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Double Qualified Teachers' Competencies Model in Higher Vocational Colleges in Henan Province

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Abstract

The objectives of this research were: (1) to develop a competency model for double-qualified teachers in higher vocational colleges, (2) to evaluate the quality of the competency model, and (3) to compare alternative models of double-qualified teacher competencies. This study examined the competencies of 1,003 double-qualified teachers at higher vocational colleges in Pingdingshan City, Henan Province, China, using a survey. A sample of 430 double-qualified teachers participated. Data were primarily collected through 5-point Likert scale questionnaires, enabling systematic quantitative assessment. Data analysis involved descriptive and inferential statistics, as well as confirmatory factor analysis (CFA) to evaluate the measurement models. The results indicated that four alternative models were developed: the 1-factor, 5-factor, second-order, and bifactor models. Initially, some models showed inadequate fit, but after model modification based on empirical data and CFA results, all models achieved acceptable fit. Among these, the bifactor model was identified as the optimal model for evaluating the competencies of double-qualified teachers in higher vocational colleges in Henan Province.

Keywords*:* Double Qualified Teacher, Competencies Model, Higher Vocational Colleges

Introduction

Vocational education is a cornerstone of China's strategy to develop a skilled workforce, support industrial upgrading, and drive economic growth. National policy documents, including directives from the National People's Congress Standing Committee, the State Council, and the Ministry of Education, emphasize the equal importance of vocational and general education and highlight the critical role of higher vocational education in cultivating high-level technical and skilled talents. Since 2019, policies such as the Implementation Plan for National Vocational Education Reform have set clear targets. By 2022, over 50% of professional teachers in vocational colleges should be "double-qualified" (possessing both teaching and industry-based practical skills), and each specialty should form national-level teaching innovation teams. The Ministry of Education (2021) further outlined the need to build a high-quality double-qualified teacher workforce characterized by ethics, expertise, professionalism, and vitality, supported by competency-based selection criteria, training systems, and performance evaluations.

At the provincial level, Henan Province has implemented these national directives with ambitious goals to enhance vocational education quality and faculty development. By 2022, 50% of vocational teachers were expected to be double-qualified, rising to over 60% by 2025 (Henan Provincial Government, 2022). With 110 higher vocational colleges and over 152,000 full-time teachers (including 33,942 double-qualified teachers as of 2024), the province has strengthened industry-education integration, diversified investment mechanisms, and refined internal quality assurance systems. Nevertheless, challenges remain, particularly in emerging

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sectors such as AI and green technology, where industry-experienced instructors are scarce. Competency-based frameworks emphasizing digital literacy, cross-disciplinary knowledge, and adaptability to Industry 4.0 are increasingly necessary, supported by university-industry partnerships, stratified training programs, and performance-linked incentives.

At the municipal level, Pingdingshan City exemplifies the localized implementation of these policies. While the number of double-qualified teachers has increased, it remains insufficient to meet vocational education demands, especially in emerging specialties. As of 2024, 1,003 double-qualified teachers were distributed across five higher vocational colleges, with only four institutions having notable numbers (Education Department of Henan Province, 2023, 2024). Local initiatives encourage the attainment of professional qualifications and collaboration with enterprises to enhance practical skills through internships and part-time work.

Research underscores the pivotal role of double-qualified teachers in ensuring the quality of vocational education. Competency models provide essential guidance for recruitment, training, and evaluation, emphasizing mastery of course content, industry trends, teaching methodologies, and adaptability to labor market demands (Yong, Deng, et al., 2024; Wei, Li, et al., 2022). Data-driven approaches, such as those that employ data mining for competency modeling (Bo, Yang, et al., 2024), have the potential to optimize teacher selection and development. Building a high-quality double-qualified teacher workforce—supported by national policies, provincial initiatives, and local efforts—is critical for advancing vocational education, cultivating skilled technical talents, and promoting sustainable socioeconomic development in China.

Questions

1. What is the competency model of double-qualified teachers in higher vocational colleges?

2. How valid and reliable is the double-qualified teachers' competency model in higher vocational colleges?

3. Which model provides the best fit for evaluating double-qualified teachers' competencies?

Objectives

1. To develop and validate a competency model for double-qualified teachers in higher vocational colleges.

2. To assess the quality (validity and reliability) of the double-qualified teachers' competency model.

3. To compare alternative models of double-qualified teacher competencies to identify the optimal model.

Hypothesis

H1: One-factor model fits well to the empirical data.

H2: The multiple-factor model fits well to the empirical data.

H3: 2nd-order Factor model fits well to the empirical data.

H4: The Bi-Factor model fits well to the empirical data.

Literature Reviews

In China, research on the competency model for constructing double-qualified teachers in higher vocational colleges has evolved significantly over the past decade, offering theoretical and practical foundations for faculty development. Jin Lishu (2019) further developed a six-dimensional, 23-factor model (including practical literacy, scientific research ability, professional construction literacy and innovation literacy), validating its application in teacher team construction, evaluation, promotion, and performance assessment. These foundational studies collectively identified core competencies, such as expertise (depth,breadth of field knowledge), teaching competence (design/implementation/evaluation of teaching), practical experience (industry work application), professional ethics, and innovation ability such as essential for double-qualified teachers, with detailed indicators (e.g., course design, classroom management) further guiding vocational education institutions in faculty assessment and training.

Recent national research has deepened the specificity and applicability of competency models, addressing emerging challenges and integrating advanced methodologies. Zhu Rui (2019) synthesized factor analysis findings to confirm that the core dimensions of double-qualified teachers' competence include expertise, teaching competence, practical experience, professional ethics, and innovation ability, with each dimension broken down into specific indicators (e.g., teaching ability encompassing course design, student assessment). Li Zhong Jing (2020) replicated and validated Jin's six-dimensional, 23-factor model, emphasizing its utility in teacher team construction and evaluation. Wang Qin (2022) took a more nuanced approach, using behavioral event interviews to construct a six-dimensional internal structure professional knowledge, practical skills, teaching methods, professional quality and innovation ability) with 16 benchmark and 8 discriminative competencies, stressing the importance of both explicit skills and implicit elements (e.g., professional identity, self-confidence) and advocating for competency analysis tailored to professional characteristics. Cheng Qi (2024) employed a modified Delphi method and structural equation modeling to propose a "diamond model" with four dimensions (professional knowledge, professional ethics, teaching practice ability, educational philosophy) and 32 items, examining key factors influencing competency formation. Yuan Shujun & Zhou Yongxin (2024) integrated qualitative and quantitative research, analyzing key competency areas (personal characteristics, professional attitude, teaching ability, development service ability, scientific research innovation) and constructing a model balancing commonality and specialty for statistical analysis. Collectively, these studies have refined the theoretical framework, methodology, and practical tools for cultivating double-qualified teachers, aligning with national goals of high-quality vocational education.

While international research does not specifically address "double-qualified teachers," studies on teacher competence in vocational and general education provide valuable insights applicable to China's context. Competence models in this field span disciplines such as management, psychology, and education, focusing on the knowledge, skills, attitudes, and personal attributes required for effective teaching. Arifin & Rasdi (2017) emphasized the need for vocational teachers to combine theoretical knowledge with entrepreneurship and employ-ability skills, proposing a model encompassing teaching ability, professional ability, communication ability, and personal ability to meet labor market demands. Wahyuni etal. (2020) identified key competency areas for vocational high school (VHS) teachers, including teaching/learning/practical work (TLP) skills, understanding vocational learning principles,

promoting student potential, industry-based skills for a productive learning environment, evaluation/examination, and industry-aligned curriculum design, with training programs prioritizing these dimensions. Daminov etal. (2020) explored the essence of "competence" in vocational teacher training systems, highlighting its role in improving teaching ability through structured professional development. Mutiara (2022) discussed the core competencies required in the Industry 4.0 era, emphasizing teaching ability, personal ability, professional ability, and social ability to prepare students for future societal needs.These international studies collectively underscore the importance of aligning teacher competence with industry needs, technological advancements, and student-centered learning, offering a global perspective on the multifaceted skills required of vocational educators.

Recent international research has also focused on digital competence and teaching proficiency in the context of evolving educational landscapes. Senita etal. (2024) examined teacher digital competence (TDC) trends from 2013–2023, revealing sustained research growth until 2020, with Spain as a leading contributor, and highlighted key themes such as digital literacy, TPACK (Technological Pedagogical Content Knowledge), and professional development. Farhat etal. (2024) investigated teaching competencies in Pakistani public schools, finding that educators in urban areas outperformed rural counterparts in lesson planning, presentation, evaluation, and classroom management, with recommendations for targeted training programs. Ardiana etal. (2024) explored the correlation between teacher competence and student learning motivation, emphasizing the role of effective pedagogical strategies, individualized student support, and engagement in enhancing motivation. Ergünay & Parsons (2023) noted that teacher competency frameworks are designed based on research and local/national needs, outlining the knowledge, skills, and character traits required for improved teaching activities. Collectively, these studies demonstrate that international frameworks prioritize adaptability to technological change, alignment with labor market demands, and the cultivation of both technical and interpersonal skills, providing a comparative lens for refining China's double-qualified teacher models.

National research in China has systematically developed and refined competency models for double-qualified teachers in higher vocational colleges, progressing from foundational dimensions (e.g., practical ability, teaching competence, innovation) to sophisticated, multi-dimensional frameworks (e.g., vocational ability, implicit traits, professional fields). These studies have addressed theoretical constructs, practical indicators, and methodological approaches (e.g., factor analysis, Delphi method, structural equation modeling), aligning with national policies for vocational education reform. International research, while not explicitly focused on "double-qualified teachers," offers complementary insights by emphasizing the integration of professional knowledge, industry experience, digital competence, and teaching proficiency in vocational and general education contexts. Together, these domestic and international studies provide a comprehensive foundation for cultivating high-quality double-qualified teachers, highlighting the importance of aligning faculty development with industry needs, technological advancements, and student-centered learning to drive the sustainable development of vocational education.

To sum up,there are few researches on the competency model of double qualified teachers in higher vocational colleges in the world, while there are many researches on the competency model of double qualified teachers in domestic higher vocational colleges, but there is no unified model. This paper studies the competency model of double qualified teachers

in Pingdingshan higher vocational colleges. It is also hoped that the research system of double qualified teachers' competence model in higher vocational colleges can be further improved.

Methodology

This study investigated the competency model of 1,003 double-qualified teachers in higher vocational colleges in Pingdingshan City, Henan Province, China. A proportional stratified random sampling technique was used to select participants. The sample size was calculated using G*Power with degrees of freedom (df) = 80, a Type I error of 0.05, and an effect size of 0.8, resulting in a target sample of 410 teachers. During the survey, 430 valid responses were collected.

A mixed-methods approach was employed, incorporating both quantitative and qualitative data collection techniques. Quantitative data were collected using a 5-point Likert-scale questionnaire, which enabled systematic measurement of teacher competencies across multiple dimensions. Qualitative data were collected through semi-structured interviews and open-ended questionnaire items to explore teachers' experiences, perceptions, and professional development needs, providing contextual insights to complement the quantitative findings.

The study was guided by Confirmatory Factor Analysis (CFA) to validate the competency model. Four alternative models were proposed and tested: One-factor model (Brown, 2015), Multiple-factor model (Horn & McArdle, 1992), Second-order factor model (Brown, 2015), Bifactor model (Holzinger & Swineford, 1937)

These models were empirically evaluated to determine the best representation of double-qualified teacher competencies. Data analysis involved descriptive and inferential statistics, as well as CFA using statistical software to assess model fit, reliability, and validity. Qualitative data were analyzed thematically to support and interpret the quantitative findings, ensuring a comprehensive understanding of teacher competencies.

The sample consisted of 430 double-qualified teachers. Demographic characteristics included 208 males (48.4%) and 222 females (51.6%). The age distribution showed that 207 participants (48.1%) were 30 years or younger, 142 (33%) were 31–40, 54 (12.6%) were 41–50, and 27 (6.3%) were 51 or older. Educational levels were dominated by postgraduates (319, 74.2%), followed by doctorates (70, 16.3%) and undergraduates (41, 9.5%). Teaching experience was primarily 5 years or less (217, 50.5%), with smaller proportions in longer experience categories. Professional titles were mostly Assistant (192, 44.7%), Associate Professor (117, 27.2%), Lecturer (89, 20.7%), and Professor (32, 7.4%).

Descriptive statistics indicated mean scores ranging from 3.41 to 3.89 and standard deviations of 0.68 to 0.78, suggesting moderate variability. Most variables were negatively skewed, indicating a tendency toward higher ratings. Kurtosis values were acceptable for CFA, except IT (3.60), suggesting a sharper response peak.

Correlation analysis showed that all 120 indicator pairs were statistically significant ($r = 0.305–0.778$, $p < 0.01$), confirming the presence of sufficient relationships for factor analysis.

Results

1. Results of the general data analysis of the respondents of the double-double-qualified teachers' model

Demographic statistics for the samples: 208 male participants (48.4% of the total) and 222 female participants (51.6% of the total). Females slightly outnumbered males, and together they accounted for 100% of the respondents. There were 207 participants (48.1% of the total) who were 30 years old or younger, making this the largest age group. There were 142 participants (33%) aged 31-40, followed by 54 participants (12.6%) aged 41-50. The smallest group was 27 participants (6.3%) aged 51 or older. The cumulative percentage showed that all

participants fell within these age ranges. Three hundred nineteen participants (74.2%) held postgraduate degrees, making this the most common educational level. There were 70 participants (16.3%) with doctorates and 41 participants (9.5%) with undergraduate degrees. These three groups collectively represented all respondents' educational backgrounds. There were 217 participants (50.5%) with 5 or fewer years of teaching experience, the largest group in this category. There were 77 participants (17.9%) with 6-10 years of experience, followed by 96 participants (22.3%) with 11-15 years. The smallest group was 40 participants (9.3%) with over 16 years of teaching experience. The cumulative data confirmed that all teaching experience levels were represented. There were 192 participants (44.7%) with the title of Assistant, the most common professional rank. There were 117 participants (27.2%) with the title of Associate Professor, followed by 89 participants (20.7%) who held the title of Lecturer. The smallest group was 32 participants (7.4%) with the title of Professor. These four categories accounted for all participants' professional titles.

Confirmatory factor analysis established five dimensions and 15 indicators:

Personal Trait: Personal Charisma(PC). Interpersonal Traits(IT).Teachers' Ethics and Manners(TEM).

(2) Personal Quality Teachers' Ethics and Manners(TEM): Care and Respect Students(CRS).Commitment to Work(CW).

(3) Vocational Teaching Ability: Classroom Teaching Ability(CTA). Ideological and Political Education(IPE). Information Processing(IP). Teaching Research(TR).

(4) Professional Practice Ability: Practical Skill(PS). School-Enterprise Cooperation(SEC). Skill Competition(SC).

(5) Scientific Research & Social Service Ability: Scientific Research(SR).Transform Scientific Research and Serve Society (TSS). Innovation Ability and Innovation Consciousness (IAIC).

Multivariate normality assessment

Table 1 Mean, standard deviation, percent of coefficient of variation, the skewness, and the kurtosis

			Skewness		Kurtosis	
	$\bar{x}$	SD	Skewness	SE	Kurtosis	SE
PC	3.63	0.76	-0.78	0.12	0.76	0.24
IT	3.89	0.7	-1.72	0.12	3.6	0.24
TMP	3.53	0.73	-0.22	0.12	-0.04	0.24
CRS	3.52	0.76	-0.38	0.12	0.52	0.24
CW	3.59	0.73	-0.66	0.12	1.07	0.24
CTA	3.57	0.78	-0.34	0.12	0.03	0.24
IPE	3.48	0.75	-0.41	0.12	0.41	0.24
IP	3.71	0.69	-0.77	0.12	1.31	0.24
TR	3.53	0.72	-0.62	0.12	0.81	0.24

			Skewness		Kurtosis	
	$\bar{x}$	SD	Skewness	SE	Kurtosis	SE
PS	3.54	0.73	-0.72	0.12	1.04	0.24
SEC	3.53	0.74	-0.65	0.12	0.96	0.24
SC	3.7	0.68	-1.02	0.12	1.83	0.24
SR	3.54	0.73	-0.69	0.12	0.88	0.24
TSS	3.41	0.73	-0.29	0.12	0.02	0.24
IAIC	3.54	0.73	-0.69	0.12	0.88	0.24

The descriptive statistics showed that the mean scores for all variables ranged from 3.41 to 3.89, reflecting generally high levels across the measured items. Standard deviations ranged between 0.68 and 0.78, indicating moderate variability in responses. Most variables exhibited negative skewness, suggesting that participants tended to give higher ratings. Notably, IT and SC showed more pronounced negative skewness, with IT also displaying a high kurtosis value (3.60), which indicated a sharp peak and clustering of responses near the mean. Overall, the data distributions were largely acceptable for further statistical analysis, with only minor deviations from normality in a few variables.

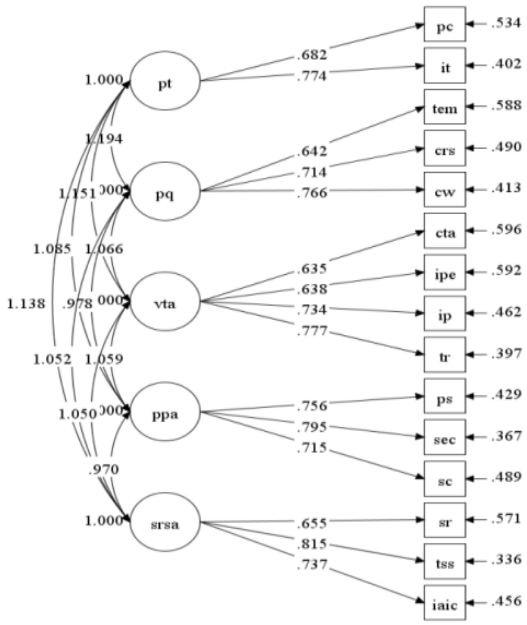
Table 2 Correlation coefficient matrix between observed variables (indicators)

indicators	PC	IT	TEM	CRS	CW	CTA	IPE	TR	PS	SEC	SC	SR	TSS	IAIC	IP
PC	1														
IT	0.528	1													
TEM	0.597	0.561	1												
CRS	0.561	0.65	0.468	1											
CW	0.719	0.653	0.495	0.539	1										
CTA	0.619	0.421	0.379	0.399	0.607	1									
IPE	0.305	0.64	0.363	0.46	0.502	0.488	1								
TR	0.618	0.694	0.633	0.584	0.53	0.379	0.445	1							
PS	0.633	0.688	0.415	0.629	0.705	0.463	0.471	0.637	1						
SEC	0.679	0.553	0.475	0.465	0.754	0.739	0.43	0.524	0.626	1					
SC	0.468	0.724	0.416	0.517	0.591	0.581	0.725	0.527	0.621	0.601	1				
SR	0.357	0.755	0.482	0.477	0.495	0.39	0.505	0.555	0.551	0.499	0.602	1			
TSS	0.486	0.56	0.525	0.486	0.443	0.391	0.41	0.649	0.524	0.463	0.488	0.516	1		
IAIC	0.629	0.719	0.477	0.694	0.651	0.444	0.515	0.624	0.757	0.52	0.614	0.556	0.567	1	
IP	0.44	0.761	0.596	0.57	0.532	0.409	0.489	0.605	0.542	0.51	0.532	0.778	0.512	0.564	1

Note: all pairs of correlation coefficients are statistically significant

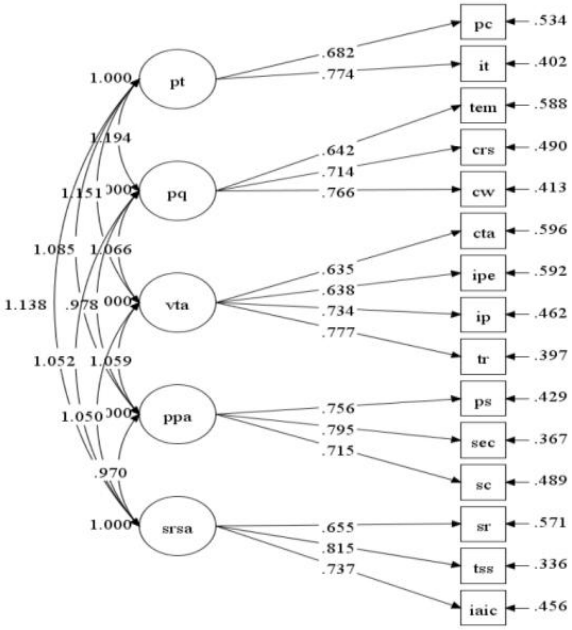
Table 2 is the correlation matrix; since there are 15 indicators, the coefficient pair is 120. The data analysis range of the correlation coefficient is 0.305 ~ 0.778. With a sample size of 430 and a significance level of 0.01, the critical Pearson correlation coefficient is about 0.124, calculated and looked up in tables. Therefore, in this data analysis, all correlation coefficients were statistically significant.

2. The analysis of the double-qualified teachers' professional competency models



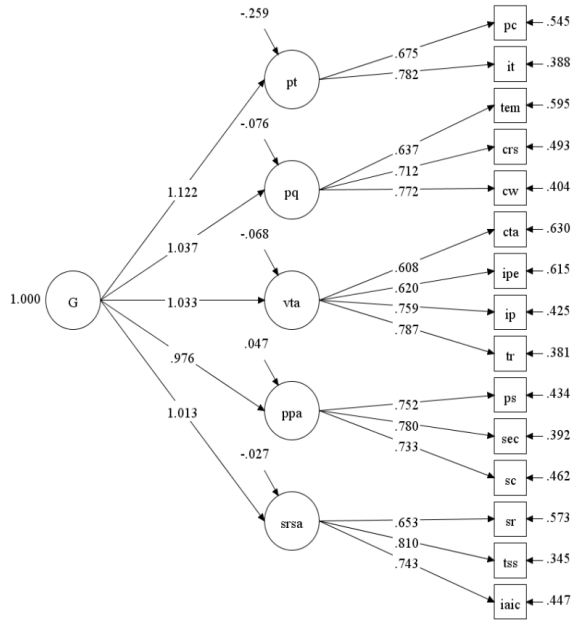
χ^2	df	χ^2/df	CFI	TLI	SRMR	RMSEA
1221.477	80	15.268	0.784	0.717	0.070	0.182

Figure 1 One-factor model simulation



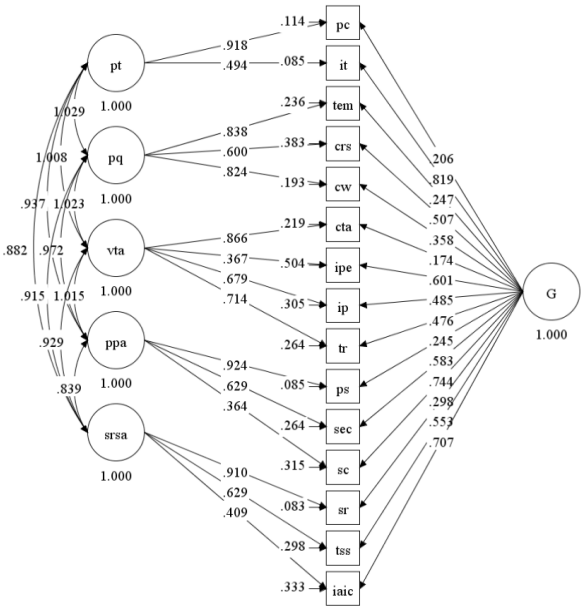
χ^2	df	χ^2/df	CFI	TLI	SRMR	RMSEA
1221.477	80	15.268	0.784	0.717	0.070	0.182

Figure 2 Multiple-factor model simulation



χ^2	df	χ^2/df	CFI	TLI	SRMR	RMSEA
1254.562	85	14.76	0.779	0.727	0.071	0.179

Figure 3 2nd order factor model simulation



χ^2	df	χ^2/df	CFI	TLI	SRMR	RMSEA
1202.106	72	16.696	0.787	0.689	0.070	0.191

Figure 4 Bi-factor model simulation

Table 3 The chi-square, Relative chi-square, CFI, TLI, and RMSEA

	χ^2	df	χ^2/df	CFI	TLI	SRMR	RMSEA
One Factor Model	1342.184	90	14.911	0.764	0.724	0.072	0.180
Multiples Model	1221.477	80	15.268	0.784	0.717	0.070	0.182
2-nd order Model	1254.562	85	14.76	0.779	0.727	0.071	0.179
Bi-Factor Model	1202.106	72	16.696	0.787	0.689	0.070	0.191

Figure 1-4 and Table 3 present the model fit indices for the double-qualified teacher competency framework across the one-factor, multiple-factor, second-order factor, and bi-factor models. Across all models, the chi-square values were high, with the bi-factor model showing the lowest (χ^2 = 1202.106). In contrast, the bi-factor model exhibited the relative chi-square (χ^2/df = 16.696), indicating poor absolute fit. The Comparative Fit Index (CFI) ranged from 0.764 to 0.787, and the Tucker-Lewis Index (TLI) remained below 0.75 in all cases, suggesting suboptimal model performance. The Standardized Root Mean Square Residual (SRMR) values were relatively low (ranging from 0.070 to 0.072), indicating acceptable residual discrepancies. However, the Root Mean Square Error of Approximation (RMSEA) values exceeded 0.17 for all models, with the bi-factor model reaching 0.191, indicating poor fit.

Overall, none of the models achieved a satisfactory fit, as indicated by the high chi-square values, poor CFI/TLI indices, and unacceptable RMSEA values. While the bi-factor model showed the highest CFI (0.787), its RMSEA was the highest, suggesting a trade-off between complexity and model fit. These results indicated that the proposed competency models required further refinement, such as adjusting factor structures, adding correlations, or considering alternative frameworks, to capture the competency dimensions of double-qualified teachers better.

Table 4 Model comparisons

	$\Delta\chi^2$	Δdf	p.=value	ΔCFI	ΔTLI	ΔRMSEA
One Factor VS Bi-Factor	140.078	18	0.000	-0.023	0.035	-0.011
Multiples VS Bi-Factor	19.371	8	0.000	-0.003	0.028	-0.009
2nd-order VS Bi-Factor	52.456	13	0.000	-0.008	0.038	-0.012

Table 4 presents the model comparisons for the double-qualified teacher competency framework, using chi-square difference tests and changes in fit indices (ΔCFI, ΔTLI, ΔRMSEA). The results indicated that the bi-factor model provided a statistically significant improvement over all other models (p = 0.000 for all comparisons). However, the changes in fit indices suggested only marginal improvements. Compared to the one-factor model, the bi-factor model showed a reduction in CFI (ΔCFI = -0.023), indicating slightly worse comparative fit, but TLI increased by 0.035 and RMSEA improved by 0.011, suggesting better absolute fit.

The multiple-factor model comparison showed minimal differences, with only slight improvements in TLI (ΔTLI = 0.028) and RMSEA (ΔRMSEA = -0.009), implying that the bi-factor model did not substantially outperform the multiple-factor model.

Overall, while the bi-factor model statistically outperformed the alternative models, the improvements in model fit were relatively small. The slight decline in CFI across comparisons indicated that the bi-factor model did not necessarily provide a superior representation of the data. These findings suggested that while the bi-factor structure captured additional variance, further refinements were needed to enhance model fit and better explain the competency dimensions of double-qualified teachers.

3. Model modification

The bi-factor model is not fit, the researchers made adjustments to this model, and the revised model is as follows:

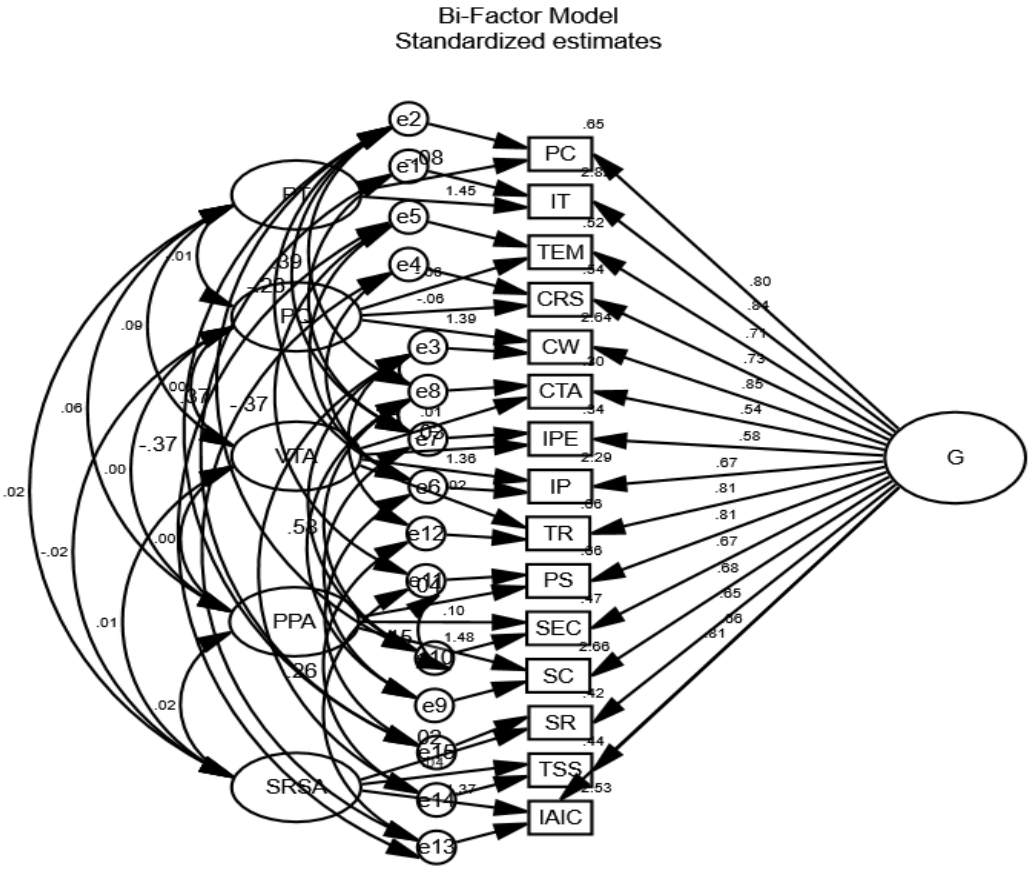


Figure 5 Bi-factor model modification

Figure 5 showed the bi-factor model after modified until model fit. This bi-factor model presents standardized estimates. Structurally, the path relationships between the general factor G, multiple specific factors, and observed variables are clearly displayed. The path coefficients (factor loadings) reflect the explanatory power of different latent constructs on the observed indicators. In terms of model fit indices, the chi - square value is significant, but it is affected by the sample size and needs to be considered in conjunction with other indices. A relative chi - square of 3.271 is acceptable. A CFI of 0.980 and a TLI of 0.955 indicate a good model fit, and an RMSEA of 0.073 is also within an acceptable range. Overall, this bi-factor model is quite appropriate in terms of structural setting and data fit.

Quality of bi-factor model after modified

Table 5 Standardized Factor Loadings, AVE, and Composite Reliability

Observed variables	General Factor Loading (G)	Specific Factor Loading	Specific Factor	Error Variance	AVE	CR
PC	0.65	0.26	PPA	1.45	0.451	0.843
IT	0.52	0.52	PPA	1.39		
TEM	0.8	-0.06	PPA	1.39		
CRS	0.71	0.64	PPA	1.36		
CW	0.77	0.4	PPA	1.36		
CTA	0.73	0.54	PPA	1.29		
IPE	0.85	0.29	PPA	1.36		
IP	0.54	-0.1	VTA	1.48	0.393	0.762
TR	0.58	0.68	VTA	1.48		
PS	0.67	-0.08	VTA	1.26		
SEC	0.81	-0.37	SRSA	1.26	0.466	
SC	0.67	0.42	SRSA	1.42		
SR	0.76	0.44	SRSA	1.32		
TSS	0.61	0.53	SRSA	1.33		
IAIC	0.65	0.53	SRSA	1.33		0.815
General Factor (G)					0.583	0.932

The results of the bi-factor analysis indicated that all observed items loaded significantly on the general factor (G), with standardized loadings ranging from 0.52 to 0.85, suggesting a strong underlying competency construct that is consistent across domains. Specific factors—Professional Practice Area (PPA), Value and Teaching Attitude (VTA), and Student Related Skills and Attitudes (SRSA)—showed additional variance contributions, although some loadings were weak or negative (e.g., TEM = -0.06, SEC = -0.37), implying limited unique variance beyond the general factor for these items. The general factor demonstrated adequate convergent validity (AVE = 0.583) and excellent composite reliability (CR = 0.932), exceeding the thresholds recommended by Fornell and Larcker (1981) and Hair et al. (2019). Among specific factors, PPA approached acceptable convergent validity (AVE = 0.451), while all exhibited acceptable composite reliability (CR: PPA = 0.843, VTA = 0.762, SRSA = 0.815). These findings support the dominance of a general competency factor while highlighting moderate contributions from domain-specific dimensions, aligning with the conceptualization of bi-factor models (Reise, 2012).

Discussion

Competency Models

The findings of this study confirm that Spencer's Competency Dictionary provides a robust theoretical foundation for assessing the professional competencies of double-qualified teachers in higher vocational colleges. Using this framework, four competing models were constructed: the one-factor, multiple-factor, second-order factor, and bi-factor models. These models represent alternative conceptualizations of how teacher competencies are structured, ranging from a single overarching dimension to models that separate competencies into specific, interrelated sub-domains.

Qualities of Alternative Models

Initial evaluations of all four models indicated generally acceptable measurement quality, as evidenced by significant factor loadings and correlations among indicators. However, the bi-factor model consistently demonstrated superior psychometric properties. While the initial fit indices for the bi-factor model (CFI = 0.787, TLI = 0.689, RMSEA = 0.191) suggested suboptimal absolute fit, the model offered the unique advantage of capturing both the general competency factor and domain-specific factors, which is conceptually aligned with the multi-dimensional nature of teacher competence in vocational education. Through model refinement, including the addition of residual correlations and adjustment of factor structures, the modified bi-factor model achieved excellent fit (CFI = 0.980, TLI = 0.955, RMSEA = 0.073), confirming both its statistical robustness and theoretical plausibility. This outcome illustrates the importance of iterative model evaluation in CFA studies, especially when addressing complex constructs such as teacher competencies that combine personal traits, professional skills, and applied knowledge.

Best-Fit Professional Competency Model

The final modified bi-factor model emerged as the most appropriate framework for representing the competencies of double-qualified teachers. It accounts for a general competency factor (G) that underlies all observed variables, while simultaneously identifying five domain-specific sub-dimensions: Personal Trait – attributes such as charisma, interpersonal skills, and ethics. This structure aligns with both Spencer's competency framework and previous empirical studies in China (e.g., Jin, 2019; Yuan & Zhou, 2024), highlighting the interplay between general competency and specialized skill domains. Importantly, the bi-factor model addresses the limitations of simpler models, which either ignore sub-domain variance (one-factor) or fail to adequately capture the shared variance across dimensions (multiple-factor, second-order).

Implications and Theoretical Integration

The results underscore that effective double-qualified teachers are characterized by a combination of broad, general competencies and specific professional skills, supporting the notion that competency models should reflect both holistic and differentiated dimensions. This insight is critical for faculty development programs, recruitment, evaluation, and policy-making, particularly in rapidly evolving vocational contexts where industry-specific expertise, pedagogical adaptability, and innovation are required.

New Knowledge

From the study "Research on the Competency Model of Double-Qualified Teachers in Higher Vocational Colleges in Pingdingshan City, Henan Province, China", the following knowledge can be summarized:

Double-Qualified Teacher Competency Model

The most suitable model is the Bi-Factor Model, which includes a General Factor and five specific factors, namely:

Personal Trait – Personal Charisma (PC), Interpersonal Traits (IT), Teachers' Ethics and Manners (TEM)

Personal Quality – Care and Respect Students (CRS), Commitment to Work (CW)

Vocational Teaching Ability – Classroom Teaching Ability (CTA), Ideological and Political Education (IPE), Information Processing (IP), Teaching Research (TR)

Professional Practice Ability – Practical Skill (PS), School-Enterprise Cooperation (SEC), Skill Competition (SC)

Scientific Research & Social Service Ability – Scientific Research (SR), Transform Scientific Research and Serve Society (TSS), Innovation Ability and Innovation Consciousness (IAIC)

Recommendations

Based on the research results and data analysis, the researchers have made the following recommendations.

Recommendation for policy formulation

1. Formulate the Management Measures for Dual-Qualified Teacher Training to enhance teachers' professional skills through multiple pathways.

2. Revise the Annual and Contract Period Assessment Management Measures for Faculty in Higher Vocational Colleges.

3. Amend the Management Measures for Faculty Title Evaluation in Higher Education Institutions. The evaluation of senior academic titles in the teaching series shall require the attainment of at least an intermediate-level Dual-Qualified Teacher Certificate.

Recommendation for Practical Applications

1. In terms of teacher training, we will take on-the-job training in enterprises and participation in enterprise practices as a long-term training goal. Meanwhile, we will select outstanding teachers to participate in training programs such as the Teaching Ability Enhancement Training Program for Young Teachers in Higher Education Institutions, the Teacher Quality Improvement Program for Vocational Colleges (including the "Double-qualified Teacher" Enterprise Practice Project, which involves 1-2 months of full-time practice in enterprises during the summer vacation), the 1+X Certificate System Teacher Training (focusing on assessor training for vocational skills certificates), and the "Summer Key Teacher Training Program" organized by the Henan Provincial Department of Education (covering topics such as information-based teaching and the construction of high-quality courses). We will also enhance the cultivation of information-based teaching capabilities: carry out information-based teaching training to improve teachers' ability to use online teaching platforms, virtual simulation software and other information-based tools, enrich teaching resources and forms. We will apply the achievements of artificial intelligence technology to daily teaching.

2. In terms of teacher assessment and evaluation, we will conduct annual and tenure-based evaluations, add assessment targets such as skills training, social services and scientific and technological services, dynamically monitor teachers' completion of these targets, and link the evaluation results to teachers' title evaluation, performance assessment and job promotion, to motivate teachers to actively enhance their own capabilities.

3. In terms of school-enterprise cooperation, we will establish a regular mechanism for teachers' on-the-job training in enterprises: stipulate that teachers must spend a certain amount of time each year working in enterprises, participating in actual production and management, understanding the latest technologies and development trends in the industry, and accumulating practical experience. We will also build an exchange and collaboration platform: establish a school-enterprise talent exchange and collaboration community, jointly carry out technological research and development and innovation, and create a platform for job exchange, social

services, technology promotion and personnel interaction, providing support for teachers' practical training, technological research and development and social services.

4. In terms of strengthening team building, we will form "double-qualified" teaching teams: form teaching teams composed of full-time teachers from the school and part-time teachers from enterprises based on professional units, jointly carry out course construction, textbook compilation, teaching research and other work, promoting communication and cooperation between full-time and part-time teachers.

Recommend for Further Research

1. In terms of topic selection, considering human and financial resources as well as feasibility, the focus was mainly on universities within Pingdingshan City, Henan Province. The results and conclusions of this research are limited. If further research were conducted in other cities of Henan Province or across the country, and comparative studies were carried out, a better understanding of the competence of dual-qualified teachers could be achieved.

2. This research only obtained data from teachers and did not collect data from students or enterprise managers. As the recipients of education, students' evaluations of teachers' competence should also be given due attention. If data could be obtained from students, the results might be different and more conducive to the analysis of the competence of university teachers.

3. The purpose of this research is to provide constructive guidance for the cultivation and improvement of the competence of dual-qualified teachers in universities. The application results of this model still need further verification and practical suggestions have not been realized.

References

Ardiana, etal. (2024). Fostering Student Motivation Through Teacher Competence. *Edukasia, 5*(1), 751-758.

Arifin M A, & Rasdi R M. (2017). The competent vocational college teacher: A proposed model for effective job performance. *International Journal of Academic Research in Business and Social Sciences,* 7(2), 829-837.

Bo, Yang.et al. (2024). Construction of Human Resource Manager Competency Model Based on Data Mining Technology in Cross-Cultural Background. *International Journal of Information Technologies and Systems Approach, 17*(1), 1-17.

Cheng Qi, Liu Zhao, and Weijun Li. (2024). The Internal Structure and Influence Mechanism of Double Qualified-Teachers' Quality and Competence. *Education and Urban Society. Education and Urban Society, 57*(1), 13-39.

Daminov O, et al. (2020). The role of competence and competent in preparing professional training teachers for professional activity. *International Journal of Advanced Science and Technology,29*, 6338-6349.

Farhat,etal. (2024). Teaching Competencies Based on Comparative Assessment at Diverse School Levels. *Pakistan journal of humanities and social sciences, 12*(1), 259-270.

Jin, Lishu. (2019). Construction of "double-qualified" teacher teams in higher vocational colleges based on competency theory. *Education and Career*. 53-56

Ministry of Education of the People's Republic of China. (2021). *Implementation Plan for Improving the Quality of Vocational College Teachers (2021-2025).* Beijing: Ministry of Education of the People's Republic of China.

Mutiara, D. (2022). Teacher Competence In Industrial Revolution Era 4.0. *The Social Perspective Journal, 1*(4), 259-266.

People's Government of Henan Province. (2019). *Complementation Plan for Vocational Education Reform in Henan Province*. Zhengzhou: People's Government of Henan Province.

People's Government of Henan Province. (2022). *Implementation Opinions on Promoting the High-Quality Development of Modern Vocational Education*. Zhengzhou: People's Government of Henan Province.

Senita, etal. (2024). Research Trends in Teacher Digital Competencies: A Bibliometric Review. *Jurnal Varidika,* 31-49.

The Education Department Henan Province. (2023). *Publicity on the results of the identification of double qualified teachers in vocational education in Henan Province*. The Education Department Henan Province: https://jyt.henan.gov.cn/2023/06-30/2770128.html

The Education Department Henan Province. (2024). *Publicity on the results of the identification of double qualified teachers in vocational education in Henan Province*. The Education Department Henan Province: https://jyt.henan.gov.cn/2024/07-22/3025516.html

Wahyuni, D. S,et al. (2020). *Analysis on vocational high school teacher competency gaps: Implication for VHS teacher training needs*. In Journal of Physics: Conference series (Vol. 1516, No. 1, p. 012051).

Wei, Li. et al. (2022). *Teacher Competency Model in Human Resource Management: International Economic and Legal Experience in Chinese Universities under Digitalization.* Journal of Hygienic Engineering and Design.

Yong, Deng.et al. (2024). *Building a Hierarchical and Classified "Two-Way" Training System and Cultivating a Dual-Teacher Innovative Teaching Team Through School-Enterprise Cooperation*. Education reform and development,37-39.

Yuan Shujun & Zhou Yongxin. (2024). A Study on the Construction of double qualified teacher Competency Model: A case study of Hunan Polytechnic College of Engineering. *Economi*st, 59-63.

Zhu Rui. (2019). *Developing a competency model for double qualified teachers based on Factor Analysis Method*. In Proceedings of the 2019 Annual Meeting on Management Engineering,77-80.