Digital Competence and Talent Training Effectiveness in Vocational Undergraduate Education: Evidence from a Faculty Survey in China

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Abstract. This research investigates the influence of faculty digital competence on talent cultivation effectiveness within China's vocational undergraduate sector, contextualized by the country's evolving modern vocational education system. As digital transformation reshapes both industry demands and educational practices, understanding how teacher capabilities influence talent cultivation has become increasingly important. Leveraging survey responses from 298 instructors and employing structural equation modeling (SEM), the study empirically examines how educators' digital proficiencies shape outcomes in applied talent development. The analysis yields a robust, statistically significant positive effect of digital competence on training efficacy. Specifically, higher levels of digital competence are linked to improved student skill development, better alignment between training outcomes and labor market requirements, and enhanced overall educational performance. The measurement model exhibits robust psychometric properties: both Cronbach's alpha and composite reliability surpass established benchmarks, and fit indices confirm an acceptable to excellent model-data alignment. In doing so, the work contributes novel micro-level evidence on the centrality of instructor capabilities—particularly within the relatively underexamined landscape of vocational undergraduate education—thereby addressing a salient gap in current scholarship. It further extends existing studies on digital competence by highlighting its function as a key enabling capability that enhances the productivity and relevance of talent training. These insights carry substantial practical relevance: they highlight the imperative for institutions to place faculty digital literacy at the core of professional development initiatives, systematically embed digital tools into pedagogical practice, and strengthen curricular alignment with dynamic industry demands.

Keywords: digital competence; educational effectiveness; vocational higher education; digital transformation; teacher capability; China

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1 Introduction

The accelerated evolution of the digital economy and artificial intelligence has catalyzed a fundamental transformation in global production paradigms, industrial configurations, and occupational skill demands (Zhang, 2023[1]). Within this evolving landscape, higher education systems—especially those in emerging economies navigating structural economic shifts—are increasingly charged with the mission of cultivating advanced technical and skilled human capital. In China, vocational undergraduate education, as a recently formalized tier of higher learning, serves as a strategic conduit that aligns academic training with the dynamic requirements of the labor market. Unlike traditional academic-oriented universities, vocational undergraduate institutions emphasize the development of applied competencies, practical skills, and industry-oriented capabilities (Liu, 2025[2]). However, in these institutions, the efficacy of talent development hinges critically on instructors' ability to navigate digital transformation and meaningfully embed emerging technologies into their pedagogical practice.

In the contemporary digital landscape, educator digital competence is increasingly regarded as a foundational professional competency. It extends beyond technical proficiency with digital tools to encompass data-informed decision-making, the pedagogical orchestration of technology-enhanced learning environments, and adaptive responsiveness to emergent technological shifts. A growing body of scholarship has linked this multifaceted capability to improved instructional quality, heightened learner engagement, and the enactment of innovative teaching practices (Hidayat-Ur-Rehman, 2024[3]; Dang et al., 2024[4]). Nevertheless, most of the current literature focuses on general higher education contexts or K–12 education systems, with limited attention given to vocational undergraduate education (Casal-Otero et al., 2023[5]; Yim and Su, 2025[6]). More importantly, empirical evidence on how teachers' digital competence affects talent training outcomes in applied-oriented higher education remains insufficient, particularly in the context of China's vocational education reform.

The unique positioning of vocational undergraduate education further accentuates the centrality of digital competence. Specifically, as industries undergo accelerated digitalization, graduates must now command not only domain-specific technical proficiencies but also robust digital literacies and the capacity to operate effectively within technology-mediated work environments (Pasi and Dhamak, 2025[7]). The implementation of digital teaching tools, such as learning management systems, artificial intelligence-assisted instruction, and data-driven learning analytics, requires teachers to develop advanced digital competencies (Konstantinidou et al., 2026[8]). Without such capabilities, it is difficult for institutions to achieve the goal of cultivating high-quality applied talents aligned with industrial upgrading and technological innovation.

Against this background, this study examines the critical relationship between faculty digital proficiency and talent training effectiveness within the distinctive context of China's vocational undergraduate education. Using survey data collected from faculty members in vocational undergraduate institutions in China, this study develops a quantitative framework to assess whether and to what extent digital competence is associated with improved talent training outcomes. In contrast to studies relying on

macro-level or institutional data, this research adopts a micro-level perspective, focusing on individual teachers as the key agents of educational transformation. By emphasizing instructor-level capabilities, the study provides granular empirical evidence that digital competence is closely related to key educational outcomes.

This study contributes to scholarly discourse by addressing an important gap in the existing literature. First, it advances research on digital competence by situating the analysis within the context of vocational undergraduate education—a domain that remains relatively underexplored in prior studies. Second, it enriches the field of talent development by empirically examining the relationship between teacher capabilities and training effectiveness using survey data. Third, the findings not only deepen theoretical understanding of human capital development in applied disciplines, but also offer practical policy implications for improving educational quality in response to the intertwined dynamics of digital transformation and industrial upgrading.

2 Literature Review

2.1 Digital Competence in Education

The swift diffusion of digital technologies and artificial intelligence has established digital proficiency as a core competency underpinning contemporary educational ecosystems. Broadly conceived, it denotes the capacity of individuals to strategically deploy digital tools, critically engage with information, and seamlessly embed technology into the execution of professional or learning-related tasks (Vuorikari et al., 2022[9]). Within educational settings, educators' digital competence transcends mere technical fluency, encompassing the pedagogical orchestration of digital resources, data-informed practice, and the design of innovative instructional strategies (Caena and Redecker, 2019[10]).

Empirical evidence indicates that educators' digital competence is instrumental in fostering learning environments enriched by technology. For example, Nikolopoulou et al. (2021[11]) argue that teachers' readiness to integrate digital technologies determines the effectiveness of technology adoption in classrooms. Similarly, Scherer et al. (2019[12]) find that digital competence significantly influences teachers' ability to design interactive and student-centered learning experiences.

Furthermore, contemporary scholarship increasingly conceptualizes digital competence as a multifaceted construct, encompassing technical fluency, data literacy, and the pedagogical use of digital technologies (Falloon, 2020[13]; Instefjord and Munthe, 2016[14]). These dimensions are particularly relevant in vocational education, where teaching requires a strong connection between technological tools and practical skill development.

However, most existing studies focus on primary, secondary, or general higher education contexts, while empirical evidence in vocational undergraduate education remains limited. In particular, the role of teachers' digital competence in shaping applied talent cultivation outcomes has not been sufficiently explored. This gap motivates the present study.

2.2 Talent Training Effectiveness in Vocational Education

Talent training effectiveness is a central concern in vocational and applied higher education, as these systems aim to cultivate graduates who can meet the demands of rapidly evolving labor markets. Prior research generally conceptualizes training effectiveness in terms of students' skill acquisition, employability, and the alignment between education and industry needs (Jackson, 2016[15]).

A large body of literature highlights the importance of curriculum design, industry collaboration, and experiential learning in improving training outcomes (Dressier et al., 2011[16]). For example, Martin et al. (2023[17]) emphasizes that workplace-based learning plays a critical role in developing practical competencies, while Jackson (Cotronei-Baird, 2020[18]) finds that employability outcomes depend heavily on the integration of academic and practical skills.

Concurrently, scholarly attention has increasingly turned toward the implications of this digital transformation for talent development paradigms. Digital technologies facilitate adaptive, learner-centered, and data-informed instructional processes that have the potential to strengthen both student engagement and academic achievement (Song et al., 2024[19]). However, the ultimate efficacy of these technological innovations is contingent upon their pedagogical integration by educators.

Despite these advances, existing studies predominantly focus on institutional factors, such as curriculum systems and school–enterprise cooperation, while relatively less attention has been paid to teacher-level capabilities. In particular, despite this recognized centrality of the instructor, there remains a paucity of micro-level empirical research that systematically investigates how faculty competencies directly shape talent cultivation outcomes in the specific context of vocational undergraduate education.

2.3 Linking Digital Competence to Educational Effectiveness

The relationship between digital competence and educational effectiveness has attracted increasing scholarly attention. Grounded in human capital theory, educator competencies are regarded as pivotal inputs shaping educational productivity, given their direct bearing on instructional quality and student academic attainment (Hanushek and Rivkin, 2010[20]).

Empirical evidence consistently indicates a positive relationship between educators' digital competence and both instructional effectiveness and student academic outcomes. For instance, (Chiu et al., 2024[21]) find that teachers with higher digital competence are more likely to adopt innovative teaching practices, which in turn enhance student engagement. Similarly, (Gil-Flores et al. 2017[22]) demonstrate that digital competence contributes to improved instructional effectiveness and learning outcomes.

From a constructivist perspective, digital technologies facilitate interactive and learner-centered environments, but their effectiveness depends on teachers' ability to design meaningful learning experiences (Ertmer and Ottenbreit-Leftwich, 2010[23]). Educators who possess greater digital competence are more capable of embedding digital tools into pedagogical practices, thereby fostering more effective learning experiences.

In addition, technology adoption theory suggests that the benefits of digital technologies are contingent on users' capabilities and readiness (Venkatesh et al., 2003[24]). Educators exhibiting greater digital proficiency are more inclined to adopt and strategically deploy advanced technologies in instructional contexts, thereby contributing to enhanced educational quality. While these studies provide valuable insights, most of them focus on general education settings or examine teaching outcomes such as student engagement and academic performance. Few studies explicitly analyze the impact of digital competence on talent training effectiveness in vocational undergraduate education, particularly using micro-level survey data and structural equation modeling approaches.

2.4 Research Gap and Contribution

Based on the above review, three main gaps can be identified.

First, existing studies on digital competence largely focus on general education contexts, with limited attention to vocational undergraduate education, where the integration of technology and practical skills is particularly critical. Second, prior research on talent training effectiveness tends to emphasize institutional and curricular factors, while the role of teacher-level capabilities remains underexplored. Third, Empirical research systematically investigating the link between digital competence and talent development efficacy—particularly through micro-level data and robust quantitative methodologies—remains notably scarce.

To address these gaps, this study leverages primary survey data from China's vocational undergraduate institutions to probe the association between faculty digital competence and the efficacy of talent cultivation. By employing structural equation modeling, this study furnishes novel empirical insights into how instructor capabilities serve as a critical catalyst for shaping educational outcomes within the applied-oriented paradigm of higher education.

3 Theoretical Analysis and Hypothesis Development

The effectiveness of talent training in vocational undergraduate education depends on whether teaching activities can transform instructional inputs into students' employable competencies in an efficient and industry-relevant manner. Within the ongoing landscape of digital transformation, the efficacy of talent cultivation is fundamentally mediated by educators' digital proficiency. This construct transcends mere technical fluency with digital instruments, encompassing a broader pedagogical and cognitive skill set; rather, it reflects a composite ability to integrate digital platforms, analyze educational data, redesign teaching processes, and incorporate emerging technologies such as artificial intelligence into instruction. As vocational undergraduate education aims to cultivate high-level applied talents for technology-intensive industries, digital competence becomes a productive input that directly affects the quality of talent training.

To formalize this relationship, this study conceptualizes talent training as an educational production process. Let T denote talent training effectiveness, which reflects the

extent to which students acquire practical skills, digital literacy, and labor-market adaptability. Assume that talent training effectiveness is jointly determined by teachers' instructional effort *e*, students' absorptive capacity *s*, curriculum-industry alignment *m*, and teachers' digital competence *d*. The basic production function can be expressed as:

$$T = A(d) \cdot F(e, s, m) \tag{1}$$

where $A(d)$ denotes the efficiency term associated with teachers' digital competence, and $F(\cdot)$ is the core educational production function. Equation (1) implies that digital competence does not merely add another input into teaching; instead, it enhances the productivity of existing instructional inputs by improving the efficiency with which teaching effort is transformed into student outcomes. In other words, digital competence functions as an enabling capability that raises the marginal output of teaching activities.

For the purpose of empirical tractability, the analytical model adopts a Cobb–Douglas production function specification:

$$T = A(d)e^{\alpha}s^{\beta}m^{\gamma},\ \alpha > 0, \beta > 0, \gamma > 0 \tag{2}$$

and let the efficiency term be specified as:

$$A(d) = e^{\phi d},\ \phi > 0 \tag{3}$$

Substituting Equation (3) into Equation (2) yields:

$$T = e^{\phi d}e^{\alpha}s^{\beta}m^{\gamma} \tag{4}$$

Taking logarithms on both sides gives:

$$lnT = \phi d + \alpha lne + \beta lns + \gamma lnm \tag{5}$$

Equation (5) shows that digital competence exerts a direct positive effect on talent training effectiveness through the coefficient ϕ. If $\phi > 0$, then a higher level of digital competence improves the efficiency of the educational production process and thereby raises talent training effectiveness. This formulation provides a theoretical basis for the positive relationship examined later in the empirical analysis.

The underlying economic logic of this relationship can be further explained from three interrelated dimensions. First, digital competence improves the efficiency of instructional resource allocation. Teachers with stronger digital competence are better able to access, evaluate, and integrate digital teaching resources, thereby reducing information frictions and improving the precision of teaching delivery. In vocational undergraduate education, where practical knowledge and technological updating are especially important, such efficiency gains are likely to be substantial. Formally, if the effective teaching effort is denoted by $e^{*} = d \cdot e$, then higher digital competence enlarges the productivity-adjusted teaching effort, which increases the output elasticity of instructional input.

Second, digital competence enhances the degree of curriculum-industry matching. A key feature of vocational undergraduate education is that it does not pursue abstract

knowledge accumulation alone but seeks to cultivate competencies aligned with real occupational tasks and industrial upgrading. Teachers with stronger digital competence are more capable of embedding new technologies, digital workflows, and intelligent production scenarios into teaching content. This improves the alignment term m in Equation (2). If we further assume that:

$$m = m_0 + \delta d,\ \delta > 0 \tag{6}$$

then the derivative of talent training effectiveness with respect to digital competence becomes:

$$\frac{\partial T}{\partial d} = \frac{\partial A(d)}{\partial d} e^{\alpha} s^{\beta} m^{\gamma} + A(d) e^{\alpha} s^{\beta} \gamma m^{\gamma-1} \frac{\partial m}{\partial d} \tag{7}$$

Since $\frac{\partial A(d)}{\partial d} > 0$ and $\frac{\partial m}{\partial d} = \delta > 0$, it follows that:

$$\frac{\partial T}{\partial d} > 0 \tag{8}$$

Equation (8) indicates that digital competence improves talent training effectiveness through both an efficiency-enhancing channel and a curriculum-matching channel. Even without explicitly testing these channels in the empirical section, the model clarifies why the overall effect should be positive.

Third, digital competence increases the adaptability of teaching to heterogeneous student needs. In practice, students differ substantially in learning pace, digital literacy, and prior knowledge. Teachers with stronger digital competence can use data analytics, learning management systems, and intelligent assessment tools to identify student differences and adjust instructional arrangements more efficiently. This means that digital competence also improves the realization of student absorptive capacity s, because teaching can be more accurately matched to students' actual learning conditions. If effective absorptive capacity is written as $s^* = s(1 + \eta d)$, where $\eta > 0$, then digital competence again raises the marginal productivity of talent training.

Theoretically, this conceptual framework is grounded in an integrated perspective that draws upon human capital theory, constructivist learning principles, and models of technology adoption. Human capital theory suggests that teacher competence is a key source of educational productivity because it determines the quality of knowledge transmission and skill formation. In particular, constructivism posits that learners actively co-create knowledge through experiential engagement, collaborative problem-solving, and contextually embedded activities—processes that are significantly amplified within digitally enhanced instructional settings. Technology adoption theory further implies that the value of educational technologies depends not only on their availability but also on teachers' capacity to absorb and use them effectively. Thus, digital competence should be understood as a strategic teaching capability that shapes both the efficiency and relevance of talent cultivation.

Taken together, the above analysis suggests that digital competence affects talent training effectiveness not as a superficial technological attribute, but as a foundational capability embedded in the educational production function. It enhances the productiv-

ity of teaching effort, improves curriculum-industry alignment, and strengthens the responsiveness of instruction to student heterogeneity. Therefore, when teachers possess higher digital competence, vocational undergraduate institutions are more likely to achieve better talent training outcomes.

Based on the foregoing theoretical analysis, this study formulates the following hypothesis:

H1: Teachers' digital competence is positively associated with talent training effectiveness in vocational undergraduate education.

4 Research Design

4.1 Data and Sample

This study employs a survey-based approach to examine the relationship between faculty digital competence and talent training effectiveness in China's vocational undergraduate education sector. Primary data were collected through a standardized questionnaire administered to faculty members from several vocational undergraduate institutions in Guangdong Province. The target population consisted of full-time teachers directly engaged in teaching activities, as they are the primary actors in integrating digital technologies into instructional processes and influencing student learning outcomes. A total of 320 questionnaires were distributed. After excluding incomplete, inconsistent, or otherwise invalid responses, a final sample of 298 valid questionnaires was retained, yielding an effective response rate of 93.13%.

The sample covers a range of demographic and professional characteristics, including gender, age, teaching experience, academic rank, and disciplinary background. Respondents were drawn from several applied fields, such as engineering, management, information technology, and education. In addition, a considerable proportion of respondents reported experience in practice-oriented teaching and industry–education collaboration, which enhances the relevance of the sample to the context of vocational undergraduate education.

4.2 Variable Measurement

All constructs were assessed on a five-point Likert-type scale, anchored at 1 ("strongly disagree") and 5 ("strongly agree"). The questionnaire design followed established practices in educational and management research and was aligned with the conceptual structure developed in the theoretical analysis. Since both digital competence and talent training effectiveness are multidimensional constructs, the measurement strategy in this study emphasizes latent-variable modeling rather than reliance on a single observed indicator.

4.2.1 Digital Competence (DC).

Digital competence is the principal independent variable in this study and is conceptualized as a multidimensional construct reflecting educators' ability to effectively integrate digital technologies into teaching and learning practices. Consistent with the conceptual framework developed earlier, digital competence is measured through four dimensions: technical application, data literacy, instructional innovation, and artificial intelligence application.

Technical application refers to teachers' ability to use digital platforms and tools in classroom settings. Data literacy captures the ability to collect, interpret, and apply teaching-related data in instructional decision-making. Instructional innovation reflects the extent to which teachers adopt technology-enhanced pedagogical approaches. Artificial intelligence application denotes teachers' ability to use AI tools and evaluate AI-generated content in educational contexts. Each dimension is measured through multiple questionnaire items, and digital competence is modeled as a latent construct in the subsequent structural equation analysis.

4.2.2 Talent Training Effectiveness (TTE).

Talent training effectiveness is the dependent variable of this study. It denotes the degree to which vocational undergraduate programs effectively foster students' competency acquisition and ensure their alignment with prevailing labor market demands. Consistent with the educational production logic outlined in the theoretical section, this construct is measured through three dimensions: student ability enhancement, employability matching, and overall evaluation.

Student ability enhancement captures improvements in students' practical skills, digital literacy, and problem-solving abilities. Employability matching reflects the degree to which students' competencies correspond to industrial and occupational demands. Overall evaluation represents teachers' general assessment of the effectiveness of talent cultivation in their institutions. Similar to digital competence, talent training effectiveness is treated as a latent variable constructed from multiple observed indicators.

4.2.3 Control Variables.

To address potential omitted variable bias, the analysis incorporates a range of control variables capturing both individual-level and institutional-level attributes. At the individual level, the control variables include gender, age, educational attainment, academic rank, and teaching experience. These variables are commonly associated with differences in teaching style, professional capacity, and technology adoption.

At the institutional level, the study further controls for factors related to the digital teaching environment, including participation in digital or AI-related training, frequency of digital tool usage, and perceived institutional support for digital teaching. In addition, school type and regional location are included to account for possible differences in institutional resources and educational conditions. These variables were coded numerically for empirical estimation.

4.3 Reliability and Validity

Given that the analysis is based on latent constructs measured through multi-item scales, the measurement model must first be evaluated in terms of reliability and validity before examining the structural relationships. Accordingly, a series of standard psychometric tests were conducted.

First, internal consistency was assessed using Cronbach's alpha and composite reliability (CR). Cronbach's alpha reflects the internal consistency among items within each construct, while CR provides a reliability estimate commonly used in latent-variable models. As reported in the empirical results, all constructs exceed the conventional threshold of 0.70 on both indicators, suggesting satisfactory reliability.

Second, convergent validity was examined using standardized factor loadings and the average variance extracted (AVE). Significant factor loadings indicate that the observed indicators adequately represent their corresponding latent constructs, while AVE values above 0.50 suggest that each construct explains more than half of the variance in its indicators. In this study, all factor loadings are statistically significant and all AVE values exceed the recommended benchmark, indicating good convergent validity.

Third, discriminant validity was evaluated using the Fornell–Larcker criterion, which requires the square root of the AVE for each construct to be greater than its correlations with other constructs. The empirical results satisfy this condition for all constructs, confirming that the latent variables are conceptually related yet empirically distinct.

4.4 Model Specification

To empirically test the proposed relationship between digital competence and talent training effectiveness, this study posits a structural relationship in which talent training effectiveness is modeled as a function of digital competence and a set of control variables. In line with the theoretical analysis, the baseline structural relationship can be written as:

$$TTE_i = \alpha + \beta DC_i + \gamma X_i + \varepsilon_i \tag{9}$$

where TTE_i denotes talent training effectiveness, DC_i represents digital competence, X_i is a vector of control variables, and ε_i is the error term.

4.5 Estimation Strategy

The empirical analysis is conducted using covariance-based structural equation modeling (SEM). This approach is particularly suitable for the present study because it enables the simultaneous estimation of latent constructs and their interrelationships, while also correcting for measurement error. Compared with conventional regression methods, SEM provides a more rigorous framework for analyzing multidimensional variables such as digital competence and talent training effectiveness.

The estimation proceeds in two stages. First, confirmatory factor analysis (CFA) was performed to assess the psychometric properties of the measurement model, ensuring that each observed indicator exhibits a strong and theoretically coherent loading on its assigned latent construct. Second, the structural model is estimated to examine whether digital competence is positively associated with talent training effectiveness.

To assess the overall fit of the structural equation model (SEM), this study presents a set of commonly employed goodness-of-fit indices: the chi-square to degrees of freedom ratio (χ^2/df), the Comparative Fit Index (CFI), the Tucker–Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). In accordance with established benchmarks, an acceptable model fit is indicated when CFI and TLI values are greater than 0.90, while RMSEA and SRMR values fall below 0.08. As shown in the empirical findings, all reported fit statistics satisfy or surpass these thresholds, thereby affirming that the hypothesized model exhibits a satisfactory correspondence with the observed data.

5 Empirical Results

5.1 Descriptive Statistics and Correlation Analysis

Table 1 presents the descriptive statistics and correlation matrix for the key variables. The findings show that digital competence exhibits a relatively high mean score, suggesting that teachers in vocational undergraduate institutions have, on average, developed a certain level of digital capability. Similarly, the mean value of talent training effectiveness indicates that the overall performance of talent cultivation is at a moderate-to-high level.

The standard deviations of the variables show sufficient dispersion, which supports the feasibility of subsequent empirical analysis. More importantly, the correlation matrix reveals that digital competence is positively associated with talent training effectiveness at a statistically significant level. This initial evidence is consistent with the theoretical expectation that digital competence enhances the productivity of teaching inputs.

In addition, digital competence is positively correlated with its sub-dimensions, including instructional innovation and data literacy, suggesting that these components are closely interrelated within the broader construct. The correlation coefficients among the variables remain below the commonly accepted threshold for multicollinearity concerns, indicating that the empirical analysis is unlikely to be affected by serious collinearity issues.

Table 1. Descriptive Statistics and Correlation Matrix

Variables	Mean	SD	DC	TI	CI	IEI	TTE
DC	3.98	0.52	1				
TI	4.05	0.48	0.68***	1			
CI	3.92	0.5	0.64***	0.66***	1		
IEI	3.85	0.55	0.58***	0.60***	0.62***	1	
TTE	4.1	0.47	0.72***	0.70***	0.68***	0.63***	1

5.2 Reliability and Convergent Validity

Table 2 summarizes the results of reliability and convergent validity evaluations. All constructs demonstrate Cronbach's alpha values above the recommended cutoff, reflecting strong internal consistency among their respective measurement items. This conclusion is further reinforced by composite reliability estimates, which confirm that each latent variable is assessed with high reliability.

Moreover, all standardized factor loadings are both statistically significant and sufficiently large, indicating that the observed indicators adequately capture their associated latent constructs. Additionally, the average variance extracted (AVE) for every construct exceeds the 0.50 threshold, implying that more than 50% of the variance in its indicators is accounted for by the construct itself.

Taken together, these findings provide robust empirical evidence supporting the reliability and convergent validity of the measurement model, thereby affirming that the latent constructs employed in this study are both theoretically well-grounded and empirically sound.

Table 2. Reliability and Convergent Validity

Construct	Items	Cronbach's α	CR	AVE
DC	12	0.912	0.925	0.612
TI	6	0.893	0.907	0.621
CI	6	0.887	0.901	0.603
IEI	4	0.865	0.891	0.672
TTE	8	0.908	0.921	0.657

5.3 Discriminant Validity

Table 3 presents the findings of discriminant validity assessment based on the Fornell–Larcker criterion. In the matrix, diagonal entries correspond to the square roots of the average variance extracted (AVE) for each latent construct, whereas off-diagonal entries reflect inter-construct correlations.

The results reveal that, for every construct, its AVE square root exceeds all of its correlations with other constructs. This confirms that the constructs are empirically distinguishable and represent distinct conceptual domains.

Table 3. Discriminant Validity (Fornell–Larcker Criterion)

Variables	DC	TI	CI	IEI	TTE
DC	0.782				
TI	0.68	0.788			
CI	0.64	0.66	0.776		
IEI	0.58	0.6	0.62	0.82	
TTE	0.72	0.7	0.68	0.63	0.81

This finding is particularly important given the conceptual proximity between digital competence and talent training effectiveness. The evidence of discriminant validity confirms that these constructs, although related, represent different aspects of the educational process and should be treated as separate latent variables in the structural model.

5.4 Model Fit Evaluation

Prior to testing the structural relationships, it is essential to evaluate whether the model adequately represents the observed data. Table 4 presents the corresponding model fit indices.

The findings show that all goodness-of-fit measures satisfy widely accepted benchmarks. Specifically, the chi-square to degrees of freedom ratio (χ^2/df) falls within the acceptable range; both the Comparative Fit Index (CFI) and Tucker–Lewis Index (TLI) surpass the recommended threshold; and the Root Mean Square Error of Approximation (RMSEA) along with the Standardized Root Mean Square Residual (SRMR) remain below their respective cutoff values.

The findings collectively demonstrate that the integrated measurement and structural components exhibit a strong alignment with the empirical data, thereby validating the model's adequacy for examining the proposed theoretical relationships.

Table 4. Model Fit Indices

Fit Index	Value	Recommended Threshold
χ^2/df	2.31	< 3
CFI	0.952	> 0.90
TLI	0.941	> 0.90
RMSEA	0.057	< 0.08
SRMR	0.042	< 0.08

5.5 Structural Model Results

Table 5 presents the parameter estimates derived from the structural model. The path coefficient linking digital competence to talent training effectiveness is positive and statistically significant, suggesting that greater digital competence is associated with enhanced outcomes in talent training.

From an economic and educational perspective, the magnitude of the estimated coefficient suggests that digital competence constitutes a substantial predictor of talent training effectiveness rather than a marginal factor. This finding suggests that digital competence is pivotal in determining how effectively teaching inputs are converted into student competencies.

This result is consistent with the theoretical framework developed in Section 2. Specifically, digital competence enhances the productivity of instructional effort, improves the alignment between curriculum content and industry requirements, and increases the

adaptability of teaching to heterogeneous student needs. Through these channels, digital competence contributes to higher levels of talent training effectiveness.

Accordingly, the empirical evidence provides strong support for H1, confirming that digital competence is positively associated with talent training effectiveness in vocational undergraduate education.

Table 5. Structural Model Results

Path	Coefficient	Std. Error	t-value	p-value
DC → TTE	0.643***	0.052	12.37	0

6 Conclusion and Discussion

Based on survey data collected from faculty members in China's vocational undergraduate institutions, this study examines the relationship between teachers' digital competence and talent training effectiveness. The structural equation modeling results reveal a significant positive association between digital competence and talent training effectiveness, indicating that higher levels of digital competence are linked to stronger student skill development, better alignment with labor market demands, and improved overall training outcomes. These findings suggest that digital competence is not merely a supplementary teaching skill, but an important pedagogical capability associated with the quality of vocational undergraduate education in the context of digital transformation.

Theoretically, this study contributes to the literature by situating digital competence within the context of vocational undergraduate education and highlighting the role of teacher-level capabilities in shaping educational outcomes. Practically, the findings suggest that institutions should strengthen teacher training, promote the effective integration of digital technologies into teaching, enhance institutional support, and encourage closer collaboration with industry. However, several limitations should be acknowledged. The use of cross-sectional survey data limits causal interpretation, and the regional focus of the sample may affect the generalizability of the findings. In addition, the analysis concentrates on direct relationships without examining potential mechanisms. Future research may address these limitations by using longitudinal data and broader samples.

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