence Under the Background of New Engineering

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Abstract: *As a strategic measure for China to respond to the new round of technological revolution and industrial transformation, New Engineering construction is promoting the in-depth transformation of higher education towards industry-education integration and knowledge-practice unification. As the core carrier for cultivating high-quality technical and skilled talents, the higher vocational education model must accurately adapt to the ability requirements of industrial positions in the New Engineering context. Reconstructing the talent training system oriented by job competence has become the core breakthrough for higher vocational education reform. Focusing on the core connotation of New Engineering and the key requirements of job competence, this study systematically sorts out the development status and existing dilemmas of the higher vocational education model under the New Engineering background, focuses on summarizing reform research results in six core fields: talent training objectives, curriculum system, teaching model, teaching staff, evaluation system and industry-education integration, summarizes the weaknesses of current research and future development trends, provides theoretical support and practical guidance for subsequent higher vocational education model reform practices, and helps higher vocational education cultivate more high-quality technical and skilled talents meeting the needs of New Engineering industries.*

Keywords: *New Engineering; Job Competence; Higher Vocational Education; Model Reform; Review*

1. Introduction

Against the background of accelerated global technological revolution and industrial transformation, emerging technologies such as artificial intelligence, big data, cloud computing, new energy and new materials have developed rapidly, giving birth to a series of new industries, new formats and new models. The demand for high-quality technical and skilled talents presents distinct compound, innovative and applied characteristics. Since China officially launched New Engineering construction in 2017, a series of policy documents including "Several Opinions on Deepening Industry-Education Integration" and "New Engineering Construction Action Plan" have been issued successively, clearly proposing to promote higher education reform and cultivate various talents adapting to New Engineering development, which has defined a clear direction for the reform and development of higher vocational education.

Higher vocational education takes serving industrial development as its fundamental purpose and cultivating technical and skilled talents as its core mission. The quality of its talent training directly determines the development vitality and core competitiveness of New Engineering industries. As a comprehensive ability index to measure an individual's adaptability to a specific position and ability to achieve work goals, job competence covers multiple core dimensions including knowledge, skills and literacy, which is highly consistent with the ability requirements of industrial positions in the New Engineering context. At present, the traditional higher vocational education model faces prominent problems

such as disconnection between talent training and job needs, backward curriculum system compared with industrial technology iteration, rigid teaching model and insufficient teachers' practical ability, which can no longer meet the job competence training requirements under the New Engineering background. Therefore, promoting higher vocational education model reform with job competence as the core has become an inevitable choice for the high-quality development of higher vocational education in the new era.

In recent years, domestic academic circles have conducted extensive research on the internal relationship between New Engineering, job competence and higher vocational education model reform, forming relatively rich research results. By systematically sorting out relevant literature, this study comprehensively reviews the core connotation of New Engineering and job competence, the development status and dilemmas of the higher vocational education model, the key points of reform research, research deficiencies and future trends, aiming to integrate existing research results, clarify research hotspots and weak links, and provide reference for subsequent relevant research and practical work.

2. Core Connotation and Adaptability Analysis of New Engineering and Higher Vocational Job Competence

2.1 Core Connotation and Development Characteristics of New Engineering

Driven by the new round of technological revolution and industrial transformation, New Engineering is a new type of engineering education system covering the transformation and optimization of emerging and traditional engineering majors, with the core goal of cultivating technical talents adapting to emerging industry development and traditional engineering upgrading. Its core essence focuses on three dimensions: "novelty", "integration" and "practicality". "Novelty" is reflected in focusing on emerging industrial fields such as artificial intelligence, intelligent manufacturing and big data, and cultivating professional talents adapting to new industries and new formats; "Integration" is reflected in promoting interdisciplinary integration, industry-education integration and science-education integration, breaking traditional disciplinary and school-enterprise cooperation barriers, and realizing in-depth connection between education and industry; "Practicality" is reflected in adhering to a practice-oriented approach, focusing on cultivating students' practical operation ability, innovation ability and practical problem-solving ability, and accurately meeting the actual needs of industrial positions.

The development of New Engineering presents distinct characteristics of the times: first, the high speed of technological iteration. The rapid update and iteration of emerging technologies require talent training to keep up with technological development, and realize dynamic optimization and timely update of educational content; second, the comprehensiveness of job needs. New Engineering industrial positions are no longer limited to single skill requirements, but put forward higher requirements for talents' interdisciplinary knowledge reserve, comprehensive skill level and innovative thinking ability; third, the close connection of industry-education coordination. The link between industrial development and education and training is increasingly close, and enterprises' full participation in the whole talent training process has become an inevitable trend in New Engineering development. As discussed by the National Joint Conference of Presidents of Higher Vocational Schools, under the New Engineering background, higher vocational education needs to actively respond to the development trends of "diversification, personalization, lifelong learning, internationalization and digitalization", anchor the foundation of type education, and realize systematic, overall and integrated development [1].

2.2 Core Dimensions of Job Competence and Requirements for Higher Vocational Talent Training

The concept of job competence was first proposed by American psychologist McClelland, specifically referring to the collection of comprehensive abilities such as knowledge, skills and literacy required for an individual to successfully

complete work tasks and achieve work goals in a specific position. Combined with the actual needs of industrial positions in the New Engineering context, the job competence of higher vocational talents mainly includes four core dimensions: the professional skill dimension, i.e., mastering core professional knowledge and operational skills, being able to skillfully use professional technology to solve practical job problems, which is the basic support of job competence; the innovation ability dimension, i.e., having innovative thinking, awareness and practical ability, being able to adapt to technological iteration and job changes, and participate in technological innovation and product R&D; the professional literacy dimension, including professional ethics, dedication, sense of responsibility and cooperation ability, which is the core element for talents' sustainable development; the lifelong learning dimension, i.e., having independent learning ability, being able to actively track industry technology development trends, continuously update knowledge and skills, and adapt to industrial upgrading and job transformation needs.

It is worth noting that with the continuous advancement of the digital intelligence wave, modern occupations generally present mixed task characteristics. Non-routine task skills have become the core advantage to improve workers' employability, and the traditional static skill training model can hardly adapt to the development needs of the digital intelligence era [2]. This requires higher vocational education to cultivate talents with not only conventional operational skills, but also comprehensive abilities to handle mixed and cross-scope tasks, and construct a mixed task skill map meeting position needs.

2.3 Adaptability Between New Engineering and the Cultivation of Higher Vocational Job Competence

There is a high degree of adaptability between New Engineering development and higher vocational job competence cultivation, and the two support each other and develop synergistically. On the one hand, New Engineering industry development provides a clear direction for higher vocational job competence cultivation. The ability requirements of industrial positions determine the goals, contents and methods of higher vocational talent training, and promote higher vocational education to optimize the talent training system around job competence; on the other hand, higher vocational job competence cultivation provides solid talent support for New Engineering industry development. Only by cultivating technical and skilled talents meeting job competence requirements can we promote the sustainable and healthy development of New Engineering industries and realize win-win cooperation between education and industry.

From the perspective of mechanism coupling, there are profound internal connections between New Engineering construction, higher vocational industry-education integration and job competence cultivation in three aspects: theory, practice and functional value [3]. At the theoretical level, both are based on economic innovation theory, emphasizing the close combination of technological innovation and economic development, and promoting in-depth linkage between education and industry; at the practical level, both focus on school-enterprise collaborative education, emphasizing the organic integration of theoretical learning and production practice, and realizing accurate connection between talent training and job needs; at the functional value level, both take serving industrial development as the core goal, supporting China's industrial transformation and upgrading and high-quality development.

3. Development Status and Dilemmas of Higher Vocational Education Model Based on Job Competence Under the Background of New Engineering

3.1 Initial Manifestation of Reform Effects

Driven by New Engineering construction, China's higher vocational education has gradually established the orientation of job competence, actively promoted education model reform, and achieved phased results. First, talent training objectives have gradually focused on job competence. Most higher vocational colleges have redefined talent

training orientation in combination with New Engineering industry needs, broken the traditional "valuing theory over practice" orientation, and highlighted the comprehensive cultivation of professional skills, innovation ability and professional literacy. For example, based on regional industrial characteristics, Chengdu Industry and Trade Vocational and Technical College has established the core orientation of "serving regional industries and cultivating technical talents". Through dynamic major adjustment, it has formed a professional cluster accurately connecting with the regional industrial system, helping to accurately match talent training with job needs [1]; Wuxi Vocational Institute of Technology, targeting the New Engineering major of intelligent manufacturing, has clearly defined the talent training objective as "compound technical and skilled talents who master the operation, programming, operation and maintenance and innovation optimization capabilities of intelligent manufacturing equipment and have good professional literacy" in combination with enterprise job competence requirements, which accurately meets the job needs of intelligent manufacturing enterprises in the Yangtze River Delta region.

Second, industry-education integration and school-enterprise cooperation have been continuously deepened. Higher vocational colleges have actively cooperated with New Engineering-related enterprises, promoted in-depth integration of enterprise and educational resources through co-constructing training bases, co-setting courses and co-cultivating talents, provided students with a real post practice environment, and effectively improved students' post adaptability. Lanzhou Resources and Environment Vocational and Technical University has co-constructed an intelligent meteorological industry-education integration practice center with the Provincial Meteorological Bureau, creating a new-type classroom with "real scenes, digital intelligence integration and double-teacher teaching", which has significantly improved students' practical skills [4]; Shenzhen Institute of Information Technology has co-constructed an artificial intelligence training base with New Engineering enterprises such as Huawei and Tencent, introduced real enterprise projects, allowed students to participate in post practices such as artificial intelligence algorithm optimization and big data analysis, realized seamless connection between training content and enterprise job needs, and significantly improved students' job competence.

Third, progress has been made in teaching model innovation. Some higher vocational colleges have introduced project-based teaching, case-based teaching and flipped classroom to replace the traditional "lecture-based" teaching, focusing on giving play to students' main role, guiding them to actively participate in practical operations and innovative exploration, and improving their practical and innovation abilities. At the same time, the application of digital intelligence technology in teaching has become increasingly popular. Some colleges and universities use artificial intelligence, big data and other technologies to optimize the teaching process, promoting the transformation of teaching models towards intelligence and personalization. Zhejiang Institute of Mechanical and Electrical Engineering, in the New Engineering major of new energy vehicle technology, adopts the "project-driven + virtual simulation" teaching model, taking real post projects such as new energy vehicle fault diagnosis and battery management system debugging as carriers, combined with the virtual simulation platform, allowing students to practice repeatedly in the simulated scene, which not only reduces training costs, but also improves their post operation ability and emergency response ability.

Fourth, the construction of teaching staff has been continuously strengthened. Higher vocational colleges have improved teachers' practical ability and professional quality by introducing enterprise technical backbones, carrying out teachers' practical training, and encouraging teachers to participate in enterprise project R&D, striving to build a "double-qualified" teaching staff to provide solid guarantee for job competence cultivation.

industry.

3.2 Existing Main Dilemmas and Performances

Although certain achievements have been made in higher vocational education model reform, combined with the job

competence training requirements under the New Engineering background, there are still many incompatible problems, mainly reflected in six aspects:

First, the positioning of talent training objectives is not accurate enough. Some higher vocational colleges have not conducted in-depth research on the job competence requirements of New Engineering industrial positions, and their talent training objectives still remain at the traditional skill training level, with insufficient attention to innovation ability, lifelong learning ability and interdisciplinary comprehensive ability, leading to disconnection between talent training and job needs. At the same time, in the upsurge of upgrading to undergraduate colleges, some colleges and universities have encountered vague talent training positioning, blindly pursuing academic improvement and ignoring the core training objective of technical and skilled talents .

Second, the curriculum system lags behind industrial technology development. The curriculum setting is still based on the traditional disciplinary system, lacking in-depth integration with New Engineering technology and job needs. The curriculum content is outdated and updated slowly, failing to reflect the latest industry technologies and job requirements; the curriculum structure is unreasonable, with an unbalanced proportion of theoretical and practical courses, and practical courses lack pertinence and effectiveness, making it difficult to effectively cultivate students' post operation ability. In addition, disciplinary barriers have not been completely broken, and interdisciplinary courses are insufficient, failing to meet the needs of New Engineering positions for compound talents .

Third, the intensity of teaching model innovation is insufficient. Most higher vocational colleges still adopt the traditional teaching model, with a single teaching method and insufficient attention to students' main role, which is difficult to stimulate their learning enthusiasm and innovative thinking; the practical teaching link is weak, training base construction is backward, some training bases lack a real post environment, and training content is disconnected from actual posts, making it difficult to achieve the "knowledge-practice unification" training goal.

Fourth, there are obvious shortcomings in teaching staff construction. The proportion of "double-qualified" teachers is low, some teachers lack enterprise practical experience, their professional skills are disconnected from industry technology development, and they are difficult to be competent for job competence-oriented teaching; teachers' innovative teaching ability is insufficient, making it difficult to adapt to the requirements of new teaching models; enterprise technical backbones have low enthusiasm to participate in teaching, and the school-enterprise collaborative education mechanism is not perfect.

Fifth, the evaluation system is not scientific and reasonable. The traditional higher vocational education evaluation system mainly relies on theoretical examinations and skill assessments, focusing on evaluating students' knowledge and skills, while ignoring the evaluation of core job competence dimensions such as innovation ability, professional literacy and lifelong learning ability; the evaluation subject is relatively single, mainly based on school evaluation, lacking the participation of third-party evaluations such as enterprises and industries, and the evaluation results can hardly fully reflect students' job competence level.

Sixth, the depth of industry-education integration is insufficient. School-enterprise cooperation mostly stays at the surface level, lacking a long-term cooperation mechanism, and enterprises can hardly truly integrate into the whole talent training process; the integration of industry-education integration resources is insufficient, the resource advantages of schools and enterprises have not been fully exerted, and training bases, teaching resources and other resources have not been effectively shared, leading to insufficient effectiveness in job competence cultivation .

4. Key Research on the Reform of Higher Vocational Education Model Based on Job Competence Under the Background of New Engineering

4.1 Reform of Talent Training Objectives: Anchoring the Core Demands of Job Competence

Talent training objectives are the core of higher vocational education model reform and the premise and foundation for job competence cultivation. Under the New Engineering background, higher vocational education should be based on industrial position needs, reposition talent training objectives with job competence as the core, break the traditional single "skill-based" training orientation, and build a trinity talent training objective system of "knowledge, skills and literacy". Specifically, it is necessary to strengthen training focus in three aspects: first, focus on professional skill cultivation, ensure students master core professional knowledge and operational skills, and can skillfully use professional technology to solve practical job problems; second, highlight innovation ability cultivation, focus on cultivating students' innovative thinking, awareness and practical ability, and adapt to technological iteration and job change needs; third, strengthen professional literacy and lifelong learning ability cultivation, help students achieve sustainable development, and adapt to industrial upgrading and job transformation needs.

In view of the mixed task characteristics of the digital intelligence era, higher vocational education should break the traditional static skill training model, construct a mixed task skill map meeting position needs, focus on cultivating students' core advantage skills in handling non-routine tasks, and improve their employability [2]. Some scholars have proposed to reshape talent training specifications based on the "task-skill" analysis framework and construct a mixed task-based "new craftsman" training model to help higher vocational graduates adapt to New Engineering industrial position needs [7].

4.2 Reform of Curriculum System: Constructing a Modular System Oriented by Job Competence

As the core carrier for realizing talent training objectives, curriculum system reform should closely focus on job competence requirements, combine with New Engineering technology development trends, and construct a "position-oriented, module-integrated and dynamically updated" curriculum system. First, optimize the curriculum structure, reasonably adjust the proportion of theoretical and practical courses, ensure the proportion of practical courses is not less than 50%, and highlight practical ability cultivation; construct a modular curriculum system of "public basic courses + professional core courses + post skill courses + innovation and expansion courses", clarify the training focus of each module, and realize the coordinated cultivation of knowledge, skills and literacy. For example, in accordance with the principle of "industries decide major settings, enterprises decide curriculum systems, and employers decide talent evaluation", Chengdu Industry and Trade Vocational and Technical College has discontinued industry-disconnected majors, added emerging majors conforming to development trends, upgraded existing majors, formed a professional cluster accurately connecting with the industrial system, and optimized the curriculum system simultaneously ; Jiangsu Vocational Institute of Architectural Technology, in the New Engineering major of building intelligence, divides the curriculum system into three modules: "architectural foundation + intelligent technology + post operation", adds post skill courses such as intelligent building control system and Internet of Things technology application, deletes outdated traditional building construction courses, making the curriculum structure more in line with the competence requirements of building intelligence positions.

Second, update curriculum content, keep up with New Engineering technology development, timely integrate the latest industry technologies and job requirements into curriculum content, delete outdated knowledge, and add content related to emerging technologies such as artificial intelligence, big data and intelligent manufacturing; strengthen interdisciplinary course construction, break disciplinary barriers, set up interdisciplinary and cross-field integrated

courses, and cultivate students' interdisciplinary comprehensive ability. Based on regional advantages, Guiyang University of Health and Nursing has laid out professional clusters around the whole industrial chain of "medical treatment - health care - nursing - care - service", constructed a curriculum system covering the whole life cycle, and realized the accurate connection of "people's livelihood pain points - industrial hot spots - professional highlights" ; Guangdong Light Industry Vocational and Technical College, in the New Engineering major of industrial robot technology, has updated the curriculum content to "robot programming and debugging, industrial robot system integration, intelligent control technology", integrated the latest technical standards of enterprises such as Huawei and KUKA, and set up an interdisciplinary course of "robot fault diagnosis and innovation optimization" to cultivate students' comprehensive skills and innovation ability.

Third, promote curriculum construction standardization, formulate scientific curriculum standards in combination with job competence requirements, clarify the teaching objectives, content, methods and assessment methods of each course, and ensure accurate connection between curriculum teaching and job needs; strengthen school-enterprise co-constructed course construction, jointly develop courses with enterprises, and invite enterprise technical backbones to participate in curriculum design and teaching implementation to ensure curriculum content is consistent with actual posts .

4.3 Reform of Teaching Model: Strengthening Practice Orientation and Industry-Education Coordination

Under the New Engineering background, higher vocational teaching model reform should highlight practice orientation, strengthen industry-education coordination, and construct a "knowledge-practice unification and school-enterprise coordination" teaching model. First, promote project-based teaching, case-based teaching and flipped classroom, take real post projects and industry cases as carriers, guide students to actively participate in practical operations and innovative exploration, and improve their practical ability and practical problem-solving ability. Lanzhou Resources and Environment Vocational and Technical University has "moved" the Lanzhou National Meteorological Observatory into the campus, carried out practical teaching with real meteorological observation projects as carriers, and created a new-type classroom with "real scenes, digital intelligence integration and double-teacher teaching" ; Zhejiang Industry and Trade Vocational and Technical College, in the New Engineering major of artificial intelligence, adopts case-based teaching, selects real enterprise cases such as "intelligent customer service system development and face recognition technology application", guides students to complete case analysis, scheme design and practice implementation in groups, effectively improving their post operation ability and innovative thinking.

Second, improve the practical teaching system, construct a three-level practical teaching system of "on-campus training + enterprise internship + on-the-job internship", clarify the training focus of each link, and realize in-depth integration of practical teaching and post reality; strengthen training base construction, co-construct on-campus and off-campus training bases with enterprises, create a real post environment, and improve practical teaching effectiveness. Chongqing Industry Polytechnic College has co-constructed a new energy vehicle training base with Chongqing Changan Automobile, introduced the enterprise's latest new energy vehicle production equipment and projects, allowed students to complete training in the real production scene, mastered core position-required skills, and quickly adapted to enterprise positions after graduation.

Third, promote intelligent teaching reform, use artificial intelligence, big data and other technologies to build an intelligent teaching platform, realize personalized push of teaching content, real-time monitoring of teaching process and precise teaching evaluation, and improve teaching efficiency and quality; introduce virtual simulation technology, construct virtual training scenes, make up for the shortage of real training bases, reduce training costs, and improve students' practical operation ability. As emphasized by the National Joint Conference of Presidents of Higher Vocational

Schools, digital intelligence is the "new engine" driving the transformation of higher vocational education form and capacity improvement, and we should actively embrace the digital intelligence wave to build a new intelligent teaching ecology .

4.4 Reform of Teaching Staff: Building a "Double-Qualified" Team Adaptable to the Cultivation of Job Competence

The teaching staff is the core support for higher vocational education model reform and the key guarantee for job competence cultivation. Under the New Engineering background, higher vocational teaching staff construction should focus on "double-qualified" team cultivation, improve teachers' practical ability, innovation ability and teaching ability, and build a "school-enterprise collaborative, reasonably structured and high-quality" teaching staff. First, strengthen "double-qualified" teacher training, establish a teacher practical training mechanism, organize teachers to receive on-the-job training in New Engineering-related enterprises and participate in enterprise project R&D, so as to improve their practical ability and professional skills; encourage teachers to obtain industry vocational qualification certificates to enhance their professional ability; strengthen teachers' innovation ability training, organize them to participate in innovative teaching seminars and academic exchanges, and improve their innovative teaching ability. Chengdu Industry and Trade Vocational and Technical College dispatches faculty and staff to work full-time in industrial park service stations, which not only collects enterprise needs, but also improves teachers' practical ability ; Hunan Industry Polytechnic College organizes intelligent manufacturing major teachers to receive on-the-job training in enterprises such as Sany Heavy Industry and Zoomlion Heavy Industry, participates in enterprise intelligent production line transformation projects, and teachers' practical ability has been significantly improved. After returning to school, they integrate enterprise actual projects into teaching, improving teaching pertinence and effectiveness.

Second, optimize the teaching staff structure, introduce enterprise technical backbones and industry experts as part-time teachers to enrich the teaching staff and make up for the lack of full-time teachers' practical ability; reasonably adjust the age, title and professional structure of teachers to build an echelon-structured teaching staff; strengthen interdisciplinary teacher training, encourage teachers to learn and teach across majors, and improve their interdisciplinary comprehensive ability.

Third, establish a teacher incentive mechanism for school-enterprise collaborative education, encourage teachers to participate in school-enterprise cooperation projects, co-constructed courses and training base construction, and provide corresponding rewards and support; improve the teacher evaluation system, include practical ability, participation in school-enterprise cooperation and innovative teaching achievements into teacher evaluation indicators, and stimulate teachers' work enthusiasm and initiative . At the same time, based on the concept of industry-education integration community of destiny, promote two-way flow of school-enterprise teachers, establish a mutual appointment and part-time mechanism between teachers and enterprise technical backbones, and realize teacher resource sharing and win-win .

4.5 Reform of Teaching Staff: Building a "Double-Qualified" Team Adaptable to the Cultivation of Job Competence

Evaluation system reform is an important means to promote job competence cultivation. Under the New Engineering background, higher vocational education should break the limitations of the traditional evaluation system and construct a "diversified, process-oriented and three-dimensional" evaluation system oriented by job competence. First, improve evaluation content, break the single "knowledge + skills" evaluation model, include core job competence dimensions such as innovation ability, professional literacy and lifelong learning ability into the evaluation scope, and realize comprehensive evaluation of students' comprehensive ability. Combined with the requirements of the mixed task skill map, add non-routine task skill evaluation content, focusing on evaluating students' comprehensive ability to handle complex post tasks .

Second, innovate evaluation methods, implement the combination of process-oriented evaluation and summative evaluation. Process-oriented evaluation focuses on evaluating students' learning process, practical operation and innovative exploration, while summative evaluation focuses on comprehensive assessment of students' job competence; adopt diversified evaluation methods such as practical assessment, project defense, enterprise evaluation and industry certification to improve evaluation pertinence and effectiveness.

Third, expand evaluation subjects, break the limitation of single school evaluation, introduce third-party evaluation subjects such as enterprises, industries and society, let enterprises deeply participate in the evaluation of students' job competence, and ensure evaluation results can truly reflect students' post adaptability and actual level. Chengdu Industry and Trade Vocational and Technical College has established the talent evaluation principle of "employers have the final say", and incorporated enterprise evaluation into the talent training evaluation system ; Shanghai Electronic Information Vocational and Technical College, in the New Engineering major of big data, invites technical backbones of enterprises such as Alibaba and Baidu to participate in the evaluation of students' on-the-job internship and project defense, score from the dimensions of post operation ability, cooperation ability and innovation ability, and the evaluation results are directly used as an important basis for students' graduation assessment, effectively improving the fit between talent training and job needs.

Fourth, establish an evaluation feedback mechanism, timely collect evaluation results, analyze problems in the talent training process, and optimize the talent training plan, curriculum system and teaching model in a targeted manner, forming a "evaluation - feedback - improvement" closed-loop mechanism to continuously improve talent training quality.

4.6 Reform of Industry-Education Integration: Constructing a Long-Term Mechanism for School-Enterprise Collaborative Education

Industry-education integration is the core path for higher vocational education model reform under the New Engineering background and a key measure to improve students' job competence. We should deepen school-enterprise coordination, construct a long-term mechanism of "school-enterprise cooperation, industry-education integration and collaborative education", and realize in-depth integration and win-win cooperation between education and industry. First, construct a school-enterprise community of destiny, promote in-depth school-enterprise cooperation, let enterprises participate in the whole talent training process, including talent training plan formulation, curriculum design, teaching implementation, practical training and evaluation, to ensure accurate connection between talent training and job needs. Chengdu Industry and Trade Vocational and Technical College has constructed the "Chengdu Industry and Trade Model" of "school-enterprise community of destiny", co-constructed service stations with industrial parks, embedded in the regional industrial system layout, and realized in-depth symbiosis and win-win of industry-education integration ; Anhui Vocational and Technical College has co-constructed an intelligent manufacturing industry college with Chery Automobile. Enterprises participate in the whole talent training process, jointly formulate training plans, co-construct courses and dispatch teachers. Students participate in enterprise production projects during their studies and directly take up jobs after graduation, with greatly improved job competence, achieving mutual benefit and win-win between schools and enterprises.

Second, strengthen co-construction and sharing of training bases, jointly build on-campus and off-campus training bases with enterprises, introduce enterprise production projects, let students carry out practical operations in the real production scene, and improve their post operation ability and post adaptability. Lanzhou Resources and Environment Vocational and Technical University has co-constructed an intelligent meteorological industry-education integration practice center with the Provincial Meteorological Bureau, realizing seamless connection between training scenes and post reality .

Third, promote innovation of industry-education integration education models, implement modern apprenticeship, order-based training and directional employment, let students learn and practice under the guidance of enterprise masters, and improve their job competence; carry out school-enterprise cooperation project R&D, encourage students to participate in enterprise technological innovation and product R&D, and improve their innovation ability and practical problem-solving ability. At the same time, improve policy guarantees for industry-education integration. The government should strengthen policy guidance and support, issue relevant preferential policies to encourage enterprises to participate in industry-education integration; establish an industry-education integration evaluation mechanism to promote continuous deepening of school-enterprise cooperation; strengthen integration of industry-education integration resources, build a school-enterprise cooperation platform, and promote resource connection and advantage complementarity between schools and enterprises.

5. Deficiencies of Existing Research and Future Research Trends

5.1 Deficiencies of Existing Research

Although domestic scholars have conducted extensive research on higher vocational education model reform based on job competence under the New Engineering background, forming rich research results, there are still many weak links based on existing literature analysis: first, insufficient practical research. Most studies stay at the theoretical discussion level, and the proposed reform paths lack specific practical case support, with poor operability; some practical case studies are not in-depth enough, failing to summarize replicable and promotable practical experience. Second, single research perspective. Most studies focus on reform in a single field such as curriculum system and teaching model, lacking systematic research on the higher vocational education model, and failing to construct an all-round and multi-level reform system.

Third, insufficient in-depth research on job competence. Most studies only clarify the core dimensions of job competence, but lack accurate investigation and analysis on the job competence requirements of different New Engineering majors and positions, leading to lack of pertinence of reform paths; research on the construction and application of mixed task skill maps is insufficient, which can hardly adapt to the mixed task post characteristics in the digital intelligence era . Fourth, insufficient in-depth research on industry-education integration. Most studies focus on the surface level of school-enterprise cooperation, and insufficient research on key issues such as long-term industry-education integration mechanism construction, school-enterprise interest distribution mechanism and enterprise participation in talent training incentive mechanism, leading to difficulties in continuous deepening of industry-education integration . Fifth, lack of research foresight, insufficient prediction of New Engineering technology development trends and job competence change trends, which can hardly adapt to the needs of future industrial development and talent training.

5.2 Future Research Trends

Combined with New Engineering development trends and the actual situation of higher vocational education reform, future related research will show the following development directions: first, strengthen practical research, focus on specific New Engineering majors and positions, carry out targeted reform practices, summarize replicable and promotable practical experience, and improve research operability; strengthen practical application research of mixed task skill maps, and construct a skill training system meeting position needs . Second, strengthen systematic research, construct an all-round and multi-level higher vocational education model reform system from multiple dimensions such as talent training objectives, curriculum system, teaching model, teaching staff, evaluation system and industry-education integration, and realize coordinated promotion of reforms in various fields.

Third, deepen job competence research, strengthen accurate investigation and analysis of job competence of different New Engineering majors and positions, construct personalized job competence models, clarify the mixed task skill requirements of each position, and optimize the talent training plan . Fourth, deepen industry-education integration research, focus on long-term industry-education integration mechanism construction, conduct in-depth research on key issues such as school-enterprise interest distribution mechanism and enterprise participation in talent training incentive mechanism, and promote industry-education integration towards in-depth and long-term development; explore new industry-education integration models and paths based on the mechanism coupling between New Engineering and industry-education integration .

Fifth, enhance research foresight, closely track New Engineering technology development trends, predict job competence change trends, lay out education model reform in advance, and cultivate technical and skilled talents adapting to future industrial development; strengthen interdisciplinary research, integrate multi-disciplinary theories such as education, economics and engineering, and improve research depth and breadth. Sixth, strengthen regional research, combine the development characteristics of New Engineering industries in different regions, explore regional characteristic higher vocational education model reform paths, and support regional industrial transformation and upgrading and high-quality development.

6. Conclusion

Under the New Engineering background, promoting higher vocational education model reform based on job competence is an inevitable choice for higher vocational education to adapt to industrial development and improve talent training quality, and also an important support for promoting the sustainable and healthy development of New Engineering industries. There is a high degree of adaptability between New Engineering and higher vocational job competence cultivation. The two have profound internal connections in theory, practice and functional value, and their in-depth coupling can promote win-win cooperation between education and industry .

At present, China's higher vocational education model reform has achieved initial results in talent training objectives, curriculum system, teaching model and teaching staff, but there are still problems such as inaccurate talent training objectives, backward curriculum system, insufficient teaching model innovation, weak teaching staff, unscientific evaluation system and insufficient industry-education integration depth, which can hardly fully adapt to the job competence training requirements under the New Engineering background. Domestic scholars have put forward a series of targeted reform ideas and practical paths around six core fields: talent training objectives, curriculum system, teaching model, teaching staff, evaluation system and industry-education integration, providing theoretical reference and practical guidance for higher vocational education model reform.

Existing research still has problems such as weak practical research, single research perspective, insufficient in-depth research on job competence and industry-education integration, and lack of foresight. In the future, relevant research should strengthen practical and systematic research, deepen job competence and industry-education integration research, enhance research foresight and regionalization, continuously improve the higher vocational education model reform system, promote high-quality development of higher vocational education, cultivate more high-quality technical and skilled talents meeting New Engineering industry needs, and provide strong talent support for China's new round of technological revolution and industrial transformation.

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