

Research and Practice on the Path of Improving the Teacher's Ability and Quality of Electronic and Information Innovation Teams in Higher Vocational Education under the Background of Digital Transformation

Chunxiu Xu^{1*}, Min Ding¹, Jing Chen¹

¹ Shandong Labor Vocational and Technical College, Jinan, China

Email Address

59407418@qq.com (Chunxiu Xu)

*Correspondence: 59407418@qq.com

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Abstract:

Under the background of digital and intelligent transformation, improving the ability and quality of teachers in the innovation teams of electronics and information majors in higher vocational education is the core task for the high-quality development of vocational education. This article constructs a competency and quality model for team teachers with the framework of “five dimensions, three levels, and N items”, plans and implements a five-dimensional improvement path featuring “pioneering leadership, empowerment, quality enhancement, efficiency improvement, and wisdom cultivation”, explores a “five-dimensional and multi-element” evaluation system, and conducts research and practice on the path to improve the ability and quality of teachers in the innovation teams of electronics and information majors. The research findings show that this path can significantly enhance the comprehensive ability and quality of team teachers, providing theoretical support and practical reference for the construction of vocational education teacher teams and the cultivation of talents suitable for the industry.

Keywords:

Digital-intelligent Transformation, Electronics and Information Specialties, Teachers' Competency and Literacy, Enhancement Pathway

1. Introduction

With the rapid development of information technology and AI technology, the digital transformation of education has become a strategic task for building a digital China and an education powerhouse. The report of the 20th National Congress of the Communist Party of China emphasizes the promotion of digitalization in education, and as a key force, teachers urgently need to reconstruct their professional

competence framework to meet the needs of the times. The construction of innovative teams for vocational education teachers is an important lever for deepening the reform of the “dual teacher” team [1]. Since 2019, 511 national level teams have been selected nationwide. The software technology innovation team of Shandong Vocational and Technical College of Labor has been upgraded step by step since 2018, and has successively been awarded as an excellent teaching team in Shandong Province, a Huang Danian style team, and a provincial-level teaching innovation team. In 2023, it was successfully selected as a national level vocational education teacher innovation team. Through years of practice, we have explored a path for improving the abilities and qualities of teachers in electronic and information innovation teams, and created a high-quality “dual teacher” teaching team that effectively supports the cultivation of high-quality skilled talents required for new productivity. This provides a reference paradigm for the digital transformation of vocational education teachers.

2. New Requirements for the Competence and Quality of Teachers in the Electronic and Information Innovation Teams of Vocational Colleges in the Context of Digital Transformation

2.1. Policy orientation and the needs of the times

Driven by the digital transformation and the strategy of building a strong education country, the upgrading of vocational education teachers' abilities has become the key to supporting the high-quality development of education. As the forefront field of technological iteration, electronic and information majors urgently need to solve the contradictions between technological innovation and teaching lag, as well as the disconnect between industry and education in the era of “artificial intelligence+” [2]. At the policy level, it is emphasized that “dual teacher” teachers need to possess the abilities of technology integration, data-driven, and interdisciplinary integration; At the practical level, industrial digital intelligence has led to new posts such as intelligent hardware development and industrial Internet operation and maintenance, which forces teachers to master new technologies such as artificial intelligence and big data, and transform technological logic into teaching resources [3]. Therefore, it is urgent to establish a closed-loop teacher capability system of “technology tracking industry transformation teaching innovation”, promote the deep integration of education chain, talent chain and industry chain, and provide core support for cultivating high-quality skilled talents needed for new quality productivity.

2.2. Problems in the abilities and qualities of teachers in electronic and information innovation teams under the background of digital transformation

Through literature analysis, empirical research, and team building practices, it has been found that there is still a significant gap between the abilities and qualities of teachers in the electronic and information innovation teams in higher vocational education and policy requirements, as well as industry demand. Firstly, under the background of digital transformation, the abilities and qualities that vocational college electronic and information innovation team teachers should possess are unclear, which fails to timely reflect the latest development requirements of vocational education and digital transformation for teachers; Secondly, teacher training often focuses on individual teacher development, and the cultivation of teachers' collaborative innovation ability is insufficient, making it difficult to form an effective team development synergy; Thirdly, teachers lack innovative awareness of empowering

education and teaching with information technology, and their digital literacy needs to be improved; Fourthly, the degree of integration between teachers and enterprises is not deep, and the growth of teachers' abilities lacks support from industry university research cooperation. The professional and curriculum construction of teachers cannot match the needs of industrial development and enterprise digital transformation. The technical research and social service capabilities that "dual teacher" quality teachers should possess still need to be further improved.

3. The Path to Improving the Ability and Quality of Innovative Team Teachers

3.1. Building a "Five dimensional, Three layered, N item" Teacher Competency Model for Electronic and Information Innovation Teams under the Background of Digital Transformation

This study is based on the three-level coding framework of grounded theory, and constructs a core competency model for teachers in electronic and information innovation teams through systematic data deconstruction and theoretical abstraction. The study adopted a multi-source data triangulation strategy, integrating policy texts such as the "Dual Teacher Teacher Standards for Vocational Education", in-depth interview records of 25 expert teachers, CSSCI literature from the past five years, and national innovation team practice cases. A teacher competency model was constructed, which includes five dimensions of professional competence, digital literacy, professional construction and teaching ability, service ability, and collaborative innovation ability, a three-tier structure, and N competency elements. This model provides theoretical basis and practical reference for planning the path of team teacher competency improvement.

3.2. Plan and implement a five dimensional improvement path for teachers' abilities and qualities

Based on the "Five Dimensions, Three Layers, and N Items" teacher competency model, relying on the practice of building innovative teams for national vocational education teachers, and based on the concept of "collaborative innovation and symbiotic growth", focusing on the needs of digital transformation, and collaborating with chain leading enterprises and regional enterprises, a diversified collaborative support platform is constructed, including "training and exchange, competition and education integration, scientific research services, and international exchanges". Focusing on the improvement of teachers' abilities, exploring the five stage teacher growth path of young teachers being able to step onto the podium, backbone teachers standing firm on the podium, professional leaders being able to study and teach well, famous teachers and craftsmen being skilled, and leading figures being authoritative [4]. By implementing the five major projects of "leading, wise, efficient, integrated, and quality-oriented" through "Party building guidance, cultural education", "government school enterprise operation, building carriers", "industry education integration, curriculum reconstruction", "module reform, resource development", and "cross domain collaboration, technology empowerment", a "hierarchical classification, precise cultivation" mechanism is formed to comprehensively enhance the dual teacher ability of teachers and forge an excellent dual teacher team. (Figure 1)

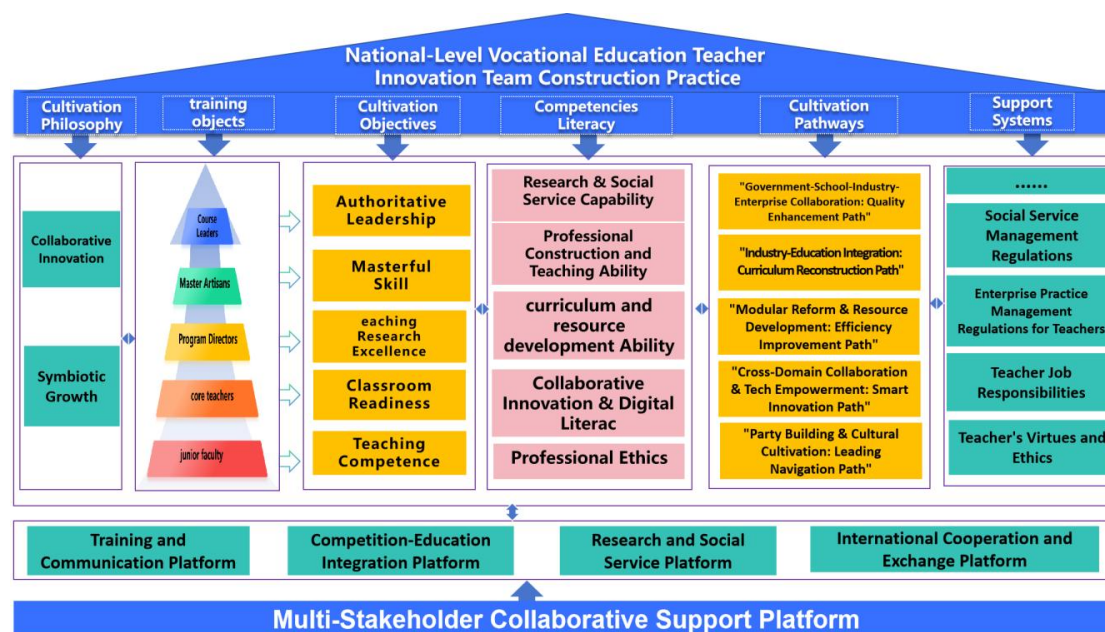


Figure 1. Five dimensional improvement path for teachers' abilities and qualities.

3.2.1. “Party Building Leading, Cultural Cultivation” - Path of Leading Professional Literacy

Give full play to the leading role of the team’s “National University 'Double Leaders' Faculty Party Branch Secretary Studio”, adhere to political learning and party building activities, and create a party building brand of “Craftsmanship to the Party, Information to the Country”. By carrying out party building activities, strengthening teachers’ political awareness, and improving their professional ethics and style. At the same time, led by the national level vocational education teacher innovation team, we aim to create a team culture of collaborative innovation and open sharing [5]. Carry out a series of activities around the spirit of educators, guide teachers to integrate it into teaching practice, unite team strength through culture, and enhance teachers’ professional ethics.

3.2.2. “Cross domain collaboration and technological empowerment” - a wise path for collaborative innovation and digital literacy

Taking digital transformation as the driving force and relying on the four party linkage mechanism of “government, school, industry, and enterprise”, we will build a cross regional, cross disciplinary, and cross professional collaborative innovation ecosystem. Collaborate with leading enterprises in the industry chain, regional benchmark enterprises, and high-level universities to establish a three-level carrier platform of “Technology Research and Development Center Industry College Digital Teaching Workshop”. Through a collaborative model of “project co research, talent co education, resource co construction, and achievement sharing”, promote the iterative upgrading of teachers' digital capabilities.

3.2.3. “Module Reform and Resource Development” - Course and Resource Development Efficiency Enhancement Path

Based on the job competency map, we will construct a four tiered modular curriculum system consisting of “basic skills, specialized skills, comprehensive practice, and innovative expansion”. We will dynamically integrate AI, 5G, and other

industrial technology iterations, deeply integrate skill competition standards and 1+X certificate requirements, and achieve the integration of “job course competition certificate”. With the help of information technology teaching platforms, we collaborate with leading enterprises and universities to jointly build a virtual real integration resource library, develop digital teaching materials and other teaching resources, and form an ecological loop of “dynamic adaptation of courses to industries, continuous iteration and growth of resources”, injecting new momentum into improving the quality and efficiency of vocational education.

3.2.4. “Integration of Industry and Education, Refactoring Curriculum” - Path to Integration of Professional Construction and Teaching Capability

Based on the provincial-level skill master studio and on-site engineer special training program project, implement the school enterprise joint talent cultivation model. Refactoring the curriculum system, setting course modules according to industry needs and professional standards, and implementing modular teaching. Enhance teachers’ professional development capabilities through specialized training, academic exchanges, and other means, so that they can keep up with the dynamic development of the industry and optimize their professional settings. Enhance teachers’ curriculum development capabilities through the construction of virtual teaching and research rooms and teaching resource libraries. Carry out activities such as “grinding, speaking, and evaluating”, implement the “mentorship and guidance” project, and organize teacher enterprise practice exercises to enhance teachers’ teaching implementation capabilities.

3.2.5. “Government, schools, enterprises, building carriers” - Path to improving research and service capabilities

The joint construction of new technology research and development centers, collaborative innovation centers, skill master studios and other platforms by schools and enterprises provides conditions for teachers to carry out new technology research, enhance scientific research innovation and technical service capabilities. Teachers participate in the analysis of enterprise digital transformation needs and the formulation of implementation plans to assist small and medium-sized enterprises in digital upgrading. Improve the vocational training system, create a training center that integrates industry and education, and combine technological innovation with training. Carry out community services, establish community courses, and enhance teachers’ social service capabilities. Participate in vocational education “precision” service “going global” projects to enhance teachers’ international service capabilities.

3.3. Exploring the “Five Dimensional and Multivariate” Evaluation System for Teachers’ Ability and Quality in Innovative Teams

Breaking the traditional results oriented evaluation method, implementing the “teacher teaching portfolio” system, determining the five dimensional evaluation indicators of teachers’ digital literacy, professional competence, professional construction and teaching ability, service ability, and collaborative innovation ability, implementing self, student, expert, peer and other multiple subject evaluations, and forming a “five dimensional and diverse” team teacher evaluation system [6]. With the help of the national innovation team project management system and the college information platform, we consider the micro level achievement of student training quality, teacher personal cycle development goals, incremental ability quality, and the

overall achievement of team development goals. Based on the evaluation data, verify the scientificity of the teacher competency model and the effectiveness of the improvement path.

4. Guarantee Measures

To ensure the effective training of innovative team teachers' abilities and systematically solve the difficulties of mechanism connection and resource coordination in team building, it is necessary to establish a four in one guarantee system of "organization system condition evaluation". In terms of organizational support, a dual team leader responsibility system consisting of the Party Secretary and the Dean will be implemented. A government school enterprise collaborative special team will be established to coordinate top-level design, and a three-level innovation team will be built based on the Teacher Development Center. The training of "dual teacher" teachers will be included in the plan; Institutional safeguards include revising the "Teacher Development Standards" and "Team Management Measures" to establish a comprehensive management system covering the entire chain of teacher career development, team operation, and fund utilization; Special funds for team building need to be established to ensure conditions, and a budget approval and dynamic allocation mechanism under the project leader system should be implemented; The performance evaluation implements the "PDCA cycle" management, refines the task book of 37 construction indicators, establishes a three-dimensional evaluation system of daily "monitoring+dynamic assessment+expert diagnosis", realizes process visualization control through the quality diagnosis and improvement platform, and links the evaluation results with resource allocation [7]. The four major measures form a closed-loop mechanism of "decision-making coordination institutional norms resource empowerment evaluation optimization", focusing on precise allocation of special funds, deep integration of school enterprise resources, and scientific adjustment of performance leverage, to build a sustainable development ecosystem for teaching innovation teams.

5. Conclusions

Under the background of digital transformation, the software technology teaching team of Shandong Labor Vocational and Technical College has achieved dual breakthroughs in teacher team construction and talent cultivation quality by constructing a four in one teacher capability development system of "model construction path innovation diagnosis and reform drive ecological empowerment". The team has formed a dual teacher structure of "leading teachers+industry leaders+professional and part-time combination", and has been awarded 7 national titles such as National Teacher Teaching Innovation Team. It has cultivated 2 national teaching teachers, 1 national technical expert, and 18 provincial teachers and technical experts. The teacher teaching competition has won 36 awards at or above the provincial level. Focusing on the "Three Education" reform, we have developed 2 national level online quality courses, 7 international (national) teaching standards, won 14 awards including the first prize of provincial teaching achievements, published 28 new forms of textbooks, and obtained 11 invention patents. The talent cultivation has achieved remarkable results, with 205 awards in the student skills competition (including 20 in the Chinese competition), 74 titles such as National Technical Expert, a certificate acquisition rate of 96.8%, and an employment rate of 97.42%. Practice has proven that this system effectively solves the problem of

improving the abilities of vocational education teachers through the construction of capability models, innovative training paths, closed-loop quality diagnosis and reform, and empowering the production and education ecology. It provides a replicable paradigm for the construction of vocational college teaching staff and strongly supports the cultivation of high-quality skilled talents in the digital age, with important promotion value.

Conflicts of Interest

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

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