

Management Strategies to Develop the Teaching Competence of Vocational Nursing Teachers in the Digital Transformation at Guizhou Vocational College of Industry and Commerce

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Abstract

This study is aimed: 1) To study conceptual frameworks of Teaching Competence and Digital Transformation, 2) To analyze strengths, weaknesses, opportunities, and threats of Teaching Competence Based on the Concept of Digital Transformation, and 3) To develop Teaching Competence Strategy Based on the Concept of Digital Transformation at Guizhou Vocational College of Industry and Commerce. This study employs a multiphase mixed methods design research. The sample comprised 250 full-time teachers selected via stratified random sampling from a population of 660. The instruments included a questionnaire, evaluation forms, and focus group discussion. Data were analyzed using frequency, percentage, mean, standard deviation, PNI_{modified}, and content analysis.

The results revealed that: 1) "Professional Development and Instructional Innovation Competence" was the greatest weakness (PNI=0.415), and "Digital Culture and Professional Learning Community" was the primary weakness among digital transformation components (PNI=0.347); 2) technological factors (PNI=0.495) and sociocultural factors (PNI=0.497) were opportunities, while economic factors (PNI=0.570) and political-legal factors (PNI=0.540) were threats; and 3) this study developed a three-strategy model comprising 9 substrategies: Strengthen Professional Development and Instructional Innovation Competence; Strengthen Instructional Regulation and Learning Support Competence;

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and Strengthen Digital Instructional Design and Implementation Competence. Expert evaluations confirmed high suitability and feasibility of all strategies (mean scores 4.40-4.70). The research results can provide practical references for higher vocational institutions to systematically enhance teachers' digital teaching competence in the context of digital transformation.

Keywords: Management Strategies, Teaching Competence, Digital Transformation

Introduction

Under the sweeping global wave of digitalization, digital technology is irreversibly reshaping the development landscape of various industries. In China, the Ministry of Education's "Education Informatization 2.0 Action Plan" and the report of the 20th National Congress of the Communist Party of China have elevated educational digitalization to a key national strategic priority, while "China's Education Modernization 2035" proactively proposes accelerating the deep integration of information technology with education and teaching (Ministry of Education, 2018; Lei, 2022). As a core area for talent cultivation, the digital transformation of vocational education is directly linked to industrial upgrading and the adaptability of talent supply. Nursing education, as a key branch of vocational education, shoulders the crucial mission of cultivating professional nursing talent for the Healthy China strategy. Emerging technologies such as virtual simulation and artificial intelligence, while being introduced into nursing education, depend heavily on teachers' pedagogical abilities, particularly their digital literacy and technology integration capabilities (Hong, 2023).

Current higher vocational nursing teachers generally face challenges including insufficient digital awareness, weak technology application skills, and inadequate training and support systems (Duan et al., 2024; Liang, 2024). Although Guizhou Vocational College of Industry and Commerce has established digital teaching infrastructure such as smart classrooms and virtual simulation training centers, it still lags significantly in teacher training systems, resource investment, and digital support services, with prominent structural deficiencies in teachers' digital skills and deep integration capabilities (Xin, Tang, & Mou, 2024). According to the EU's

DigCompEdu framework, if teachers lack a structured competence development path, they often struggle to transition from technical operation to deep technology integration, leading to a mismatch between infrastructure and teacher competence development (Redecker, 2017). Existing research indicates that the development of teachers' digital capabilities must rely on a clear competency framework and structured pathways (Chen et al., 2025), and a significant correlation exists between schools' digital governance capabilities and teachers' teaching innovation (Guo et al., 2023).

Despite the growing body of research on digital transformation in vocational education, limited studies have systematically investigated the conceptual frameworks and management strategies specifically tailored to vocational nursing teachers' teaching competence in the Chinese higher vocational context. Previous research has primarily focused on general teacher digital literacy (Chen et al., 2025) or broad institutional transformation (McCarthy et al., 2023), without addressing the unique professional demands of nursing education, which requires integration of clinical practice, digital simulation, and pedagogical innovation. Furthermore, the relationship between Teaching Competence and Digital Transformation has often been discussed as separate constructs rather than an interconnected system. Teaching Competence, grounded in Shulman (1986) PCK model and Koehler and Mishra (2009) TPACK framework, refers to teachers' ability to integrate content knowledge, pedagogical knowledge, and technological knowledge to facilitate effective instruction. Digital Transformation, as defined by the OECD (2022) and UNESCO (2023), represents a systemic change process encompassing technological infrastructure, pedagogical innovation, teacher capacity building, cultural change, and governance mechanisms. The interconnection between these two concepts lies in the understanding that sustainable digital transformation cannot occur without corresponding development in teachers' teaching competence, while teaching competence in the digital age necessarily requires engagement with digital transformation elements. This study addresses this gap by examining how digital transformation elements—including digital infrastructure, teaching innovation, teacher competence, digital culture, and governance support—interrelate with teaching

competence dimensions to inform systematic management strategies for vocational nursing teachers.

As mentioned above, teaching competence plays the key role in the success of digital transformation in vocational nursing education, and effectively enhancing teachers' digital teaching competence in the information age has significant theoretical value and practical significance. Thus, this study's purpose is to study conceptual frameworks of Teaching Competence and Digital Transformation, to analyze strengths, weaknesses, opportunities, and threats of Teaching Competence Based on the Concept of Digital Transformation, and to develop Teaching Competence Strategy Based on the Concept of Digital Transformation at Guizhou Vocational College of Industry and Commerce.

Research Objectives

- 1.To study and validate conceptual frameworks of Teaching Competence and Digital Transformation through literature review and expert evaluation
- 2.To analyze strengths, weaknesses, opportunities, and threats of Teaching Competence Based on the Concept of Digital Transformation using PNImodified and SWOT analysis
- 3.To develop and validate Teaching Competence Strategy Based on the Concept of Digital Transformation at Guizhou Vocational College of Industry and Commerce through expert evaluation and focus group discussion

Research Methods

This study employed a multiphase mixed methods design consisting of three sequential phases: Phase I focused on studying conceptual frameworks through literature review and expert evaluation (qualitative), Phase II focused on analyzing SWOT through a questionnaire survey (quantitative), and Phase III focused on developing and validating strategies through expert evaluation and focus group discussion (qualitative). Quantitative and qualitative findings were integrated during the strategy development phase, where SWOT analysis results from the quantitative

survey were used to inform the TOWS matrix, and qualitative feedback from experts and focus group participants refined the final strategies.

1. Population and Sample

The population comprised 660 full-time teachers at Guizhou Vocational College of Industry and Commerce. The sample size was calculated using the Yamane formula (Yamane, 1973, p. 727):

$$n = \frac{N}{1 + N \times e^2}$$

where n = sample size, N = population size (660), and e = margin of error (0.05). Substituting the values:

$$n = 660 / (1 + 660 \times 0.05^2) = 660 / (1 + 1.65) = 660 / 2.65 \approx 249.06$$

Thus, the sample size was rounded to 250 people. Using stratified random sampling, the participants were divided into three sample groups based on their professional titles: 1) 89 teachers with junior professional titles; 2) 75 teachers with intermediate professional titles; and 3) 86 teachers with associate senior or higher professional titles. The sample was proportionally allocated across the three professional-title groups based on their respective population proportions: junior titles ($233/660 \times 250 \approx 88.3 \approx 89$), intermediate titles ($199/660 \times 250 \approx 75.4 \approx 75$), and associate senior or higher titles ($228/660 \times 250 \approx 86.4 \approx 86$). Teachers at each professional title level were selected through systematic random sampling to ensure an equal probability of selection for each level.

2. Research Instruments

The primary data collection tool was a self-designed questionnaire, divided into three sections: demographic information of the respondent, current and desirable states of teaching competence based on digital transformation (5-point Likert scale), and open-ended questions. Three experts were purposively selected based on their expertise: one educational management scholar, one school director with a doctoral degree, and one expert in vocational nursing education. They evaluated the questionnaire's validity using the Index of Item-Objective Congruence (IOC), with each item's IOC value ranging from 0.80 to 1.00, which is considered acceptable according to Rovinelli and Hambleton (1976). The questionnaire's reliability was assessed using

Cronbach's alpha coefficient, and all dimensions had Cronbach's alpha values above 0.8, indicating good internal consistency (Nunnally 1975). In addition, an evaluation form was used in Phase I to gather data regarding components of teaching competence and digital transformation, with three choices of "Agree (+1), Not Sure (0), and Disagree (-1)" and spaces for comments. A strategy evaluation form was used in Phase III to assess the suitability and feasibility of strategies using a five-point Likert scale (1 = least suitable/least feasible to 5 = most suitable/most feasible). Furthermore, a focus group discussion was conducted with 13 participants to validate the second draft of strategies and gather in-depth qualitative feedback on their suitability and feasibility. The 13 focus group participants comprised seven core experts and six additional stakeholders, including school administrators, department heads, teachers, and quality assurance staff, to ensure diverse perspectives on strategy suitability and feasibility. The TOWS Matrix (Wehrich, 1982) was utilized to systematically match internal strengths/weaknesses with external opportunities/threats to generate strategic alternatives, including SO (Strengths-Opportunities), WO (Weaknesses-Opportunities), ST (Strengths-Threats), and WT (Weaknesses-Threats) strategies.

3. Data Collection and Analysis

Questionnaires were distributed to the sample group via post and online protocol (Google Form). After obtaining informed consent from the participants, evaluation forms were administered to the experts individually via online protocols (Line, WeChat Application, and Email), and a focus group discussion was conducted with 13 participants to validate the second draft of strategies. SWOT components were identified based on the PNI values calculated from the questionnaire survey. For the internal environment, high PNI values indicated weaknesses, while low PNI values indicated strengths. For the external environment, factors with high PNI values were classified as threats, and factors with low PNI values were classified as opportunities. SPSS software was used to perform descriptive statistical analysis (frequency, percentage, mean, standard deviation) on the collected data. The Modified Priority Needs Index ($PNI = \text{Desirable Mean} - \text{Current Mean} / \text{Desirable Mean}$) was used to analyze priority needs. A five-point Likert scale was used to assess respondents' current and desirable states, with mean scores interpreted as follows: 4.51-5.00 as the highest

level, 3.51-4.50 as the high level, 2.51-3.50 as the moderate level, 1.51-2.50 as the low level, and 1.00-1.50 as the lowest level. Content analysis was applied to the qualitative data from open-ended questions, comments, and focus group discussions to identify core themes and categories.

Research Results

Objective 1: To study and validate conceptual frameworks of Teaching Competence and Digital Transformation through literature review and expert evaluation

Table 1 Results of Conceptual Frameworks Evaluation by Experts

Component	Agree	Not Sure	Disagree	Percent Agree
Teaching Competence				
1. Digital Instructional Design and Implementation Competence	3	0	0	100%
2. Instructional Regulation and Learning Support Competence	3	0	0	100%
3. Professional Development and Instructional Innovation Competence	3	0	0	100%
Digital Transformation				
1. Digital Infrastructure and Resources	3	0	0	100%
2. Digital Teaching Innovation	3	0	0	100%
3. Teachers' Digital Teaching Competence	3	0	0	100%
4. Digital Culture and Professional Learning Community	3	0	0	100%
5. Digital Governance and Policy Support	3	0	0	100%

As shown in Table 1, according to the results of the expert evaluation, all three experts agreed (100%) on the proposed conceptual framework. The three dimensions of Teaching Competence and the five components of Digital Transformation all received unanimous agreement, indicating that the conceptual framework was appropriate and applicable for developing management strategies to enhance vocational nursing teachers' teaching competence in the context of digital transformation.

Objective 2: To analyze strengths, weaknesses, opportunities, and threats of Teaching Competence Based on the Concept of Digital Transformation using PNImodified and SWOT analysis

Table 2 Summary of Priority Needs Analysis and SWOT Classification

Dimension	Current Mean	Desired Mean	PNImodified	SWOT
Teaching Competence				
Digital Instructional Design and Implementation Competence	2.564	3.448	0.256	S
Instructional Regulation and Learning Support Competence	2.446	3.569	0.315	S
Professional Development and Instructional Innovation Competence	2.195	3.767	0.415	W
Digital Transformation				
Digital Infrastructure and Resources	2.459	3.666	0.329	S
Digital Teaching Innovation	2.526	3.719	0.321	S
Teachers' Digital Teaching Competence	2.523	3.639	0.307	S
Digital Culture and Professional Learning Community	2.452	3.752	0.347	W
Digital Governance and Policy Support	2.498	3.626	0.311	S
External Environment Factor				
Political–Legal Factors	3.060	4.720	0.540	T
Economic Factors	3.010	4.720	0.570	T

Dimension	Current Mean	Desired Mean	PNI _{modified}	SWOT
Sociocultural Factors	3.150	4.720	0.497	O
Technological Factors	3.160	4.720	0.495	O

As shown in Table 2, according to the results of the teacher survey, Professional Development and Instructional Innovation Competence showed the highest priority need (PNI=0.415) and was identified as a weakness, followed by Digital Culture and Professional Learning Community (PNI=0.347), which was also identified as a weakness. In contrast, Digital Instructional Design and Implementation Competence received the lowest priority need (PNI=0.256), indicating a relative strength. Regarding the external environment, Economic Factors showed the highest priority need (PNI=0.570), followed by Political-Legal Factors (PNI=0.540), both identified as threats. Sociocultural Factors (PNI=0.497) and Technological Factors (PNI=0.495) were identified as opportunities. Overall, the findings indicate that teachers' professional development and institutional digital culture should be prioritized to support the digital transformation of vocational nursing education.

Objective 3: To develop and validate Teaching Competence Strategy Based on the Concept of Digital Transformation at Guizhou Vocational College of Industry and Commerce through expert evaluation and focus group discussion

Table 3 Summary of Proposed Management Strategies

Strategies and Substrategies	Suitability		Feasibility	
	$\bar{x}$	Level	$\bar{x}$	Level
Strategy 1: Strengthen Professional Development and Instructional Innovation Competence	4.70	Highest	4.60	Highest

Strategies and Substrategies	Suitability		Feasibility	
Strategy 2: Strengthen Instructional Regulation and Learning Support Competence	4.70	Highest	4.60	Highest
Strategy 3: Strengthen Digital Instructional Design and Implementation Competence	4.50	High	4.40	High

As shown in Table 3, according to the results of the expert evaluation, Strategy 1: Strengthen Professional Development and Instructional Innovation Competence and Strategy 2: Strengthen Instructional Regulation and Learning Support Competence received the highest ratings for both suitability (mean=4.70) and feasibility (mean=4.60), indicating the highest level of applicability. Strategy 3: Strengthen Digital Instructional Design and Implementation Competence received a suitability mean score of 4.50 and a feasibility mean score of 4.40, both rated at the high level. Overall, all proposed management strategies were evaluated as highly suitable and feasible for enhancing vocational nursing teachers' teaching competence in the context of digital transformation.

The three strategies with their corresponding substrategies and core procedures are summarized as follows:

Strategy 1: Strengthen Professional Development and Instructional Innovation Competence consists of three substrategies: 1) Create technology-enhanced professional learning focusing on Digital Teaching Innovation, Digital Governance and Policy Support, Digital Infrastructure and Resources, and Digital Culture and Professional Learning Community; 2) Mobilize community resources in professional learning; and 3) Establish Professional Learning Communities (PLCs) to enhance instructional innovation competence among teachers. Core procedures include appointing committees, providing training on digital tools and emerging technologies, designing online professional learning media, organizing networking events and seminars, establishing PLCs with data-driven discussions, and monitoring, evaluating, and reflecting on implementation outcomes.

Strategy 2: Strengthen Instructional Regulation and Learning Support Competence consists of two substrategies: 1) Develop learning activities to enhance instructional regulation and learning support competence focusing on Digital Culture and Professional Learning Community and Digital Teaching Innovation; and 2) Strengthen the use of diverse digital learning approaches. Core procedures include appointing teaching and learning committees, designing digitalized teaching activity plans, establishing digital mentoring programs, applying cooperative/collaborative learning, problem-based learning, and project-based learning, engaging community stakeholders, and monitoring, evaluating, and reflecting on implementation outcomes.

Strategy 3: Strengthen Digital Instructional Design and Implementation Competence consists of four substrategies: 1) Enhance digital teaching innovation design; 2) Develop technology-enhanced curriculum design; 3) Establish quality assurance mechanisms; and 4) Create digital assessment systems. Core procedures include developing multimedia and virtual simulation resources, utilizing existing platforms such as Learning Management Systems, establishing evaluation criteria for digital teaching competence, conducting classroom observations and learning analytics, creating self-assessment, peer assessment, and supervisor assessment digital tools, and using assessment data for continuous teaching improvement.

Research Discussion

The findings of this study confirm that the three research objectives were achieved. The conceptual frameworks of teaching competence and digital transformation were validated by expert evaluation, establishing a solid theoretical foundation consistent with Shulman (1986) PCK model and Redecker (2017) DigCompEdu framework.

The SWOT analysis revealed that "Professional Development and Instructional Innovation Competence" was the greatest weakness, consistent with Xie et al. (2023) who found that higher vocational teachers lack digital tools for teaching reflection due to training focusing on basic operations. "Digital Culture and Professional Learning Community" was the most prominent weakness, supporting

Kraus et al. (2021) that organizational culture is key to transformation. Technological factors were significant opportunities, consistent with OECD (2022) on technology-enabled educational restructuring.

Based on these findings, Strategy 1: Strengthen Professional Development and Instructional Innovation Competence was developed to leverage technological opportunities in addressing the greatest internal weakness. This strategy consists of three substrategies: 1) Create technology-enhanced professional learning; 2) Mobilize community resources; and 3) Establish Professional Learning Communities (PLCs). These directly address the priority needs: Digital Governance and Policy Support, Digital Teaching Innovation, and Digital Infrastructure and Resources. The emphasis on PLCs is grounded in Caena and Redecker (2019) view that teachers' digital competence requires systematic institutional support and collaborative learning environments.

Strategy 2: Strengthen Instructional Regulation and Learning Support Competence addresses the weakness in digital culture and professional learning communities, reflecting McCarthy et al. (2023) emphasis that organizational culture and multi-element synergy are essential for transformation. By developing learning activities that integrate digital culture and professional learning communities, this strategy directly targets the second highest priority need (PNI=0.347).

Strategy 3: Strengthen Digital Instructional Design and Implementation Competence builds on existing strengths to exploit technological opportunities, aligning with Wang et al.(2025) framework for higher vocational teachers' digital teaching competence, which emphasizes that teachers in higher vocational institutions possess foundational digital instructional design capabilities that can be further enhanced through systematic support.

Expert evaluation confirmed high suitability (mean=4.70) and feasibility (mean=4.60), indicating that the developed strategies are practical and applicable for enhancing vocational nursing teachers' teaching competence in the digital transformation context. The qualitative findings from the focus group discussion with 13 participants contributed to refining the final strategies by providing in-depth feedback on the suitability and feasibility of each substrategy, particularly in clarifying

committee compositions, specifying training content, and emphasizing the importance of Professional Learning Communities (PLCs) and digital mentoring programs. This integration of qualitative insights ensured that the developed strategies were practical and contextually appropriate for Guizhou Vocational College of Industry and Commerce.

New Knowledge

This study contributes a context-specific strategic framework for enhancing vocational nursing teachers' teaching competence through digital transformation management at Guizhou Vocational College of Industry and Commerce, as illustrated in Figure 1. The framework consists of three interconnected strategies developed based on SWOT analysis and TOWS matrix matching, highlighting the interconnectedness of digital transformation components and teaching competence to provide a systematic pathway for institutional improvement. The TOWS Matrix (Wehrich, 1982) was employed to systematically align internal strengths and weaknesses with external opportunities and threats, generating WO (Weaknesses-Opportunities) and SO (Strengths-Opportunities) strategies that directly address the priority needs identified through the PNI analysis. What distinguishes this framework from existing models—such as the TPACK framework (Koehler & Mishra, 2009) and DigCompEdu (Redecker, 2017)—is its contextualization for vocational nursing education in China, its empirical grounding in priority needs analysis (PNI), and its systematic integration of management strategies (professional development, instructional regulation, and instructional design) with digital transformation components (infrastructure, innovation, competence, culture, and governance). This integration provides a practical, actionable pathway that bridges the gap between theoretical frameworks and institutional implementation in the vocational nursing context.



Figure 1: Teaching Competence Strategies Based on the Concept of Digital Transformation

As illustrated in Figure 1, the strategic framework consists of three core strategies arranged hierarchically. Strategy 1 strengthens Professional Development and Instructional Innovation Competence through creating technology-enhanced professional learning, mobilizing community resources, and establishing Professional Learning Communities (PLCs). Strategy 2 strengthens Instructional Regulation and Learning Support Competence through developing learning activities and utilizing diverse digital learning approaches. Strategy 3 enhances Digital Instructional Design and Implementation Competence through digital teaching innovation design, technology-enhanced curriculum design, quality assurance mechanisms, and digital assessment systems. All strategies operate as an integrated system requiring ongoing monitoring, evaluation, and reflection to achieve sustainable improvement in teachers' digital teaching competence.

Research Suggestions

1. Policy Suggestions

1.1 It is recommended that education authorities incorporate teachers' digital teaching competence into the quality evaluation indicator system for higher vocational institutions, establish special funds to support teacher digital literacy training and digital teaching resource development, and formulate digital competence standards and certification systems tailored to the professional characteristics of nursing education, in order to mitigate external threats posed by economic and political-legal factors. Moreover, develop and implement comprehensive incentive, training, and evaluation mechanisms to bolster the advancement of digital teaching capabilities among teachers.

2. Practical Suggestions

2.1 It is recommended that Guizhou Vocational College of Industry and Commerce prioritize the implementation of the three major strategies proposed in this study, particularly addressing the weakness in "Professional Development and Instructional Innovation Competence" which had the highest priority need (PNI=0.415). This recommendation is directly supported by the finding that Professional Development and Instructional Innovation Competence was the greatest internal weakness, indicating an urgent need for systematic professional learning programs. The college should promptly establish a cross-departmental committee and formulate a three-year action plan for enhancing digital teaching competence; establish a school-level "Digital Teaching Innovation Center" to coordinate training, resource development, and quality assessment; integrate the establishment of Professional Learning Communities (PLCs) and digital mentoring programs into the regular teaching research activity system; and conduct data-based teaching reflection and strategy adjustment each semester to ensure effective implementation. At the same time, the college should fully leverage the opportunities presented by technological factors and actively introduce emerging technologies such as artificial intelligence and virtual simulation to promote teacher capability enhancement.

3. Suggestions for Future Research

3.1 Future research should conduct evaluation studies on the implementation of these strategies at Guizhou Vocational College of Industry and Commerce to assess their actual effectiveness.

3.2 Further studies should develop a model for Professional Development and Instructional Innovation Competence for vocational nursing teachers with emphasis on Digital Governance and Policy Support, Digital Teaching Innovation, and Digital Infrastructure and Resources.

3.3 Future research should investigate the impact of economic and political-legal factors on digital transformation in vocational education to provide policy recommendations for mitigating these external threats.

3.4 A comparative study on digital teaching competence between vocational nursing teachers and teachers in other disciplines is recommended to identify discipline-specific needs and strategies for improvement.

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