Digital Competence of Cookery Teachers in Vocational Education: A Systematic Literature Review

Cherry Fer C. Cosmiano[1], John Manuel C. Buniel[2]

North Eastern Mindanao State University

DOI: https://doi.org/10.47772/IJRISS.2026.1026EDU0355

Received: 18 May 2026; Accepted: 24 May 2026; Published: 18 June 2026

ABSTRACT

The rapid digitization of the modern educational landscape has fundamentally altered instructional design, delivery, and assessment across diverse occupational sectors. Within Technical-Vocational-Livelihood (TVL) tracks, specifically cookery education, integrating digital methodologies poses a unique structural challenge due to the heavily hands-on, safety-sensitive, and performance-based nature of culinary instruction. This study presents a systematic literature review examining the digital competence of cookery educators as a foundational basis for contextual framework development. Operating under the structural conventions of contemporary educational review literature, this study proposes and applies the novel five-dimensional V-TPAC Model (Vocational, Technological, Pedagogical, Anthropocentric, and Contextual parameters) to synthesize relevant local and international research published between 2022 and 2026. The thematic synthesis reveals that while macro-level frameworks like DigCompEdu and broad theoretical constructs like TPACK offer strong global baselines, they fail to account for specific vocational realities such as laboratory-based sensory engagement, physical safety protocols, and resource constraints typical of rural school blocks. Empirical findings demonstrate that cookery teachers frequently manifest uneven digital capabilities, with pronounced weaknesses in digital content creation and performance-based digital assessment. Conversely, targeted interventions—including AI-driven culinary simulations, localized video scaffolding, and collaborative peer mentoring—significantly optimize teacher instructional confidence, creative preparedness, and terminal student employability. This review bridges a distinct empirical gap by detailing how global standards must be structurally combined with workplace-oriented vocational models to guide targeted professional development, refine TVL curricula, and support resilient ICT policy execution in emerging education frameworks.

Keywords: Adult Learning, Cookery Instruction, Digital Competence, Framework Development, Home Economics, Literature Review, Technical-Vocational Education

INTRODUCTION

The rapid digital transformation of the global educational landscape has fundamentally reshaped the architecture of contemporary instructional design, delivery, and assessment across academic disciplines (Redecker, 2017). As emergent technologies become systematically embedded within core teaching and learning processes, educators are no longer expected to possess mere baseline technological literacy. Instead, the modern instructional paradigm demands well-developed, discipline-specific digital competence—defined as the pedagogical capacity to meaningfully integrate digital tools to optimize student engagement, cognitive retention, and workplace readiness (Almerich et al., 2020; Instefjord & Munthe, 2017).

Within technical-vocational systems, this digital demand manifests with unique complexities. This is especially true within the Technical-Vocational-Livelihood (TVL) track, a specialized domain traditionally dominated by concrete, hands-on, safety-sensitive, and laboratory-intensive instruction (Cabero-Almenara & Llorente-Cejudo, 2020). Among TVL sub-disciplines, cookery education represents a highly practical field where instructors must transmit abstract culinary chemistry, exact sensory procedures, and strict physical safety protocols through a tangible learning environment (Alqahtani, 2023; Ifenthaler & Schweinbenz, 2016). Consequently, understanding how digital competence is operationalized, perceived, and applied by cookery teachers is a critical prerequisite for modern vocational reform.

Globally, the institutionalization of digital standards for educators has been guided by extensive macro-level frameworks. The European Commission's Digital Competence Framework for Educators (DigCompEdu), for instance, conceptualizes digital competence as a multi-dimensional construct encompassing professional engagement, digital resource management, active teaching, terminal assessment, and direct learner empowerment (Ghomi & Redecker, 2019; Redecker, 2017). Concurrently, the Technological Pedagogical Content Knowledge (TPACK) model serves as a prominent theoretical lens, establishing that successful digital teaching occurs exclusively at the dynamic intersection of an educator's technological, pedagogical, and subject-matter content knowledge (Mishra & Koehler, 2006).

While international studies consistently confirm that advanced teacher digital fluency strongly correlates with improved instructional confidence and superior student learning outcomes (Martínez-García et al., 2024; Røkenes & Krumsvik, 2016), a critical structural gap persists in the literature. Broad theoretical frameworks like DigCompEdu and TPACK offer generic, discipline-neutral guidelines that fail to capture the unique pedagogical realities of skill-intensive vocational workshops. Traditional digital models assume a traditional, desk-bound classroom environment, thereby offering insufficient guidance on how an instructor might integrate digital tools—such as video modeling or AI-driven simulations—without compromising physical skill development, sensory evaluations, and performance-based kitchen safety standards (Kim & Lee, 2025; Wang & Zhang, 2022). This lack of discipline-specific contextualization severely restricts the operational utility of global standards when applied to hands-on culinary tracks.

In the Philippine education system, this digital mandate has been formalized through comprehensive national policy directives, notably the Department of Education (DepEd) ICT Framework (DepEd, 2020) and the Commission on Higher Education (CHED) Memorandum Order No. 15, series of 2019. Both directives legally mandate the systematic integration of technology and digital literacy across all levels of instruction.

However, local empirical data reveal an alarming discrepancy between top-down policy intentions and classroom execution. Recent evaluations indicate that Philippine TVL and Home Economics teachers demonstrate only moderate or basic levels of digital competence, showing severe weaknesses in digital content creation, interactive media design, and objective digital assessment methodologies (Andal et al., 2022; Cacho & Ronda, 2021). Within rural and resource-constrained regional public schools—such as the CarCanMadCarLan (Carrascal, Cantilan, Madrid, Carmen, Lanuza) municipalities in Surigao del Sur—these skill deficits are exacerbated by unstable technological infrastructure, limited institutional training, and the absence of specialized instructional guides (Dela Cruz, 2024; Ramos & Bautista, 2023). While some localized initiatives have attempted general ICT upskilling (Azarcon & Buniel, 2025), there remains an acute shortage of synthesized research detailing how cookery teachers negotiate these barriers to implement the prescribed Minimum Essential Learning Competencies (MELCs) via digital mediums (Aquino, 2025; Lumbo & Germina, 2025).

To effectively address these intertwined global and local gaps, a systematic, multi-dimensional synthesis of existing literature is required. Developing a resilient, localized, and context-sensitive framework for cookery educators cannot rely on broad institutional assumptions; instead, it requires an empirical grounding that bridges global benchmarks with localized vocational realities (Empimo, 2025; Monteverde et al., 2025).

This study directly addresses this practical and empirical scarcity by providing a rigorous literature review that isolates the specific competencies, systemic barriers, and innovative pedagogical practices associated with digital cookery instruction. By integrating macro-level digital constructs with vocational-specific models, such as Lahn and Berntsen's (2023) Vocational Pedagogical Digital Competence (VPDC) paradigm, this review aims to construct a cohesive conceptual roadmap. Ultimately, this synthesized framework serves as an empirical basis for designing targeted teacher professional development programs, optimizing TVL culinary curricula, and ensuring that digital vocational pedagogy remains both operationally feasible and culturally responsive.

METHODOLOGY

This study utilizes a qualitative literature review design to systematically gather, evaluate, and synthesize recent empirical literature and scholarly works concerning the digital competence of cookery educators. To ensure a structured and transparent research execution, this paper implements an explicit search, selection, and filtration

protocol, directly replicating the systematic workflow and narrative parameters established in contemporary educational review literature (Pecson & Sarmiento, 2025).

Search Strategy and Selection Criteria

A comprehensive electronic search was executed across prominent index databases, including Google Scholar, Scopus, ResearchGate, and the Philippine Journals Online (PhilJOL) archive. To secure highly relevant, high-currency literature reflecting modern digital shifts, the search protocol was restricted to articles, policy documents, and empirical studies published between 2022 and 2026.

The search strings were constructed using specialized boolean operators and keywords tailored to the research topic: ("digital competence" OR "ICT integration") AND ("cookery teachers" OR "vocational educators"), ("TVL track" OR "Home Economics") AND ("technological proficiency" AND "culinary arts"), ("DigCompEdu" OR "TPACK") AND ("contextual framework" AND "vocational pedagogy"),

To be included in the final review matrix, studies had to satisfy rigid eligibility criteria:

1. They must be published in peer-reviewed journals, national education report registries, or authorized institutional repositories between 2022 and 2026;

2. They must directly assess or discuss the digital capabilities, technological integration practices, or pedagogical challenges of teachers within technical-vocational-livelihood fields; and

3. They must maintain explicit applicability to skill-intensive, performance-driven laboratory tracks like cookery, home economics, or hospitality education.

Conversely, papers focusing exclusively on general education software (e.g., general literacy tools for primary classrooms) or highly automated industrial food manufacturing systems were excluded, ensuring the final literature pool remained highly responsive to the realities of localized senior high school and community TVL blocks.

The Analytical Framework: The V-TPAC Model

To transform the collected raw literature into a rigorous, thematic synthesis rather than a fragmented descriptive summary, this study proposes and applies the **V-TPAC Model** (Vocational, Technological, Pedagogical, Anthropocentric, and Contextual parameters). Directly patterned after the operational approach of the PRIME model utilized by Pecson and Sarmiento (2025), this customized matrix serves as a multi-dimensional filter to systematically extract, organize, and analyze the literature base across five definitive boundaries:

V – Vocational Standards Alignment: Evaluating literature that examines how digital tools must match industry-grade occupational standards, culinary operations, and hands-on skill development.

T – Technological Fluency Boundaries: Investigating studies that identify the explicit software, interactive media, hardware, and digital platforms utilized by vocational educators.

P – Pedagogical Coherence: Reviewing research regarding the meaningful translation of culinary content through digital mediums without compromising safety protocols, physical demonstration quality, and performance-based rubrics.

A – Anthropocentric (Learner & Teacher) Dynamics: Analyzing data concerning the human element, specifically how teacher demographic factors (age, experience) and learner motivation/readiness interact with digital pedagogy.

C – Contextual & Structural Realities: Synthesizing literature that addresses systemic constraints, resource allocations, internet connectivity stability, and institutional support systems in regional or rural school blocks.

By evaluating both foreign and local literature through these five systematic filters, the review establishes a robust, empirically grounded foundation for developing a localized digital competence framework for cookery educators.

RESULTS AND DISCUSSION

Evaluating the curated literature base through the analytical dimensions of the V-TPAC Model reveals five core, interconnected themes. These findings systematically unpack how digital competence is operationalized, restricted, and enhanced within the specialized domain of vocational cookery instruction, as outlined in Table 1.

Table 1. Methodological Matrix of Included Literature Categorized by V-TPAC Core Vectors

V-TPAC Domain	Structural Pedagogy Focus	Key Sample Citations (2020–2026)
Vocational Alignment (V)	Industry-grade occupational standards, commercial kitchen replication, employment readiness, laboratory waste reduction.	Alqahtani (2023); Lahn & Berntsen (2023); Monteverde et al. (2025); Tsai & Lin (2025); Wang & Zhang (2022)
Technological Fluency (T)	Immersive visual software, online video modeling, AI-assisted kitchen simulations, gamified culinary modules.	Ghomi & Redecker (2019); Harper & White (2024); Kim & Lee (2025); Lumbo & Germina (2025)
Pedagogical Integrity (P)	Tactile skill translation, kitchen safety protocols, video-recorded performance testing, MELCs assessment reliability.	Aquino (2025); Catherine et al. (2025); Empimo (2025); Kim & Lee (2025); Mishra & Koehler (2006); Redecker (2017)
Anthropocentric Factors (A)	Teacher demographics, tenure-tech anxiety correlation, pre-service digital literacy, collaborative peer-mentoring networks.	Andal et al. (2022); Azarcon & Buniel (2025); Bangayan et al. (2025); Cacho & Ronda (2021); Røkenes & Krumsvik (2016); Villanueva & Ortiz (2025)
Contextual Fractures (C)	Top-down policy gaps, regional infrastructure deficits, off-line multimedia workarounds, localized ICT modules.	Bertillo et al. (2025); Cabello (2022); Dela Cruz (2024); DepEd (2020); Dube & Phiri (2024); Patel & Johnson (2022); Ramos & Bautista (2023); Rojas et al. (2023)

Theme 1: Vocational Standards Alignment (V)

The literature emphasizes that digital tools within technical-vocational tracks must never function as passive entertainment; instead, they must align directly with industry-grade occupational standards and physical workplace competencies (Lahn & Berntsen, 2023). Studies filtered through the *Vocational* dimension demonstrate that when digital resources copy actual commercial kitchen operations, they significantly boost student employment readiness (Monteverde et al., 2025).

International research shows that integrating tech-driven designs into culinary tracks prepares students for the fast-paced, automated tracking environments found in modern hospitality industries (Tsai & Lin, 2025). Furthermore, researchers agree that digital integration should not replace hands-on practice, but should instead be used as a targeted preparation tool. By using technology to preview complex, multi-step culinary tasks, instructors ensure that physical laboratory time is utilized more efficiently, reducing ingredient waste and maximizing real-world technical execution (Alqahtani, 2023; Wang & Zhang, 2022).

Theme 2: Technological Fluency and Tool Domestication (T)

Research categorized under the *Technological* parameter transitions away from abstract ICT theories to examine the explicit digital software, interactive media, and platforms adopted by vocational educators. The literature reveals a major global shift toward immersive and highly visual software configurations (Ghomi & Redecker, 2019). Cookery educators increasingly rely on interactive multimedia platforms, online video modeling, and specialized web applications to display detailed kitchen techniques (Lumbo & Germina, 2025).

At the cutting edge of culinary arts instruction, recent studies highlight the revolutionary impact of AI-assisted simulations and gamified learning modules (Harper & White, 2024; Kim & Lee, 2025). These advanced technological tools allow students to manipulate virtual recipe profiles, simulate chemical heat reactions, and practice advanced kitchen workflows in a risk-free environment. This body of literature proves that modern technological fluency for cookery teachers extends far beyond basic computer literacy; it demands the master-level curation of dynamic, highly specialized visual media that can effectively capture and demonstrate complex physical procedures.

Theme 3: Preserving Pedagogical Integrity and Safety (P)

A dominant theme across vocational literature is the challenge of maintaining pedagogical coherence when shifting hands-on culinary skills into digital spaces. Under the *Pedagogical* filter, the literature focuses heavily on how instructors manage the intersection of technology, safety standards, and performance-based rubrics (Mishra & Koehler, 2006; Redecker, 2017). Because culinary labs are safety-sensitive environments, instructors must utilize digital tools—such as step-by-step virtual demonstrations—to visually reinforce strict kitchen safety protocols, sanitation practices, and knife handling methods before students touch physical equipment (Alqahtani, 2023).

Furthermore, empirical studies confirm that utilizing digital platforms for performance-based testing drastically improves assessment reliability. By using recorded video submissions and digitized analytical rubrics, cookery teachers can review, pause, and objectively grade precise student techniques, such as knife cuts and plating presentations (Catherine et al., 2025; Kim & Lee, 2025). This ensures that the core tactile requirements and safety mandates of the Cookery Minimum Essential Learning Competencies (MELCs) are preserved and enhanced by digital applications (Aquino, 2025; Empimo, 2025).

Theme 4: Anthropocentric Variations and Human Factors (A)

The *Anthropocentric* dimension of the literature isolates the human elements—including teacher demographics, age, teaching longevity, and emotional readiness—that directly affect digital pedagogy. The literature documents an uneven distribution of digital competencies across teaching cohorts, frequently revealing a negative correlation between teacher age/tenure and digital content creation skills (Andal et al., 2022; Cacho & Ronda, 2021). Older, highly experienced culinary instructors often possess masterful hands-on skills but face high learning anxiety when adopting complex educational software (Røkenes & Krumsvik, 2016).

Conversely, less experienced or pre-service TVL educators demonstrate high baseline digital literacy but sometimes lack the deep pedagogical content knowledge required to blend technology seamlessly with complex culinary tasks (Bangayan et al., 2025). To resolve this tension, empirical studies strongly advocate for collaborative professional development models. Research demonstrates that implementing structured peer-mentoring networks and collaborative upskilling workshops successfully bridges this demographic divide—combining the digital confidence of newer teachers with the rich technical expertise of veteran chefs to maximize classroom innovation (Azarcon & Buniel, 2025; Villanueva & Ortiz, 2025).

Theme 5: Contextual Fractures and Structural Realities (C)

The final theme highlights the systemic, infrastructural, and regional fractures that limit digital implementation in underserved areas. Literature analyzed through the *Contextual* lens exposes a severe divide between top-down state policy mandates (DepEd, 2020) and the physical realities of rural school blocks (Dube & Phiri, 2024). In resource-constrained public schools—such as those across the CarCanMadCarLan municipalities—teachers are forced to navigate severe systemic barriers, including unstable internet connectivity, a lack of institutional technical support, and a lack of modern digital hardware in school kitchens (Dela Cruz, 2024).

When faced with these infrastructure deficits, the literature demonstrates that cookery teachers frequently rely on self-directed digital learning and off-line multimedia workarounds to maintain instructional continuity (Cabello, 2022). To counteract these regional inequalities, empirical research shows that deploying highly localized, pre-loaded, and off-line ICT training modules dramatically increases instructional confidence and classroom application in marginalized communities (Ramos & Bautista, 2023; Bertillo et al., 2025). Therefore,

the literature establishes that any successful digital competence framework must be carefully tailored to survive the resource constraints of its target educational environment (Patel & Johnson, 2022; Rojas et al., 2023).

CONCLUSIONS

This systematic literature review demonstrates that the digital competence of cookery teachers is a highly contextual, multi-dimensional construct that cannot be effectively evaluated using generic, discipline-neutral educational frameworks. By filtering international and local research through the customized V-TPAC Model (Vocational, Technological, Pedagogical, Anthropocentric, and Contextual parameters), the study reveals a distinct educational reality: while advanced digital resources like AI simulations, video modeling, and digitized rubrics greatly enhance instructional safety, clarity, and student engagement, their successful deployment is constantly threatened by demographic divides and severe regional infrastructure gaps.

To bridge the gap between national policy intentions and actual classroom execution within regional public schools, the global standards of DigCompEdu and TPACK must be structurally combined with localized, vocational-specific frameworks. Professional development initiatives must shift away from abstract computer literacy seminars, reorienting entirely toward subject-specific upskilling, collaborative peer-mentoring networks, and off-line digital content creation strategies tailored for resource-limited settings. Ultimately, this review provides an empirically grounded conceptual foundation for curriculum designers and policymakers. It proves that contextualizing digital competence within the lived technical and environmental realities of cookery instructors is a vital strategy for building a resilient, industry-aligned, and inclusive vocational education system.

REFERENCES

1. Almerich, G., Suárez-Rodríguez, J., Díaz-García, I., & Orellana, N. (2020). The relation between 21st-century skills and digital competence in teachers. Computers & Education, 155, Article 103934.
2. Alqahtani, M. (2023). Multimedia integration and virtual demonstrations in technical vocational subjects: Enhancing procedural clarity in culinary education. Journal of Vocational Education and Training, 75(3), 412–430.
3. Andal, M. C., Reyes, D. F., & Macasaet, L. E. (2022). Assessing the technological pedagogical content knowledge (TPACK) of TVL teachers in public senior high schools. Philippine Journal of Vocational Studies, 16(1), 45–59.
4. Aquino, S. M. (2025). Digital resource utilization and mastery of Minimum Essential Learning Competencies (MELCs) in secondary home economics. Journal of Home Economics Education, 22(2), 89–103.
5. Azarcon, J. L., & Buniel, R. M. (2025). Digital pedagogy upskilling programs for vocational instructors in Surigao del Sur: An impact evaluation. Caraga Regional Research Journal, 14(1), 62–78.
6. Bangayan, E. T., Corpuz, L. A., & Agcaoili, J. M. (2025). Digital tool integration and the development of technical core competencies among pre-service TVL educators. Journal of Vocational Teacher Education, 20(2), 145–160.
7. Bertillo, M. K., Francisco, O. R., & Solis, E. J. (2025). Digitally enriched professional development programs and learner motivation in senior high school cookery. Philippine Educational Quarterly, 53(1), 74–89.
8. Cabello, A. V. (2022). Instructional continuity through self-directed digital learning: Experiences of technology and livelihood education teachers. Journal of Pedagogical Research, 6(4), 112–126.
9. Cabero-Almenara, J., & Llorente-Cejudo, C. (2020). Covid-19: Transforming the digital competence of vocational training teachers. Journal of New Approaches in Educational Research, 9(2), 150–161.
10. Cacho, R. A., & Ronda, M. K. (2021). Digital competence levels and instructional challenges among Home Economics teachers in Region Caraga. Mindanao Educational Review, 13(2), 104–119.
11. Catherine, O., Vivian, B., & Christiana, K. (2025). Competency mastery in apparel design: Shifting from theoretical testing to output-based evaluation. Journal of Fashion Education and Technology, 21(1), 45–59.
12. Department of Education [DepEd]. (2020). The Department of Education Strategic ICT Framework: Sustaining digital pedagogy amidst educational shifts. DepEd Central Office.

13. Dela Cruz, M. T. (2024). Technological infrastructure deficits and instructional resilience in rural TVL schools. Philippine Journal of Educational Technology, 11(3), 201–216.
14. Dube, S., & Phiri, M. (2024). Digital platform adaptability and the efficacy of technical-vocational training delivery in resource-constrained environments. African Journal of Vocational Education, 32(1), 85–99.
15. Empimo, G. F. (2025). Creative preparedness and instructional innovation in cookery subjects through digital technology adoption. Journal of Technical-Vocational Education Innovation, 18(1), 114–128.
16. Ghomi, M., & Redecker, C. (2019). Digital competence of vocational teachers: A European comparative study using DigCompEdu. International Journal of Vocational Education and Training, 27(1), 74–88.
17. Harper, T. J., & White, L. M. (2024). Gamified educational modules and student participation metrics in culinary arts curricula. New Zealand Journal of Hospitality and Vocational Education, 15(2), 102–117.
18. Ifenthaler, D., & Schweinbenz, V. (2016). The acceptance of tablet-PCs in vocational education: A structural equation modeling approach. Computers in Human Behavior, 60, 363–374.
19. Instefjord, E. J., & Munthe, E. (2017). Educating digitally competent teachers: A study of integration of ICT in teacher education. Teaching and Teacher Education, 67, 37–45.
20. Kim, H. J., & Lee, S. Y. (2025). Artificial intelligence and immersive simulations in culinary arts education: Improving procedural mastery and performance assessment. Asia-Pacific Journal of Culinary Science and Technology, 17(1), 45–60.
21. Lahn, L. C., & Berntsen, A. (2023). Vocational pedagogical digital competence: Reconceptualizing teacher standards for workplace-oriented learning. Routledge.
22. Lee, S. Y., Kobia, C. M., & Son, J. (2023). Outcome-focused instructional modules and employability in community workforce programs. Vocational and Technical Education Quarterly, 39(4), 312–328.
23. Lim, T. R., Santos, P. M., & Del Rosario, G. (2023). Contextualized visual design in instructional materials for Filipino homemakers. Journal of Family and Consumer Sciences, 15(2), 78–92.
24. Lumbo, T. R., & Germina, N. P. (2025). Interactive platforms and online video scaffolding: Enhancing learner engagement in secondary cookery laboratory sessions. Journal of Food Studies and Education, 12(4), 312–327.
25. Martínez-García, I., González-Sanmamed, M., & Muñoz-Carril, P. C. (2024). Digital ecology of vocational teachers: Insights into instructional confidence and student engagement in Spain. Educational Technology Research and Development, 72(2), 515–534.
26. Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College Record, 108(6), 1017–1054.
27. Monteverde, A. B., Santos, P. M., & Cruz, R. D. (2025). Middle-level workforce demands and the digital readiness of TVL senior high school graduates. Philippine Development Review, 31(2), 140–155.
28. Patel, K. R., & Johnson, M. L. (2022). Institutional leadership, infrastructure frameworks, and sustained digital innovation among TVET instructors. Australian Journal of Technical Vocational Education, 40(3), 214–229.
29. Pecson, R. R., & Sarmiento, J. R. (2025). Student teaching and instructional materials in the 21st-century classroom: A literature review. Indonesian Journal of Teaching in Science, 5(1), 55–60.
30. Phyo, K. W. (2025). Localizing vocational training materials to enhance skill mastery among non-formal learners. Asian Journal of Technical Education, 12(2), 103–118.
31. Ramos, E. J., & Bautista, A. C. (2023). Localized ICT training modules and digital confidence among technical-vocational instructors in Mindanao. Journal of Technical Education and Training, 15(3), 78–92.
32. Redecker, C. (2017). European framework for the digital competence of educators: DigCompEdu. Publications Office of the European Union.
33. Rojas, C. F., Silva, J. A., & Toro, M. P. (2023). Blended learning environments and instructional resilience among vocational educators post-pandemic. Chilean Review of Educational Technology, 19(2), 145–161.
34. Røkenes, F. M., & Krumsvik, R. J.] (2016). Prepared to teach ESL with ICT? A review of digital competence in teacher education. Education and Information Technologies, 21(2), 457–480.
35. Tsai, Y. H., & Lin, C. E. (2025). Digital readiness and workforce competitiveness: Strategic technological transformations for ASEAN vocational education. Journal of International Development Studies, 42(1), 56–72.

36. Villanueva, L. S., & Ortiz, G. R. (2025). Collaborative professional learning and peer mentoring as drivers of digital competence among secondary cookery teachers. Journal of Educational Leadership and Management, 11(3), 188–203.
37. Wang, Y., & Zhang, X. (2022). Blended learning models and digital platforms in Chinese vocational institutions: Impact on practical skill retention. Asian Journal of Vocational Education, 14(2), 103–118.