

Organizational Culture Influencing Teachers' Digital Competence in Higher Vocational Colleges

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ABSTRACT:

Despite sustained policy attention and infrastructural investment, the organisational and psychological mechanisms underpinning teachers' digital competence development remain insufficiently theorised. This study examines how organisational context and individual psychological factors jointly shape teachers' digital competence in higher vocational colleges (HVC). Survey data were collected from 409 teachers across five institutions and analysed using structural equation modelling (SEM) and bias-corrected bootstrapping procedures. The findings indicate that organisational culture, perceived organisational support, digital training opportunities, and teacher self-efficacy each exert significant positive effects on teachers' digital competence. Teacher self-efficacy functions as a partial mediator, transmitting the effects of organisational culture, perceived organisational support, and digital training opportunities to digital competence. Moreover, the results reveal significant sequential mediation pathways, demonstrating a cumulative transmission process whereby organisational culture influences perceived organisational support and digital training opportunities, which subsequently enhance teacher self-efficacy and digital competence. By conceptualising teachers' digital competence as an organisationally embedded and psychologically mediated capability, this study advances theoretical understanding of competence development and provides empirically grounded insights for digital transformation in higher vocational education.

Keywords: digital competence; organizational culture; perceived organizational support; digital training opportunities; self-efficacy

1. Introduction

Digital transformation has become a defining feature of contemporary education systems, reshaping teaching practices, professional roles, and institutional governance. Within this transformation, teachers' digital competence is widely recognised as a core prerequisite for effective technology integration and a key indicator of educational modernisation (McCarthy et al., 2023). In China, higher vocational colleges (HVC) play a strategic role in cultivating technically skilled and application-oriented talent, making teachers' digital competence particularly consequential for instructional quality, student learning outcomes, and the sustainable development of vocational education (Ping, 2025). As vocational institutions increasingly adopt smart campuses, online platforms, and blended teaching models, teachers are required not only to master digital tools but also to integrate them meaningfully into pedagogical practice (Ma et al., 2025).

Despite strong policy emphasis and continuous investment in digital infrastructure, the development of teachers' digital competence in higher vocational colleges remains uneven. Digital competence should not be understood merely as an individual technical skill; rather, it constitutes a complex professional capability embedded in organisational environments and shaped by institutional conditions (Zervas & Triantari, 2025). Vocational teachers often work under heavy teaching loads and strong practice-oriented demands, which constrain opportunities for sustained digital skill development (Gu et al., 2025). Moreover, the effectiveness of digital initiatives depends on whether organisational contexts provide adequate

support, learning opportunities, and psychological resources for teachers to engage in continuous professional growth (Brugliera, 2024).

Chengdu city, China, provides a particularly relevant empirical context for examining these dynamics. As a major hub of higher vocational education in western China and a pilot region for digital education reform, Chengdu's vocational colleges are closely aligned with regional development strategies and industrial upgrading (Gong & Zhang, 2024). These institutions face growing expectations to leverage digital technologies to support applied talent cultivation. At the same time, practical constraints persist, including uneven financial resources and notable variability in organisational culture across institutions. Consequently, even when digital infrastructure is available, teachers may differ substantially in their perceptions of organisational support, access to digital training opportunities, and confidence in implementing digital teaching. This combination makes Chengdu a representative and analytically valuable setting for investigating how organisational conditions influence teachers' digital competence.

In practice, the development of teachers' digital competence in higher vocational colleges is constrained by a combination of organisational and developmental challenges (Diachuk, 2024). Teachers may perceive organisational support as insufficient when institutional policies, incentives, or resources fail to align with the concrete demands of digital teaching (Kong et al., 2026). Weak innovation-oriented organisational culture can further limit collaboration, experimentation, and peer learning around digital pedagogy (Amankona et al., 2025). In addition, digital training opportunities may be fragmented or

overly technical, reducing their relevance to instructional practice and undermining teachers' confidence in applying digital tools (Mayantao & Tantiado, 2024). These challenges suggest that improving digital competence requires attention not only to the provision of training, but also to the broader organisational context in which teaching and professional learning are embedded.

From a scholarly perspective, existing research offers only partial explanations for these issues. Empirical studies have largely concentrated on general higher education or basic education, with relatively limited attention to higher vocational colleges. Many investigations focus on isolated predictors of digital competence or rely on descriptive analyses, providing limited insight into the mechanisms through which organisational environments shape teachers' competence. Although organisational culture, perceived organisational support, training opportunities, and self-efficacy have each been examined in prior studies, they are often treated independently rather than within an integrated explanatory framework. As a result, the internal transmission process linking organisational context to teachers' digital competence remains insufficiently theorised and empirically tested.

Against this background, the present study aims to examine how organisational culture influences teachers' digital competence in higher vocational colleges in Chengdu by integrating organisational, resource-based, and psychological perspectives. Specifically, the study pursues four research objectives:

RO1: To describe the overall level and distributional characteristics of teachers' digital competence in higher vocational colleges in

Chengdu, thereby providing an empirical baseline for subsequent model testing.

RO2: To test the direct effects of organizational culture, perceived organizational support, digital training opportunities, and teacher self-efficacy on teachers' digital competence using a structural equation modelling framework.

RO3: To examine the mediating mechanisms linking organizational antecedents to teachers' digital competence, with a particular focus on the sequential pathway in which digital training opportunities influence teachers' digital competence via teacher self-efficacy.

RO4: To elucidate an evidence-based mechanism model for enhancing teachers' digital competence in higher vocational colleges, drawing practical implications for institutional governance and professional development in the context of educational digital transformation.

2. Literature Review

2.1 Theoretical Framework

Building on organisational support theory, perceived organisational support is conceptualised as a key organisational resource through which organisational culture exerts influence on teachers' professional behaviour and competence development (Nugraha & Dekawati, 2023). Perceived organisational support reflects teachers' beliefs regarding the extent to which their institution values their contributions and is concerned with their professional well-being. Within higher vocational colleges, where teaching responsibilities are intensive and closely tied to practice-oriented instruction, such perceptions are particularly salient. When organisational culture promotes values such as professional

development, participatory governance, and recognition of instructional effort, teachers are more likely to interpret institutional policies and practices as supportive (Hsieh et al., 2025). In this study, perceived organisational support is therefore positioned as an endogenous organisational resource that mediates the relationship between organisational culture and teachers' engagement in digital teaching-related activities.

Within this framework, digital training opportunities are theorised as a concrete and operational manifestation of organisational support. Digital training opportunities are defined as teachers' perceived access to and appraisal of institutionally provided professional development activities, learning resources, and training programmes related to digital teaching (Maimun & Hakim, 2021). From a resource-based perspective, these opportunities function as enabling mechanisms that translate abstract organisational support into actionable learning conditions. In the context of higher vocational education, where digital instruction must align with skill-based training and industry standards, the perceived relevance, practicality, and continuity of training are critical (Zuo et al., 2025). Accordingly, digital training opportunities are modelled in this study as a proximal organisational resource shaped by organisational culture and perceived organisational support, and as a direct antecedent of teachers' digital competence.

Drawing on social cognitive theory, the framework further incorporates teacher self-efficacy as a central psychological mechanism linking organisational resources to competence outcomes. Teacher self-efficacy refers to teachers' beliefs in their capability to organise and execute

the actions required to accomplish specific instructional tasks (Salas-Rodriguez et al., 2025). In digital teaching contexts, this construct reflects confidence in integrating digital technologies into lesson design, classroom management, and student engagement. Social cognitive theory posits that self-efficacy develops through mastery experiences, social persuasion, and access to supportive environmental conditions (Bandura, 2001). In this study, both perceived organisational support and digital training opportunities are theorised to provide such conditions by offering encouragement, skill acquisition experiences, and institutional affirmation.

Within higher vocational colleges, access to meaningful digital training opportunities and sustained perceptions of organisational support can therefore strengthen teacher self-efficacy, which in turn facilitates the translation of organisational resources into effective digital teaching practice. Teacher self-efficacy is thus positioned as a psychological mediator that converts organisational inputs into teachers' digital competence, completing the proposed transmission process from organisational culture through organisational resources to individual capability development.

2.2 Hypothesis Development

Organisational culture (OC) provides the normative and symbolic infrastructure that shapes what teachers perceive as legitimate, valued, and rewarded within educational institutions (Cabrera Nuñez et al., 2025). In digital transformation contexts, innovation- and learning-oriented cultures tend to legitimise experimentation with technology-enhanced pedagogy and encourage sustained professional learning, whereas

risk-averse or bureaucratic cultures may suppress instructional trial-and-error (Joseph et al., 2024). Evidence across educational settings is mixed: some K–12 and higher education studies report strong positive links between innovation culture and teachers' digital capability (Purwanto & Sulaiman, 2023; Velyako & Musa, 2024), while other research in high-stakes accountability contexts finds that cultural encouragement does not always translate into deeper pedagogical integration (Tualaulelei & Halse, 2022). In higher vocational colleges, OC may be especially consequential because digital competence must support practice-based instruction and industry-aligned training tasks, increasing dependence on cultural endorsement. Even so, when resources are constrained, cultural aspirations may be insufficient to generate competence growth, which makes empirical testing necessary. Accordingly, we advance the following expectation.

H1: Organisational culture is positively associated with teachers' digital competence (TDC).

Organisational Support Theory (OST) posits that employees develop global beliefs about whether the organisation values their contributions and cares about their well-being, and these beliefs are shaped by consistent organisational cues (Li et al., 2022). Organisational culture functions as a key signalling system: norms of respect, recognition, and teacher development shape how teachers interpret institutional actions and policies. Prior findings vary by context: collegial and participatory cultures often predict stronger perceived organisational support (POS), whereas in highly hierarchical environments teachers may perceive similar initiatives as

compliance-oriented, weakening the relationship (Kurt & Duyar, 2023; Tawfig et al., 2025). In vocational institutions, where workloads and practice-training responsibilities are intense, culturally embedded recognition and developmental care may be particularly salient for POS formation (Shiri et al., 2023). At the same time, if cultural promises are not matched by tangible support, teachers may discount these signals and report lower POS. Therefore, we formulate the following proposition.

H2: Organisational culture is positively associated with perceived organisational support (POS).

From a Conservation of Resources perspective, organisational culture influences whether institutions prioritise, allocate, and sustain developmental resources that enable teachers to cope with new instructional demands. Learning- and innovation-oriented cultures are more likely to institutionalise professional development routines and invest in digital training infrastructures, increasing teachers' perceived digital training opportunities (DTO) (Amemasor et al., 2025). Cross-context evidence is not uniform: in some higher education systems, strong innovation cultures coincide with coherent, practice-based training, while in other settings "innovation" is framed as individual responsibility, producing fragmented access (Chigbu & Makapela, 2025). In higher vocational colleges, the cultural effect on DTO may be more pronounced because training must be tightly aligned with occupational curricula and practice-based teaching scenarios (Li et al., 2024). Conversely, compliance-oriented cultures can generate frequent training that is perceived as overly technical or misaligned, diminishing the salience of DTO despite

provision. On this basis, we put forward the next hypothesis.

H3: Organisational culture is positively associated with digital training opportunities (DTO).

Within OST, perceived organisational support shapes how teachers evaluate the credibility of institutional investments and whether they believe resources are genuinely available to them. When teachers perceive strong organisational support, they are more likely to report greater access to developmental resources and to interpret training provision as meaningful rather than symbolic (Li & Hashim, 2025). Evidence differs across educational contexts: in some systems, professional development is mandatory and thus less contingent on POS, while in others POS strongly predicts participation and perceived accessibility. In higher vocational colleges, time constraints and practical training duties often make discretionary engagement difficult, so POS may be particularly important for enabling access through workload accommodation and encouragement (Lee & Shin, 2023). Nevertheless, centrally standardised training systems may reduce POS–DTO associations by making access less flexible, even if support perceptions remain high. Hence, we state the following hypothesis.

H4: Perceived organisational support is positively associated with digital training opportunities

Social Cognitive Theory suggests that self-efficacy develops through supportive environments that provide feedback, social persuasion, and conditions for mastery experiences (Bandura, 2001). Perceived

organisational support can strengthen teacher self-efficacy (TSE) by signalling that teachers have institutional backing to cope with new demands and recover from setbacks during digital teaching implementation (Feng et al., 2025). Empirical results vary: in collaborative school cultures, support perceptions are often strongly associated with efficacy, whereas in high-pressure accountability contexts, support may not translate into efficacy if autonomy is constrained (García-Martín et al., 2023). In higher vocational settings, where teachers must integrate technology with practice-oriented training and evolving industry requirements, POS may be especially efficacy-relevant because it reduces uncertainty and legitimises iterative experimentation (Mekheimer, 2025). Still, if support is perceived as conditional or purely evaluative, it may not foster robust efficacy beliefs. Thus, we posit the following.

H5: Perceived organisational support is positively associated with teacher self-efficacy (TSE).

Social Cognitive Theory also implies that professional learning enhances efficacy when it generates authentic mastery experiences and reduces uncertainty about task performance (Wang et al., 2022). Digital training opportunities (DTO) can strengthen TSE by providing guided practice, modelling of effective digital pedagogy, and feedback that helps teachers interpret improvement (Khan, 2025). Findings across contexts are mixed: sustained, practice-embedded professional development tends to yield stronger efficacy gains, while one-off, tool-focused workshops often show limited effects. In vocational colleges, training that is discipline-responsive and connected to

workplace-oriented instruction is more likely to translate into confidence, because teachers can immediately apply learning to practical teaching tasks (Talafian et al., 2025). Conversely, overly technical or poorly contextualised training may increase perceived complexity and produce weaker efficacy gains. Consequently, we propose the following hypothesis.

H6: Digital training opportunities are positively associated with teacher self-efficacy (TSE).

Teachers' digital competence (TDC) is an applied capability requiring both knowledge acquisition and repeated opportunities to practise technology-integrated instruction (Nagel & Amdam, 2025). DTO can directly enhance TDC by providing structured resources, skill development, and practice-oriented learning experiences that support instructional design and implementation. Evidence across educational sectors is heterogeneous: coherent professional development is often associated with competence improvement, while fragmented training may raise awareness without producing deep pedagogical integration (Lipka et al., 2025). In higher vocational colleges, the impact of DTO may be stronger when training aligns with occupational curricula and assessment practices, enabling immediate transfer to practice-based instruction. However, if training is detached from classroom realities, improvements may be limited to technical proficiency rather than broader competence. For this reason, we articulate the next hypothesis.

H7: Digital training opportunities are positively associated with teachers' digital competence (TDC).

According to Social Cognitive Theory, self-efficacy influences persistence, effort, and resilience in the face of difficulty, which are central to sustained competence growth in complex domains such as digital teaching. Teachers with higher TSE are more likely to experiment with digital tools, persevere through implementation challenges, and refine instructional strategies over time, thereby accumulating higher TDC (Basilotta-Gómez-Pablos et al., 2022). Prior studies generally support this link, but effect sizes vary by context: where autonomy and peer support are strong, efficacy more readily translates into competence-related behaviours, whereas constrained environments may limit enactment opportunities (Zou et al., 2023). In vocational education, iterative adaptation is often necessary to align technology use with practical training tasks, making efficacy particularly consequential for competence development (Ye et al., 2024). Still, efficacy without adequate resources may not yield competence gains, implying the need to examine efficacy within the broader resource context. Accordingly, we hypothesise as follows.

H8: Teacher self-efficacy is positively associated with teachers' digital competence (TDC).

Integrating OST, COR, and SCT suggests that organisational culture (OC) affects teachers' digital competence through a layered mechanism rather than only a direct association. OC provides distal signals that shape POS (OST) and structures the availability and quality of DTO as developmental resources (COR). POS and DTO then create the supportive conditions and mastery-related experiences that strengthen TSE (SCT), which facilitates sustained enactment of

digital teaching and competence development. Empirical findings across education contexts are mixed regarding which conduit is strongest: in some higher education settings training pathways dominate, whereas in resource-constrained school contexts psychological empowerment often carries greater explanatory weight. For higher vocational colleges, the “environment–resources–psychology–ability” chain is theoretically plausible because practice-oriented workloads make both resource access (DTO) and efficacy (TSE) essential for translating culture into competence (Ye et al., 2024). In light of this integrated reasoning, we propose the following mediation hypotheses.

H9: Perceived organisational support mediates the relationship between organisational culture and teachers’ digital competence.

H10: Digital training opportunities mediate the relationship between organisational culture and teachers’ digital competence.

H11: Teacher self-efficacy mediates the relationship between organisational culture and teachers’ digital competence.

H12: Digital training opportunities and teacher self-efficacy sequentially mediate the relationship between organisational culture and teachers’ digital competence.

3. Method

3.1 Data Collection and Sample

The study targeted teachers and educational staffs working in higher vocational colleges in Chengdu, China. A stratified cluster sampling strategy was employed to ensure sample representativeness while maintaining feasibility in data collection. At the first stage, higher

vocational colleges in Chengdu were stratified according to institutional type (public and private), reflecting differences in governance structures, resource allocation, and digital development contexts. At the second stage, colleges within each stratum were treated as natural clusters, and a number of institutions were randomly selected from each group. Within the selected colleges, teachers and educational staff were further sampled to ensure diversity in academic discipline, professional role, and teaching experience. Where complete faculty rosters were available, respondents were selected through simple random sampling procedures. In cases where rosters were incomplete, proportional sampling by department or position was adopted to maintain balanced representation across institutional subgroups. This multi-stage sampling approach ensured that teachers from different subject areas and professional backgrounds were adequately represented.

Data were collected using a mixed-mode questionnaire survey combining paper-based and online formats. Questionnaires were distributed on-site in public areas of the selected colleges, such as classrooms, offices, and faculty activity spaces, and were completed under the supervision of the research team to ensure data quality. Online questionnaires were administered simultaneously through institutional communication channels to increase coverage and response efficiency. All questionnaires were completed voluntarily and anonymously.

A total of 500 questionnaires were distributed, and 409 completed questionnaires were returned, resulting in a response rate of 81.8%. Subsequently, a rigorous data screening process was conducted to exclude questionnaires

with substantial missing information, duplicate submissions, or logically inconsistent responses. Following these procedures, a sufficient number of valid questionnaires were retained for statistical analysis. Overall, the final sample exhibited a relatively balanced distribution across institutional types, academic disciplines, and professional roles, suggesting that it provides an adequate representation of teachers in Chengdu's higher vocational colleges.

3.2 Measurement

All variables in this study were measured using a self-administered questionnaire, with all items rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire included five core constructs: teachers' digital competence, self-efficacy, perceived organizational support, organizational culture, and digital training opportunities.

Teachers' digital competence was measured using an 18-item scale developed based on the Aydin et al. (2024), covering instructional design, digital collaboration, digital assessment, and professional development. Teachers' self-efficacy was assessed with 10 items adapted from the Teachers' Sense of Efficacy Scale (TSES) proposed by Tschannen-Moran and Hoy (2001), revised to reflect teachers' confidence in digital teaching environments. Perceived organizational support was evaluated using an 8-item measure adapted from the Survey of Perceived Organizational Support, focusing on teachers' perceptions of institutional care, resources, and support during digital transformation. Organizational culture was assessed through a 20-item scale derived from Smit et al. (1997)'s Organizational Culture Assessment Instrument

(OCAI), measuring four cultural dimensions: clan, adhocracy, hierarchy, and market culture. Digital training opportunities were measured using a 4-item scale designed with reference to prior studies on digital professional development, assessing the accessibility, frequency, and relevance of training opportunities available to teachers. All items were translated and contextually adjusted to ensure semantic equivalence and suitability for vocational college teachers in Chengdu. The reliability and validity of these measurement scales were examined in subsequent analyses.

3.3 Data Analysis Methods

Data analysis was conducted in several stages using SPSS and AMOS. First, descriptive statistics and preliminary data screening were performed to examine sample characteristics, variable distributions, missing values, and outliers, confirming that the data met the assumptions for multivariate analysis. Second, the measurement model was assessed through confirmatory factor analysis (CFA) to establish construct reliability and validity, with internal consistency evaluated using Cronbach's alpha and composite reliability, convergent validity examined via standardized factor loadings and average variance extracted (AVE), and discriminant validity tested by comparing the square roots of AVE with inter-construct correlations. Third, structural equation modeling (SEM) was employed to test the hypothesized relationships among organizational culture, perceived organizational support, digital training opportunities, teachers' self-efficacy, and digital competence. Model fit was evaluated using multiple goodness-of-fit indices, including χ^2 , CFI, TLI, RMSEA, and SRMR, based on commonly recommended cutoff

criteria. Mediation effects were further examined within the SEM framework using bootstrapping with bias-corrected confidence intervals to assess indirect paths. Institutional effects were controlled by including schools as control variables, and all statistical tests were conducted at a significance level of 0.05.

3.4 Pre-test

Prior to the main survey, a pre-test was conducted to evaluate the clarity, comprehensibility, and contextual suitability of the questionnaire. The instrument was developed based on established measurement scales from previous studies and was carefully adapted to the context of higher vocational education in China. The draft questionnaire was reviewed by experts in educational management and vocational education, as well as by experienced teachers from vocational colleges. Subsequently, a pilot survey was administered to a small sample of 30 teachers and educational staff who were not included in the final dataset. Feedback from this preliminary data collection led to minor revisions in item wording and contextual alignment, ensuring that the revised questionnaire was appropriate and ready for large-scale implementation.

4. Results

4.1 Descriptive Statistics and Demographic Analysis

The study employed an anonymous questionnaire survey to examine organizational culture and teachers' digital competence in higher vocational colleges in Chengdu, China. Data collection was conducted between November 2025 and January 2026 using an online survey platform. A total of 437 questionnaires were returned. After excluding invalid responses due to

missing information, logical inconsistencies, or meaningless answers, 409 valid questionnaires were retained for analysis, yielding an effective response rate of 93.59%.

Respondents were drawn from five higher vocational institutions in Chengdu, including both public and private colleges. Table 1 presents the distribution of respondents across the participating institutions. The number of participants from each institution was relatively evenly distributed, ensuring coverage of different organizational contexts. In terms of gender, the sample included 196 male (47.92%) and 213 female (52.08%) respondents, as shown in Table 1. Regarding age, respondents were mainly concentrated in the 30–39 and 40–49 age groups, while teachers under the age of 30 and those aged 50 and above were also represented. The age composition of the sample is detailed in Table 1. Teaching experience followed a similar pattern, with respondents distributed across different career stages. Teachers with 10–15 years of teaching experience formed the largest group, followed by those with 5–9 years, more than 15 years, and fewer than 5 years of experience. With respect to institutional type, 53.79% of respondents were from public colleges and 46.21% from private colleges. Table 1 reports the distribution of respondents by institutional type. Participants' academic backgrounds covered major disciplinary categories in higher vocational education, including engineering, science, technology, and mathematics; arts and humanities; business and economics; medical and nursing fields; and general education, as summarized in Table 1.

In terms of participation in digital teaching training, all respondents reported having engaged

in digital teaching–related training within the past three years. Most teachers reported participating twice, followed by those who participated once or three times or more. The frequency of participation in digital teaching training is reported in Table 1.

Table 1. Demographic Characteristics of the Valid Sample

Variable	Category	Frequency	Percentage (%)
Institution	Sichuan City Vocational College	109	26.65
	Sichuan Tianyi College (Private)	73	17.85
	Sichuan Aerospace Vocational and Technical College	76	18.58
	Sichuan Technology and Business College	71	17.36
	Chengdu Polytechnic	80	19.56
Gender	Male	196	47.92
	Female	213	52.08
Age	Under 30 years	67	16.38
	30–39 years	143	34.96
	40–49 years	122	29.83
	50 years and above	77	18.83
Teaching Experience	Less than 5 years	69	16.87
	5–9 years	114	27.87
	10–15 years	141	34.47
	More than 15 years	85	20.78
Institution Type	Public	220	53.79
	Private	189	46.21
Academic Discipline (Primary Teaching Field)	Engineering, Science, Technology, and Mathematics (STEM)	111	27.14
	Business and Economics	86	21.03
	Medical and Nursing	65	15.89
	Arts and Humanities / Social Sciences	94	22.98
	General Education	53	12.96
	Other	0	0
Participation in Digital Teaching Training (Past	None	0	0

Variable	Category	Frequency	Percentage (%)
3 Years)			
	Once	127	31.05
	Twice	215	52.57
	Three times or more	67	16.38

Descriptive statistics were calculated for the five study variables based on 409 valid responses. Table 2 reports the minimum and maximum values, means, standard deviations, skewness, and kurtosis for each variable.

Table 2. Descriptive Statistics of the Study Variables (n = 409)

Variable	Minimum	Maximum	Mean	Standard Deviation	Skewness	Kurtosis
Teachers' Digital Competence	1.667	4.778	3.432	0.815	-0.279	-0.866
Teachers' Self-Efficacy	1.583	4.833	3.4	0.86	-0.316	-0.934
Digital Training Opportunities	1.25	5	3.383	0.924	-0.189	-0.916
Perceived Organizational Support	1.375	4.75	3.368	0.876	-0.249	-1.007
Organizational Culture	1.583	4.75	3.306	0.876	-0.147	-1.145

As shown in Table 2, all variables covered the full range of the measurement scales, with minimum values between 1.250 and 1.667 and maximum values between 4.750 and 5.000. Mean scores ranged from 3.306 to 3.432 on the five-point scale. Teachers' digital competence showed the highest mean score ($M = 3.432$, $SD = 0.815$), whereas organizational culture showed the lowest ($M = 3.306$, $SD = 0.876$). The remaining variables exhibited similar mean levels. Standard deviations ranged from 0.815 to 0.924, indicating moderate variability across variables. Skewness values were negative and ranged from -0.316 to -0.147, while kurtosis values ranged from -1.145 to -0.866. All values were within acceptable thresholds, indicating no substantial deviations from normality.

4.2 Measurement Model: Reliability and Validity Assessment

Prior to testing the structural model, the measurement model was examined through confirmatory factor analysis (CFA) to assess the reliability and validity of the latent constructs. The CFA included five constructs: organizational culture, perceived organizational support, digital training opportunities, teachers' self-efficacy, and teachers' digital competence. The analysis was conducted using AMOS with maximum likelihood estimation. Figure 1 presents the confirmatory factor analysis model, illustrating the relationships between the latent variables and their observed indicators. All factor loadings were statistically

significant and loaded on their intended constructs, supporting the adequacy of the specified measurement structure.

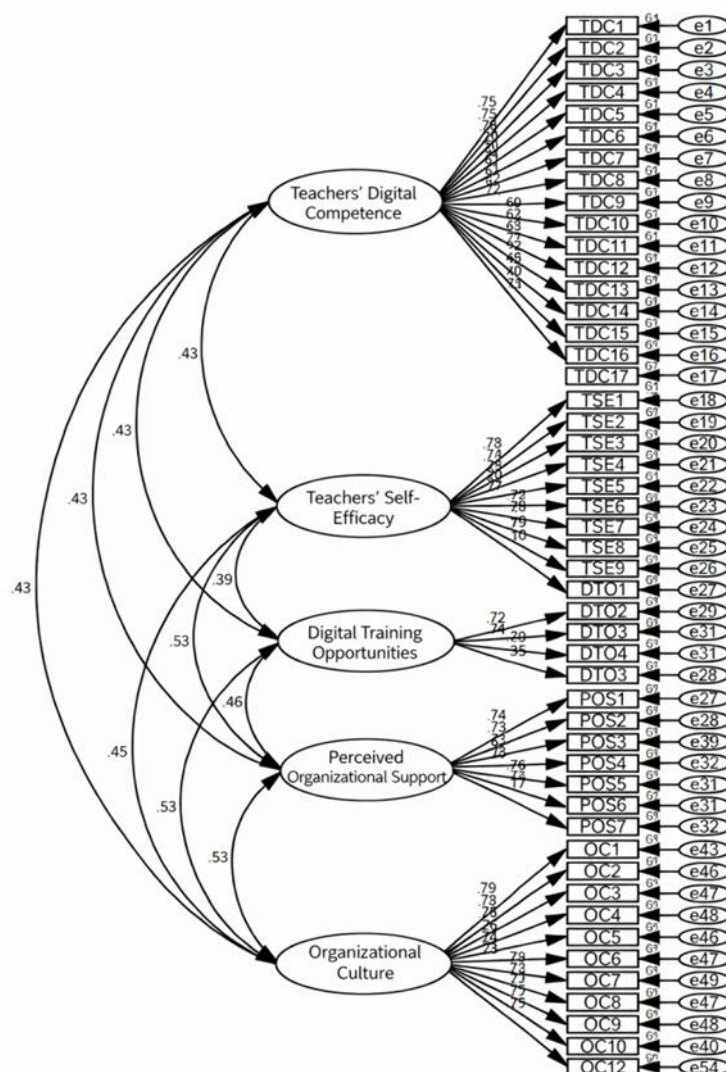


Figure 1. Confirmatory Factor Analysis

Internal consistency reliability was assessed using Cronbach's alpha coefficients. The results indicate that the overall questionnaire demonstrated excellent reliability, with a Cronbach's alpha of 0.963, suggesting a very high level of internal consistency across all measurement items. At the construct level, all dimensions exhibited strong reliability performance. Teachers' digital competence showed a Cronbach's alpha of 0.956, with corrected item-total correlations (CITC)

consistently exceeding acceptable thresholds, indicating that all items contributed meaningfully to the construct. Teachers' self-efficacy also demonstrated excellent internal consistency, with a Cronbach's alpha of 0.943 and stable item-total correlations across items. Digital training opportunities yielded a Cronbach's alpha of 0.855, which, although lower than that of the other constructs, still exceeded the recommended benchmark of 0.70, confirming satisfactory reliability. Perceived organizational support

exhibited a Cronbach's alpha of 0.919, while organizational culture achieved a Cronbach's alpha of 0.944, both reflecting strong internal consistency. Across all constructs, the removal of any individual item did not result in an increase in Cronbach's alpha, further supporting the appropriateness and stability of the measurement items. Overall, these results demonstrate that the questionnaire possesses robust internal consistency and reliability, providing a solid foundation for subsequent empirical analyses.

Convergent validity was assessed by examining standardized factor loadings and average variance extracted (AVE). As shown in Table 3, all standardized factor loadings were above the recommended minimum value of 0.50. In addition, the AVE values for all constructs exceeded 0.50, indicating that a substantial proportion of variance in the observed indicators was captured by the corresponding latent constructs. These results provide evidence of adequate convergent validity.

Table 3. Factor Loading Table

Factor	Measurement item	non standard load factor	S.E.	C.R.	p	standard load coefficient
Teacher digital competence	TDC1	1	-	-	0.000***	0.747
	TDC2	1.013	0.064	15.727	0.000***	0.749
	TDC3	0.999	0.062	16.068	0.000***	0.764
	TDC4	1.024	0.064	15.945	0.000***	0.759
	TDC5	0.890	0.061	14.563	0.000***	0.700
	TDC6	0.925	0.063	14.656	0.000***	0.704
	TDC7	0.963	0.061	15.780	0.000***	0.752
	TDC8	0.960	0.062	15.442	0.000***	0.737
	TDC9	0.970	0.063	15.501	0.000***	0.740
	TDC10	1.040	0.063	16.432	0.000***	0.779
	TDC11	0.953	0.063	15.037	0.000***	0.720
	TDC12	0.966	0.062	15.499	0.000***	0.740
	TDC13	0.978	0.063	15.484	0.000***	0.739
	TDC14	0.981	0.062	15.781	0.000***	0.752
	TDC15	1.010	0.063	15.954	0.000***	0.759
	TDC16	1.004	0.063	15.928	0.000***	0.758
	TDC17	0.958	0.063	15.134	0.000***	0.724
	TDC18	0.958	0.063	15.106	0.000***	0.723
Teacher Self-Efficacy	TSE1	1	-	-	0.000***	0.729

	TSE2	0.995	0.067	14.835	0.000***	0.734
	TSE3	1.102	0.068	16.115	0.000***	0.793
	TSE4	1.042	0.067	15.589	0.000***	0.769
	TSE5	1.117	0.069	16.140	0.000***	0.794
	TSE6	0.996	0.065	15.408	0.000***	0.760
	TSE7	0.994	0.067	14.943	0.000***	0.739
	TSE8	1.050	0.068	15.459	0.000***	0.763
	TSE9	1.089	0.069	15.875	0.000***	0.782
	TSE10	1.007	0.067	14.935	0.000***	0.738
	TSE11	1.081	0.069	15.593	0.000***	0.769
	TSE12	1.061	0.068	15.511	0.000***	0.765
Digital training opportunities	DTO1	1	-	-	0.000***	0.729
	DTO2	1.125	0.076	14.757	0.000***	0.792
	DTO3	1.145	0.078	14.749	0.000***	0.792
	DTO4	1.111	0.077	14.500	0.000***	0.777
Perceptual organization of support	POS1	1	-	-	0.000***	0.745
	POS2	1.029	0.067	15.392	0.000***	0.754
	POS3	1.091	0.066	16.458	0.000***	0.801
	POS4	1.137	0.070	16.131	0.000***	0.787
	POS5	1.024	0.066	15.473	0.000***	0.758
	POS6	1.083	0.068	15.980	0.000***	0.780
	POS7	0.967	0.065	14.859	0.000***	0.730
	POS8	1.038	0.066	15.802	0.000***	0.772
organization culture,organizational culture	OC1	1	-	-	0.000***	0.785
	OC2	0.921	0.055	16.764	0.000***	0.759
	OC3	0.911	0.055	16.424	0.000***	0.747
	OC4	0.900	0.054	16.692	0.000***	0.757
	OC5	0.928	0.055	16.921	0.000***	0.765
	OC6	0.953	0.055	17.310	0.000***	0.778
	OC7	0.907	0.054	16.777	0.000***	0.760
	OC8	0.912	0.054	16.748	0.000***	0.759
	OC9	0.938	0.054	17.227	0.000***	0.776
	OC10	0.944	0.056	16.939	0.000***	0.765
	OC11	0.917	0.055	16.769	0.000***	0.759

OC12	0.919	0.056	16.478	0.000***	0.749
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*p<0.05 **p<0.01 ***p<0.001

Discriminant validity was evaluated using the Fornell–Larcker criterion. Specifically, the square root of the AVE for each construct was compared with the inter-construct correlation coefficients (Hamid et al., 2017). Table 4 presents

the correlation matrix along with the square roots of the AVE values on the diagonal. For each construct, the square root of the AVE was greater than its correlations with other constructs, supporting satisfactory discriminant validity.

Table 4. Correlation and AVE root value

	Teacher Digital Competence	Teacher self-efficacy	Digital training opportunities	Perceptua l organizati on of support	organizatio n culture,org anizational culture
Teacher Digital Competence	0.742				
Teacher self-efficacy	0.395	0.762			
Digital training opportunities	0.435	0.385	0.773		
Perceptual organization of support	0.427	0.509	0.455	0.766	
organization culture,organizational culture	0.429	0.439	0.474	0.529	0.763

Note: The green diagonal number is the AVE square root value

4.3 Structural Model and Hypothesis Testing

Given acceptable model fit, the structural model was estimated to test the hypothesised relationships among the constructs. Path significance was evaluated using critical ratio (C.R.) values obtained from structural equation modelling, with absolute C.R. values greater than 1.96 indicating statistical significance at the 0.05 level. All hypothesised paths were statistically significant, with C.R. values exceeding 1.96 and p-values below 0.05. The structural relationships

among organisational culture, perceived organisational support, digital training opportunities, teacher self-efficacy, and teachers' digital competence are illustrated in Figure 2, which presents the estimated model with standardised path coefficients.

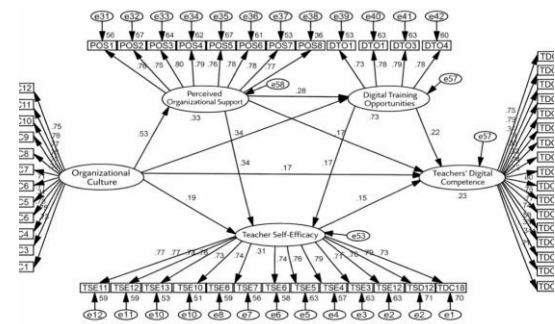


Figure 2. Path relationship results of structural equation model

Specifically, teachers’ digital competence was significantly and positively predicted by teachers’ self-efficacy ($\beta = 0.153$, C.R. = 2.756, $p < 0.01$), digital training opportunities ($\beta = 0.222$, C.R. = 3.746, $p < 0.001$), perceived organisational support ($\beta = 0.156$, C.R. = 2.544, $p < 0.05$), and organisational culture ($\beta = 0.174$, C.R. = 2.965, $p < 0.01$). Regarding the antecedents of teachers’ self-efficacy, digital training opportunities ($\beta = 0.138$, C.R. = 2.392, $p < 0.05$), perceived organisational support ($\beta = 0.345$, C.R. = 5.631, $p < 0.001$), and organisational culture ($\beta = 0.191$, C.R. = 3.276, $p < 0.001$) all exerted significant positive effects. Furthermore, digital training

opportunities were significantly predicted by perceived organisational support ($\beta = 0.284$, C.R. = 4.587, $p < 0.001$) and organisational culture ($\beta = 0.323$, C.R. = 5.251, $p < 0.001$). Perceived organisational support was, in turn, significantly influenced by organisational culture ($\beta = 0.529$, C.R. = 9.509, $p < 0.001$).

4.4 Effects Analysis

Given that the proposed structural model demonstrated acceptable fit, direct effects were examined to test the hypothesised relationships among the latent variables. Hypothesis testing was conducted using the critical ratio (C.R.) values obtained from structural equation modelling. Following established criteria, a path was considered statistically significant when the absolute value of the C.R. exceeded 1.96, corresponding to a significance level of $p < 0.05$. The results of the direct effects analysis are presented in Table 5, which reports the unstandardised path coefficients, standard errors, critical ratios, p-values, and standardised path coefficients for all hypothesised paths.

Table 5. research hypothesis testing

Hy pot hesi s	Path	Nonstandard Coefficient	S.E.	C. R.	P	Standard Coefficient	Result
H1	Teachers’ Digital Competence ← Organizational Culture	0.155	0.052	2.965	0.003**	0.174	Supported
H2	Perceived Organizational Support ← Organizational Culture	0.464	0.049	9.509	0.000***	0.529	Supported
H3	Digital Training Opportunities ← Organizational Culture	0.276	0.053	5.251	0.000***	0.323	Supported
H4	Digital Training Opportunities	0.276	0.06	4.587	0.000	0.284	Supported

Hypotheses	Path	Nonstandard Coefficient	S.E.	C.R.	P	Standard Coefficient	Result
	← Perceived Organizational Support			58.7	0***		
H5	Teacher Self-efficacy ← Perceived Organizational Support	0.344	0.061	5.631	0.000***	0.345	Supported
H6	Teacher Self-efficacy ← Digital Training Opportunities	0.142	0.059	2.392	0.017*	0.138	Supported
H7	Teachers' Digital Competence ← Digital Training Opportunities	0.232	0.062	3.746	0.000***	0.222	Supported
H8	Teachers' Digital Competence ← Teacher Self-efficacy	0.156	0.057	2.756	0.006**	0.153	Supported

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

As shown in the table, all direct paths were statistically significant, with C.R. values exceeding 1.96 and p-values below 0.05, providing empirical support for all proposed direct-effect hypotheses. Teachers' digital competence was significantly and positively predicted by teacher self-efficacy ($\beta = 0.153$, C.R. = 2.756, $p = 0.006$), digital training opportunities ($\beta = 0.222$, C.R. = 3.746, $p < 0.001$), perceived organisational support ($\beta = 0.156$, C.R. = 2.544, $p = 0.011$), and organisational culture ($\beta = 0.174$, C.R. = 2.965, $p = 0.003$). Regarding teacher self-efficacy, significant positive effects were observed for digital training opportunities ($\beta = 0.138$, C.R. = 2.392, $p = 0.017$), perceived organisational support ($\beta = 0.345$, C.R. = 5.631, $p < 0.001$), and organisational culture ($\beta = 0.191$, C.R. = 3.276, $p = 0.001$). In addition, digital training opportunities

were significantly predicted by perceived organisational support ($\beta = 0.284$, C.R. = 4.587, $p < 0.001$) and organisational culture ($\beta = 0.323$, C.R. = 5.251, $p < 0.001$). Organisational culture also exerted a strong direct effect on perceived organisational support ($\beta = 0.529$, C.R. = 9.509, $p < 0.001$).

Mediation effects were examined using a bias-corrected bootstrapping procedure with 5,000 resamples implemented in AMOS 23.0. A mediation effect was considered statistically significant when the 95% bias-corrected confidence interval (CI) did not include zero. Table 6 reports the total, direct, and indirect effects for all hypothesised mediation paths along with their corresponding 95% bias-corrected confidence intervals.

Table 6. Mediation effects based on bootstrapping

Hypothesis	Mediation Path	Indirect Effect	Bias-corrected 95% CI (Low)	Bias-corrected 95% CI (Upper)	Result
H9	OC → POS → TDC	0.003	0.001	0.01	Supported
H10	OC → DTO → TDC	0.007	0.001	0.02	Supported
H11	OC → TSE → TDC	0.029	0.008	0.068	Supported
H12	OC → DTO → TSE → TDC	0.007	0.001	0.02	Supported

As shown in the table, all six indirect effects were statistically significant, as none of the 95% bias-corrected confidence intervals included zero ($p < 0.05$). Teacher self-efficacy partially mediated the effects of perceived organisational support, organisational culture, and digital training opportunities on teachers' digital competence. For perceived organisational support, both the direct effect (0.156, 95% CI = [0.026, 0.283]) and the indirect effect via teacher self-efficacy (0.053, 95% CI = [0.013, 0.106]) were significant, yielding a total effect of 0.278 (95% CI = [0.164, 0.391]). Similar patterns were observed for organisational culture (total effect = 0.429, indirect effect = 0.029, 95% CI = [0.008, 0.068]) and digital training opportunities (total effect = 0.244, indirect effect = 0.021, 95% CI = [0.003, 0.056]), indicating partial mediation in all three cases. In addition, significant chain mediation effects were identified. Perceived organisational support and organisational culture influenced teachers' digital competence sequentially through digital training opportunities and teacher self-efficacy, with all indirect effects remaining significant. A multiple chain mediation pathway from organisational culture to teachers' digital competence via perceived organisational support, digital training

opportunities, and teacher self-efficacy was also supported, while the direct effects remained significant, indicating partial mediation.

5. Discussion

5.1 Research Findings

This study provides several key insights into the level, determinants, and mechanisms underlying teachers' digital competence in Chengdu's higher vocational colleges. Descriptive results show that teachers' digital competence is moderate overall, with substantial variability across individuals, echoing recent evidence that vocational/TVET teachers' digital competence is unevenly distributed and shaped by both personal and contextual conditions. Compared with recent DigCompEdu-based surveys that likewise report heterogeneous competence profiles across teacher groups, the present findings further reinforce the need to explain why some teachers develop stronger competence than others within the same institutional setting.

Beyond describing the competence level, the structural model clarifies that teachers' digital competence is simultaneously driven by organizational and individual factors.

Organizational culture, perceived organizational support (POS), digital training opportunities (DTO), and teacher self-efficacy (TSE) all show significant positive direct effects on digital competence, supporting a view of digital competence as an “embedded” professional capability cultivated through institutional conditions rather than a purely individual technical attribute. This aligns with recent work emphasizing the importance of school/organizational support for competence development and digital transformation readiness. At the same time, by focusing specifically on higher vocational colleges in China, the study extends prior TVET research that tends to emphasize demographic or general contextual predictors, offering a more integrated organizational–psychological explanation of competence formation.

The mediation results add a more fine-grained contribution by demonstrating how organizational factors translate into competence gains. Bootstrap tests confirm that teacher self-efficacy significantly mediates the effects of organizational culture (and related organizational conditions) on digital competence, consistent with the growing body of literature identifying self-efficacy as a key proximal driver of teachers’ digital readiness and capability. Importantly, the study also verifies a statistically significant sequential pathway in which organizational culture improves digital competence through digital training opportunities → teacher self-efficacy. This sequential mechanism complements recent intervention- and support-oriented evidence suggesting that organizational supports influence competence partly by enabling learning opportunities and strengthening psychological

readiness.

Taken together, the findings support an evidence-based mechanism model in which organizational culture acts as an upstream driver shaping POS and DTO, which then build teacher self-efficacy and ultimately enhance digital competence. The main knowledge contribution relative to the past five years of research is that this study empirically integrates (1) macro-level cultural orientation (organizational culture), (2) meso-level institutional resources (POS and training opportunities), and (3) micro-level psychological empowerment (self-efficacy) into a single SEM framework and validates both parallel and sequential mediation paths within China’s higher vocational context—an area where prior studies have more often examined these factors in isolation or without specifying the cumulative transmission process from culture to resources to efficacy to competence.

5.2 Theoretical Contributions

This study makes several theoretical contributions to the literature on teacher digital competence by advancing a more context-sensitive and mechanism-oriented explanation of competence development in higher vocational education. First, whereas much recent research has applied digital competence frameworks primarily to define competence domains or assess individual skill levels (Mattar et al., 2022; Tzafilkou et al., 2023), the present study extends this line of work by conceptualising teachers’ digital competence as an organisationally embedded pedagogical capacity. By integrating organisational culture, perceived organisational support, digital training opportunities, and teacher self-efficacy within a unified structural model, the

study advances educational theory by demonstrating that digital competence is not solely an individual technical attribute, but rather a professional capability systematically shaped by institutional environments and governance conditions.

Second, the study refines the application of social cognitive theory in digital education research by positioning teacher self-efficacy as a key psychological mechanism through which organisational resources are translated into competence outcomes. Although self-efficacy has been widely identified in recent years as a proximal predictor of teachers' digital competence, prior studies have often treated organisational influences as peripheral or indirect (Luo et al., 2025; Peng et al., 2024). The present findings extend existing theoretical accounts by empirically confirming that perceived organisational support and digital training opportunities enhance teachers' digital competence partly through strengthening their efficacy beliefs, thereby offering a more explanatory link between institutional arrangements, psychological empowerment, and pedagogical capacity building.

Third, the study contributes to mechanism-based theorising by validating both parallel and sequential mediation pathways that connect distal organisational context to individual competence development. In contrast to technology adoption models that focus primarily on behavioural intentions or motivational frameworks that emphasise general supportive conditions, this research specifies a cumulative transmission process in which organisational culture shapes perceived organisational support and digital training opportunities, which subsequently foster teacher self-efficacy and

ultimately strengthen teachers' digital competence. By clarifying how cultural and resource-based institutional factors operate through psychological processes in a multi-step sequence, the study provides a more coherent theoretical account of how vocational colleges can address the educational challenge of developing sustainable and scalable digital teaching competence among teachers.

Overall, this research enriches contemporary educational theory by integrating organisational, resource, and psychological perspectives into a comprehensive explanatory framework, thereby extending recent digital competence scholarship beyond descriptive and individual-centred approaches toward a systemic understanding of competence development in higher vocational education.

5.3 Practical Implications

For higher vocational colleges, institutional leadership needs to treat digital competence as an organisational capability-building agenda, embedding digital teaching expectations into governance routines, evaluation systems, and professional learning structures, while ensuring that support is experienced as consistent, responsive, and instructional-need-oriented.

For education authorities and policy-makers, policy design may be more effective when accountability frameworks emphasise the quality and continuity of professional learning opportunities, the availability of institutional support services, and the cultivation of enabling cultural norms that encourage experimentation and knowledge sharing. From a system perspective, resource allocation and evaluation schemes that recognise differences in

organisational readiness may reduce the risk of uneven implementation and facilitate more sustainable competence development across institutions.

For industry partners and enterprises collaborating with higher vocational colleges, industry engagement can be leveraged to provide practice-oriented digital training opportunities that are closely connected to vocational curricula, authentic work processes, and evolving technological ecosystems. Such collaboration is likely to be most effective when it extends beyond one-off workshops toward sustained co-development arrangements, including shared digital platforms, joint curriculum design, and mentoring structures that support teachers' mastery experiences and strengthen digital teaching self-efficacy.

For professional development providers and training designers, training programmes should therefore prioritise task authenticity, scaffolded practice, and iterative feedback loops, which are more likely to strengthen self-efficacy and support the conversion of training resources into competence gains. In addition, embedding collaborative formats such as peer learning communities and coaching structures may reinforce both sustained engagement and the institutionalisation of digital teaching practices.

6. Conclusion

This study investigated the development of teacher digital competence in higher vocational colleges through an integrated organisational and psychological framework. By incorporating organisational culture, perceived organisational support, digital training opportunities, and teacher

self-efficacy into a unified structural and mediation model, the study conceptualised digital competence as an outcome shaped jointly by institutional context and individual belief systems. The findings demonstrate that teacher digital competence extends beyond technical proficiency and is embedded within broader organisational and psychological processes associated with educational digitalisation. Organisational culture emerged as a foundational contextual factor influencing competence both directly and indirectly by shaping teachers' perceptions of support, the structuring of digital training opportunities, and the development of self-efficacy. Teacher self-efficacy, in turn, functioned as a key proximal mechanism linking organisational conditions to competence outcomes, highlighting the role of psychological empowerment in translating institutional resources into effective digital teaching practices. Moreover, the identification of sequential and multiple chain mediation pathways clarifies that organisational influences operate through cumulative and interconnected processes rather than isolated effects, with organisational culture, support, training opportunities, and self-efficacy functioning as interdependent components within a coherent competence development trajectory. Overall, the study contributes to the literature by providing a context-sensitive and mechanism-oriented account of how higher vocational institutions can foster sustainable digital competence through the alignment of cultural orientation, organisational support systems, professional learning structures, and psychological empowerment.

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