Digital Empowerment and Vocational Teacher Capacity Building under the Rural Revitalization Strategy: An Empirical Study and Three-Stage Progressive Model

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Abstract:During the "14th Five-Year Plan" period of China, vocational education has been further established as a core element supporting the implementation of the rural revitalization strategy. Concurrently, with the advanced development of artificial intelligence technology, the empowerment of vocational education development via digital means has emerged as a critical factor driving the vocational education teaching workforce toward professionalism, precision, and innovation-oriented development.To further investigate and analyze digital empowerment technologies and the construction of vocational teachers' competency teams under the rural revitalization strategy, this study takes the vocational education teacher training programs in 46 key assistance counties (formerly key poverty-alleviation counties) of Shanxi Province as the empirical research objects. It comprehensively adopts methodologies including questionnaire survey, in-depth interview, and quantitative data analysis to systematically examine the competency structure, training demand characteristics, and professional development improvement paths of vocational education teachers in China against the backdrop of the rural revitalization strategy.The research findings indicate that three inadequacies exist in the current competency development and training system of vocational education teachers in China. First, vocational education teachers demonstrate significant deficiencies in digital teaching competency and the ability to align with the needs of rural industries. This is primarily manifested in the insufficient current capacity for developing digital teaching resources, the relatively weak capability in designing school-enterprise cooperative teaching projects, and the difficulty in supporting the further development of regional rural industries at the present stage. Second, the existing teacher training system is disconnected from practical development. The current training focuses more on the dissemination of traditional theoretical knowledge, while the integration of practical links that can support the development of key rural industries remains relatively inadequate. Third, the application of digital technology in the existing vocational education teacher training system has not yet formed a systematic framework, and the scenarios of digital technology empowerment for rural supporting industries in the respective regions require further expansion. Additionally, further research and analysis reveal that the digital empowerment of vocational education teacher teams can be further enhanced through a three-stage development mechanism of "cognitive enlightenment - resource development - integration of industry, academia, and research". This development mechanism can further reconstruct the traditional teacher training system, thereby realizing the precision-oriented development of teachers' competencies. Accordingly, this study proposes a three-stage progressive model for improving teachers' competencies through digital empowerment. This model divides the competency development of vocational teachers into three phases: "digital cognitive enlightenment phase - localized teaching resource development phase - in-depth integration and application phase of industry, academia, and research". These three phases exhibit a sequential development trend in teachers' competency development and realize a closed-loop competency improvement path throughout the entire

vocational education career. The construction of the three-stage development model for vocational education teachers provides new insights and practical guidance for further optimizing the vocational education teacher training system in rural areas of China, enhancing the capacity of vocational education to serve regional industries, and promoting the high-quality development of vocational education.

Keywords: Rural Revitalization; Vocational Education; Digitalization

1. Introduction

With the comprehensive implementation of the Rural Revitalization Strategy, vocational education has been endowed with a new developmental mission in the contemporary era. Meanwhile, benefiting from the further advancement of digital technologies, vocational education is also regarded as a strategic supporting element in the aspect of rural talent cultivation. For this purpose, the Action Plan for Improving the Quality and Excellence of Vocational Education (2020-2023), jointly issued by the Ministry of Education and eight other ministries, further clarifies and proposes that "efforts should be made to build a high-quality and interdisciplinary teaching team, and promote digital empowerment in teachers' development".In the digital age, optimizing the capacity structure of traditional vocational education teachers and further advancing the role of vocational education in empowering the transformation and upgrading of regional industries have become key links in the development of the Rural Revitalization Strategy (Chen, 2024). However, the traditional vocational education model, especially in the fields of agriculture, humanities, commerce and trade, still relies on theoretical education, which makes it difficult to meet the development needs of the digital age and the contemporary mission of industry-education integration. Particularly in the context of extensive rural education, the current vocational education often has deficiencies in aspects such as digital literacy, industry-university-research cooperation projects, and support for the transformation and upgrading of regional industries (Yu, 2024).Thus, under the framework of digital empowerment, how to construct a teacher capacity enhancement pathway that aligns with the objectives of rural revitalization has become an essential issue in the ongoing reform of vocational education.

Based on empirical data collected from the Vocational Education Rural Revitalization Program in Shanxi Province, this paper explores the pathways and mechanisms for improving vocational teachers' competencies under digital empowerment. The analysis proceeds from four dimensions—teachers' current ability status, training needs, teaching resource development, and training model innovation—to provide both theoretical and practical insights into strengthening vocational teacher development in the digital era.

2. Research Design and Methods

2.1 Research Objects and Scope

This study selected 46 key poverty-alleviation counties in Shanxi Province as the survey area, covering more than 20 secondary and higher vocational institutions. A total of 350 valid teacher questionnaires were collected. The teacher sample primarily comprised professionals from agriculture-related, e-commerce, cultural tourism, and business disciplines. Among them, 62 were from agricultural specialties (18%), 84 from cultural tourism (24%), and 56 from business and finance (28%).

2.2 Research Methods

To ensure data comprehensiveness and the scientific validity of conclusions, this study employed multiple research methods.First of all, through field investigation, the research team conducted in-depth visits and interviews at several vocational institutions and enterprises to gain a holistic understanding of teachers' practical challenges and behavioral characteristics in digital teaching and industry-education integration.Secondly, using a questionnaire survey, a structured instrument was designed around key indicators such as training content, competency needs, and preferred learning formats, systematically gathering teachers' authentic needs and attitudes toward professional development.Finally, through on-site interviews with enterprise experts and data analysis of 350 valid questionnaires, the problems and core competency gaps in the current stage of teacher training were identified, providing a practical

basis for building an implementation path model.

3. Survey Data Statistics and Analysis

3.1 Basic Information Statistics

3.1.1 Distribution by Institution

This survey focuses primarily on secondary vocational colleges and higher vocational colleges in Shanxi Province. Among them, there are 196 teachers from secondary vocational colleges, accounting for 56%; and 154 teachers from higher vocational colleges, accounting for 44%. This is consistent with the overall distribution ratio of vocational education institutions in Shanxi Province, indicating that the survey sample is representative.

3.1.2Distribution of Teaching Seniority

Figure 1. Length of Teaching Experience Distribution

In terms of teaching seniority, teachers with "4-10 years" of experience account for the highest proportion, totaling 150 people, representing 43%; followed by teachers with "11-20 years" of experience, totaling 102 people, accounting for 29%; young teachers with "3 years or less" of experience number 66, making up 19%; and senior teachers with "more than 20 years" of experience are 32, accounting for 9%. It can be seen that the survey sample is mainly composed of middle-aged and young teachers, who have both teaching experience and the need for ability improvement, which is highly consistent with the target audience of the training.

3.1.3Distribution of Professional Fields

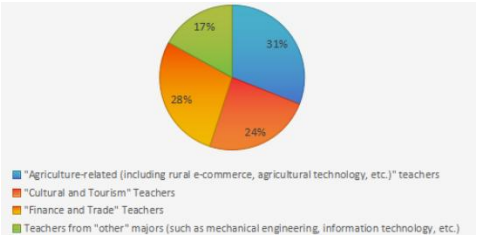

Figure 2. Distribution of Professional Fields

Among the professional fields taught by teachers, there are 108 teachers in "agricultural-related fields (including rural e-commerce, agricultural technology, etc.), accounting for 31%; 84 teachers in "cultural and tourism fields", accounting for 24%; 98 teachers in "finance and business fields", accounting for 28%; and 60 teachers in "other" fields (such as machinery, information technology, etc.), accounting for 17%. These fields cover the core related majors in the training plan and can accurately reflect the adaptability of each module content.

3.2 Analysis of Vocational School Teachers' Comprehension Level, Core Training Needs, and Weak Competencies

3.2.1Distribution of Training Understanding Level

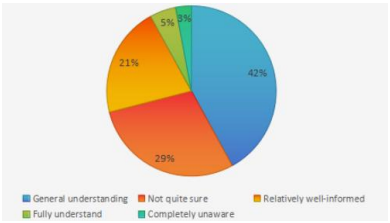

Figure 3. Training Awareness Level

In terms of the level of understanding of "the cutting-edge policies of the Rural Revitalization Strategy", teachers with "average" understanding account for the highest proportion, totaling 147 people, representing 42%; followed by 102 teachers with "little understanding", accounting for 29%; 74 teachers with "relatively good understanding", making up 21%; and a small number of teachers with "very good understanding" and "complete lack of understanding", which are 17 people (5%) and 10 people (3%) respectively. The overall cognitive level is relatively low, and it is necessary to strengthen the interpretation of policies and plans before the training.

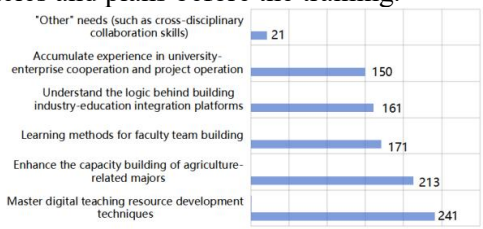

Figure 4. Core Competency Development

The core training needs show a diversified distribution. Among them, the demand for "mastering digital teaching resource development skills" is the highest, with 241 people choosing it, accounting for 69%; followed by "improving agricultural-related professional construction capabilities", with 213 people (61%); "learning methods for faculty

team building" with 171 people (49%); "understanding the logic of industry-education integration platform construction" with 161 people (46%); "accumulating experience in school-enterprise cooperation and project operation" with 150 people (43%); and "other" needs (such as interdisciplinary collaboration skills) with 21 people (6%). This reflects that teachers have the most concentrated demands on "digital teaching resources empowering regional industrial structure transformation and development direction" and "professional construction adapting to rural needs direction".

3.2.2 Data Survey and Analysis of Vocational College Teachers' Competence

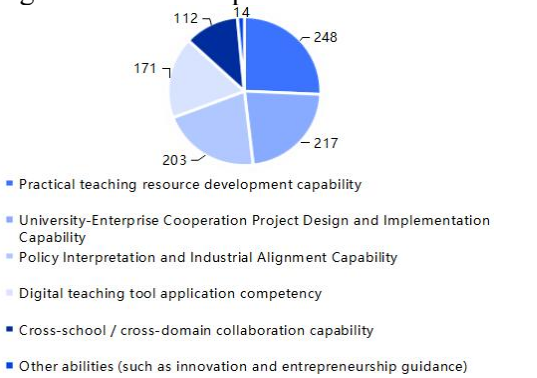

Figure 5. Data Survey and Analysis of Vocational College Teachers' Competence

Regarding the most deficient competencies of current teachers in teaching for rural revitalization, "practical teaching resource development ability" accounts for the highest proportion, with 248 teachers selecting it, representing 71%; followed by "school-enterprise cooperation project design and implementation ability" chosen by 217 teachers (62%); "policy interpretation and industry docking ability" selected by 203 teachers (58%); "digital teaching tool application ability" chosen by 171 teachers (49%); "inter-school/inter-field collaboration ability" selected by 112 teachers (32%); and "other" abilities (such as innovation and entrepreneurship guidance) chosen by 14 teachers (4%). This corresponds with the core training needs, indicating the necessity to strengthen practical content in each module.

3.3 Data Analysis on the Training Direction, Class Hour Allocation, and Empowerment of Regional Industrial Structure Transformation for Teachers in Secondary and Higher Vocational Schools

3.3.1Data Survey and Analysis of Training Direction for Secondary and Higher Vocational College Teachers

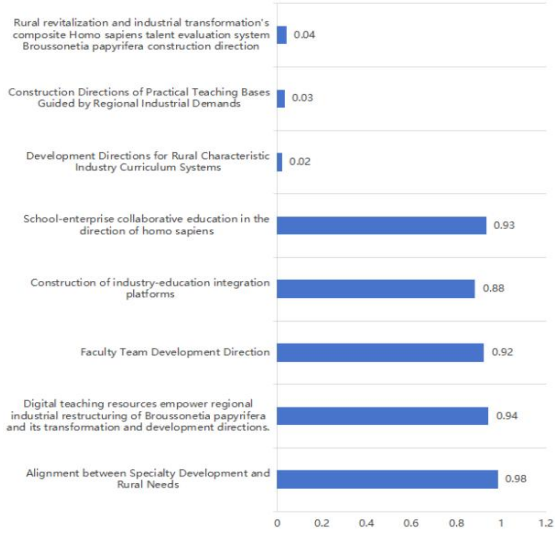

Figure 6. Data Survey and Analysis of Training Direction for Secondary and Higher Vocational College Teachers

Regarding the "professional construction aligned with rural needs direction", 343 teachers selected it, accounting for 98%; "digital teaching resources empowering regional industrial structure transformation and development direction" was chosen by 329 teachers, representing 94%; "faculty team building direction" by 322 teachers, accounting for 92%; "industry-education integration platform construction" by 308 teachers, making up 88%; "school-enterprise collaborative education direction" by 325 teachers, accounting for 93%; "rural characteristic industry curriculum system development direction" by 7 teachers, representing 2%; "regional industry demand-oriented practical teaching base construction direction" by 10 teachers, accounting for 3%; and "rural revitalization and industrial transformation compound talent evaluation system construction direction" by 14 teachers, making up 4%.

3.3.2Data Survey and Analysis of Class Hour Allocation for Secondary and Higher Vocational College Teachers' Training

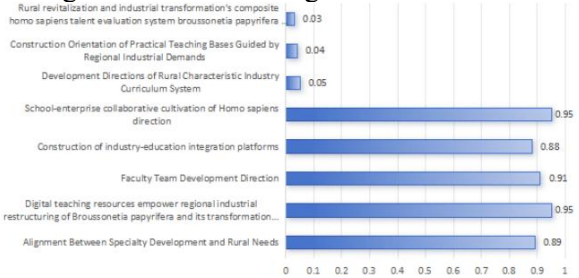

Figure 7. Class Hour Allocation

311 teachers Preferred choice "professional construction aligned with rural needs direction", accounting for 89%; 332 teachers Preferred choice" digital teaching resources empowering regional industrial structure transformation and development direction", representing 95%; 318 teachers Preferred choice"faculty team building direction", accounting for 91%; 308 teachers Preferred choice" industry- education integration platform construction", making up 88%; 332 teachers Preferred choice "school - enterprise collaborative education direction", accounting for 95%; 17 teachers Preferred choice"rural characteristic industry curriculum system development direction", representing 5%; 14 teachers Preferred choice"regional industry demand-oriented practical teaching base construction direction", accounting for 4%; and 10 teachers Preferred choice"rural revitalization and industrial transformation compound talent evaluation system construction direction", making up 3%.

3.3.2Data Analysis on Secondary and Higher Vocational College Teachers' Empowerment for Regional Industrial Structure Transformation

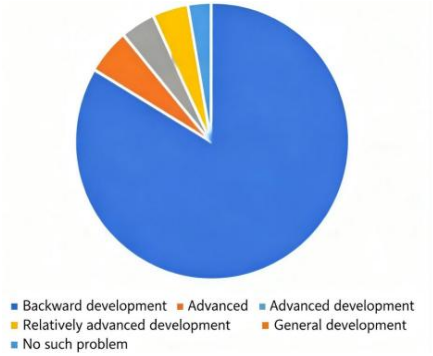

Figure 8. How do You Think about the Current Development Concept of Rural E-Commerce?

Through the collation of survey data, it is found that there are four core problems in the ability of secondary and higher vocational college teachers in 46key assistance counties to serve rural revitalization： Rural e-commerce field: outdated concepts and disconnection from practice. 83.4% of respondents believe that rural e-commerce teachers have backward development concepts, with teaching content still remaining at the theoretical level of traditional cross-border trade and lacking cognition of new rural e-commerce models such as live-streaming e-commerce and community group buying.； Meanwhile, 72.5% of teachers report a lack of cooperative resources with rural e-commerce enterprises, unable to lead students in participating in real project operations, resulting in graduates struggling to quickly adapt to job requirements. Furthermore, teachers themselves have insufficient mastery of key knowledge integrating e-commerce with agricultural product branding and standardized production, making it difficult to impart cutting-edge industrial skills to students.

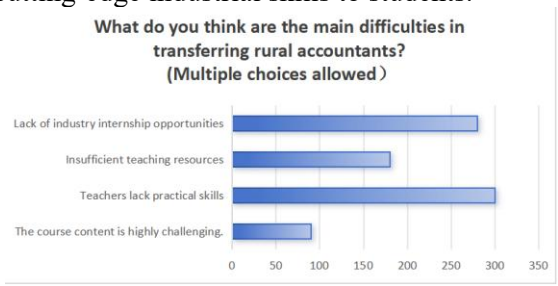

Figure 9. What Do You Think Are the Main Difficulties Intransferring Rural Accountants? (Multiple Choices Allowed)

Rural accounting field: weak practical ability and slow knowledge update. The survey shows that 49.7% of respondents consider rural accounting teaching "not very effective", with the core crux lying in teachers' capabilities: 85% of teachers lack practical ability, are unfamiliar with characteristic businesses such as rural collective economic management and agricultural subsidy application, and cannot integrate the latest accounting standards and tax policies with actual rural financial scenarios; 52% of teachers report a shortage of teaching resources, lacking real financial cases targeting rural cooperatives and small- and medium-sized enterprises, resulting in empty teaching content and students' difficulty in understanding the practical application value of theoretical knowledge.

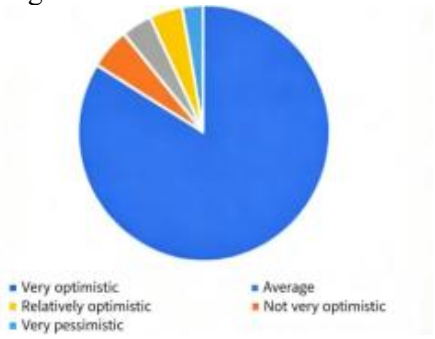

Figure 10. What Do You Think of the Future Development Prospects of Shanxi's Cultural and Tourism Industry?

Rural cultural and tourism field: insufficient faculty reserves and loose industry connection. Although 90.7% of respondents are optimistic

about the development prospects of the cultural and tourism industry, 87.5% of teachers believe that the rural cultural and tourism faculty needs to be urgently improved. Most existing teachers are "transferred teachers" or have pure theoretical backgrounds, lacking practical experience in cultural and tourism project planning, rural tourism resource development, farm stay operation, etc. Meanwhile, the cooperation between colleges and local cultural and tourism enterprises is weak, making it difficult for teachers to obtain the latest industry trends (such as new models like rural research and study tours and integration of intangible cultural heritage with cultural tourism). As a result, teaching content lags behind industrial development needs, failing to cultivate skilled talents that meet the demands of the rural cultural and tourism market.

3.3.3 Core Orientation of Teachers' Training Needs

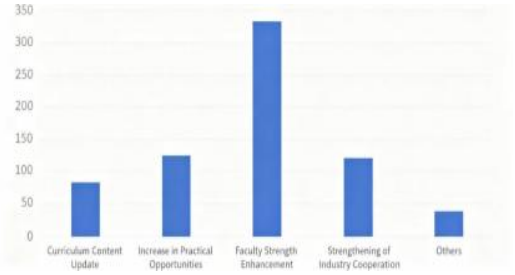

Figure 11. What Aspects of Rural Cultural Tourism Do You Think Need Improvement? (Multiple Choices Allowed Choices Allowed)

Based on the above mentioned issues, teachers' training needs demonstrate three core characteristics: "precision, practicality, and industrialization":

Content Needs: Priority is given to "practical content" closely related to rural industries, such as the operation of new rural e-commerce models, handling of rural characteristic financial businesses, and planning of rural cultural and tourism projects. Additionally, there is a demand for supplementary industry policy interpretations (e.g., special subsidy policies for rural revitalization) and interdisciplinary integration skills (e.g., integrated teaching of "e-commerce + cultural tourism").

Method Needs: Rejection of "pure theoretical lectures" and preference for methods such as "online-offline integration", "practical drills", and "enterprise-immersed learning". Training is required to directly connect with real work scenarios for rapid conversion into teaching capabilities.

Resource Needs: Desire to access enterprise case databases, practical training base resources, and guidance from industry experts. Teachers hope to establish "college-enterprise" cooperation channels through training to address the challenges of "no projects for practice and no cases for teaching" in instruction

3.3.4 Data Survey and Analysis of Time Preference and Allocation

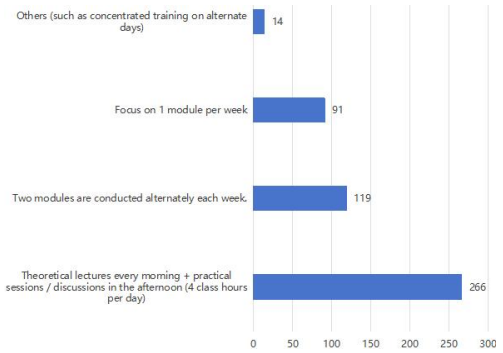

Figure 12. Data Survey and Analysis of Time Preference and Allocation

In terms of preferences for the 160-hour schedule over 4 weeks, the option "theoretical lectures in the morning + practical sessions/discussions in the afternoon (4 hours per day)" was the most popular, receiving 266 votes (76%); followed by "two modules per week conducted alternately" with 119 votes (34%); "one module focused per week" with 91 votes (26%); and "other" arrangements (such as concentrated training every other day) with 14 votes (4%). It is suggested to proceed according to the daily rhythm of "theoretical sessions in the morning + practical sessions in the afternoon" combined with the weekly arrangement of "two modules per week conducted alternately".

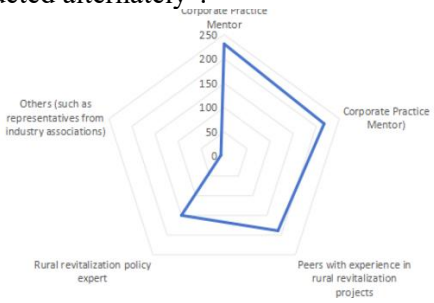

Figure 13. Radar Chart

Among the supporting resources expected from the training, "case collections (on professional development, resource development, etc.)" have the highest demand, with 248 teachers choosing them, accounting for 71%; followed by "teaching templates (such as curriculum design

templates and program frameworks)" selected by 224 teachers (64%); "online learning platforms (course replays and material downloads)" chosen by 203 teachers (58%); "compilations of policy documents" selected by 154 teachers (44%); and "other" resources (such as tool software packages) chosen by 7 teachers (2%). It is necessary to prioritize the preparation of case collections and teaching templates, and build an online resource platform.

4. Analysis of Current Problems among Secondary and Higher Vocational Teachers

4.1 Misalignment between Training Content and Rural Industry Needs

The current training programs for vocational teachers are characterized by an excessive emphasis on theory and insufficient integration with real rural industrial contexts. Only 35% of teachers consider the training content to be highly relevant to their teaching specialties, while 42% believe that the content lags behind the actual development needs of rural industries. In fact, insights from on-site interviews with enterprise professionals indicate that the talent cultivation models for these majors are severely outdated relative to the current industrial development, resulting in a serious disconnect from the actual conditions of industrial development.

4.2 Limited Training Methods and Insufficient Practicality

Currently, a large number of training courses still focus on the teaching of traditional theoretical knowledge. Further analysis based on the survey results shows that more than half of the classroom-based training is still dominated by theoretical instruction, and the practical segments require further enhancement. In fact, such training models, which lack experiential learning and immersive learning, make it difficult for various achievements obtained in practical training to be effectively transformed into practical content for classroom teaching.

4.3 Inadequate Training Evaluation System

Based on the collection and analysis of information from respondents, the current assessment of the teacher training system mainly focuses on attendance rates and exam scores. There is a lack of effective mechanisms in the overall training evaluation and development process to further assess teachers' digital teaching outcomes. In fact, due to the absence of a sound follow-up evaluation mechanism, it has long been difficult to measure the sustained impact of training on teachers' teaching achievements. Among the respondents, more than 67% of teachers reported that more precise methods are needed to evaluate the entire teaching development process.

5. Optimization Strategies and Recommendations: A Three-Stage Progressive Pathway Model

Against the backdrop of the rapid development of digital means, vocational education has become a key link in talent cultivation and serving the development of regional industries (Cao et al., 2024). At the current stage, the digital competence of vocational teachers determines, to a certain extent, the effectiveness of vocational education in serving regional development. However, many vocational teachers currently have a limited understanding of rural revitalization policies, insufficient digital teaching capabilities, and a lack of practical experience. These factors have restricted their ability to further serve the transformation and development of regional industries (Zhou & Zhao, 2025).To address these issues further, this study attempts to construct a three-stage progressive path model: "Cognitive Enlightenment - Resource Development - Industrial Integration". By reconstructing training content, innovating teaching resources, and optimizing evaluation mechanisms, this model systematically enhances teachers' digital competence and their ability to participate in industrial development.

5.1 Phase One: Cognitive Enlightenment-Consolidating Ideological Foundations and Professional Values

Cognitively speaking, cognitive enlightenment is, to a certain extent, the "ideological starting point" for the development of vocational education teachers (Li and Dai, 2021). In today’s era of continuous digital development, digital cognitive enlightenment serves to address the contemporary proposition of "why to engage in rural revitalization". The reconstruction of cognition for this mission does not rely on traditional theoretical education, but on the guidance of values and the mobilization of

ideology, enabling the digital empowerment of regional industrial transformation and upgrading to become a core cognition of vocational education.

In fact, at the current stage, many vocational teachers fail to truly understand the cutting-edge policies of rural revitalization. This restricts teaching to traditional classrooms and hinders the digital transformation and upgrading of education. Therefore, the focus of this stage lies in combining modular teaching with immersive experience, and using digital means to help vocational teachers build a dual cognitive framework that "understands both the mission of rural revitalization and the contemporary value of digital education", thereby laying a solid ideological foundation for digital competence to serve the transformation and upgrading of regional industries.

5.2 Phase Two: Resource Development-Strengthening Digital Teaching and Curriculum Innovation

Following cognitive enlightenment, the top priority is to reconstruct the development of digital resources using digital thinking, and further strengthen digital teaching and curriculum innovation. At this stage, the core issue shifts to how to use digital technology to integrate into traditional classrooms and school-enterprise cooperation projects (Yang, 2023). Currently, vocational education is trapped in two dilemmas: first, the insufficiency of digital teaching resources; second, the failure of teaching capabilities to support the strategy of regional industrial transformation and upgrading.Therefore, all efforts at this stage revolve around the development of digital resources. Firstly, vocational teachers should be provided with digital platforms to promote the development of digital teaching resources. Meanwhile, digital means should be further used to strengthen the innovation of curriculum systems, laying a solid technical service foundation for subsequent school-enterprise cooperation projects and industry-academia-research integration projects.

5.3 Phase Three: Industry Integration - Deepening Practical Engagement and Collaborative Mechanisms

The industrial integration project serves as the "final test" of vocational teachers' ability to support regional transformation. At this stage, vocational teachers apply their skills to serve regional industries, and ultimately, the new knowledge and new skills from industries are used to feed back into the development of vocational education. This eventually forms a positive interaction between vocational education and regional industrial development (Zhao, 2022).

Currently, the most prominent issue is the severe disconnect between vocational education and regional industrial development. The most obvious manifestation is that after vocational education graduates enter enterprises, many key vocational skills still require further training by enterprises. Therefore, the industrial integration stage emphasizes the establishment of a tripartite cooperation mechanism among the government, colleges, and enterprises. This mechanism aims to shorten the time for enterprises to recruit and train talents, and improve the efficiency of vocational education in supporting regional industrial transformation.

5.4 Support Mechanisms: Evaluation, Transformation, and Sustainable Development

Regarding the various issues highlighted in the current stage of digital development, the "Cognitive Enlightenment - Resource Development - Industrial Integration" three-stage teacher competency development model still requires support mechanisms to ensure its adaptability and sustainable development in practical application. To this end, it is necessary to further emphasize the importance of multi-dimensional evaluation in the support mechanisms. In addition, continued attention must be paid to the digital transformation mechanism, enabling teachers to further apply the developed digital resources to industrial practice through digital platforms. Finally, sustainability measures should be emphasized in competency development; by continuously connecting with enterprises to update digital resources, this model can be ensured to continuously contribute to the high-quality development of vocational education.In fact, the "Cognitive Enlightenment—Resource Development—Industrial Integration" three-stage teacher competency development model operates as a progressive and hierarchical framework. It progresses from enhancing the individual thinking of vocational teachers to

reconstructing the entire teaching process, and finally to building a complete industrial ecosystem, ultimately realizing the digital development of vocational education. From a practical perspective, modular teaching has improved vocational teachers' digital cognitive level; digital platforms have addressed the "skill gaps" of vocational teachers; and industrial integration projects have resolved the limitation of "insufficient practical experience". From a long-term development perspective, the high-quality development of vocational education that serves regional industrial transformation and upgrading has established a sustainable development channel for vocational education talent cultivation, and also provided new practical guidance for the high-quality development of vocational education.

6. Conclusion and Prospects

Based on the practice of teacher training in secondary and higher vocational education institutions in Shanxi Province, this study adopts qualitative and quantitative survey methods to conduct an in-depth exploration of teachers' digital empowerment competency structure and training needs at the current stage. Survey findings indicate that, at present, teachers are in urgent need of further improvement in the development of digital teaching resources and the design of industry-academia-research projects. The traditional vocational education model, which focuses on the teaching of theoretical knowledge, also requires further enhancement and optimization. Therefore, the development of digitally empowered vocational education is not only a technological innovation, but also a key path to further restructure the current educational pattern and optimize the role of education in empowering regional industrial development. This study constructs a three-stage progressive model of "cognitive enlightenment - resource development - industrial integration", which aims to further improve the digital training of teachers through the enhancement of digital cognition, the development of teaching resources, and the promotion of industry-academia-research projects. To sum up, digital empowerment provides a new model for the development of vocational education teachers. It not only enhances the core ability of vocational education to serve regional industries, but also offers theoretical and practical guidance for the digital transformation and upgrading of vocational education.

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