

Developing and Exploratorily Validating a Digital Competence Framework for University Lecturers: Development in the Context of Digital Transformation in Ho Chi Minh City

M.A. Nguyen Vo Anh

anhnv@hcmue.edu.vn

Dr. Nguyen Linh Phong

phongnl@hcmue.edu.vn

Ho Chi Minh City University of Education

M.A. Quan Tuan Anh

quantuananh@hcma.vn

Ho Chi Minh National Academy of Politics

Abstract: This study develops and provides initial exploratory evidence for a 25-item digital competence instrument for university lecturers and describes self-perceived competence among 350 lecturers at five public higher education institutions in Ho Chi Minh City. The instrument covers six domains and was developed by mapping Viet Nam's National Digital Competence Framework against DigCompEdu, UNESCO ICT-CFT, DigComp 2.2, and the AI Competency Framework for Teachers. Content validity was reviewed by 15 experts, followed by a pilot survey of 30 lecturers. In the main sample, exploratory factor analysis using principal axis factoring and Oblimin rotation supported a six-factor solution; domain reliability ranged from $\alpha = .810-.872$ and $\omega = .811-.872$. General digital skills had the highest domain mean ($M = 4.10$, $SD = 0.69$), whereas AI in teaching and professional development had the lowest mean and greatest dispersion ($M = 3.41$, $SD = 0.82$). The findings provide initial exploratory support for the proposed structure and identify priorities for professional development; they do not establish a confirmed measurement model or actual performance competence.

Keywords: *Digital competence; university lecturers; artificial intelligence; digital transformation; exploratory factor analysis.*

JEL Classification: I23; J24; C38.

1. Introduction

Digital transformation in higher education is not limited to digitizing records, deploying learning management systems, or converting printed materials into electronic formats. It simultaneously affects instructional design, assessment, academic advising, professional collaboration, data governance, and quality

assurance. Lecturers' digital competence should therefore be understood as an integrated professional competence encompassing technology, pedagogy, disciplinary content, ethics, and continuous professional learning, rather than merely the ability to operate tools. This approach is consistent with the logic of TPACK, in which the educational value of

technology depends on its integration with pedagogical and content knowledge (Mishra & Koehler, 2006).

International frameworks reinforce this integrated understanding. DigCompEdu organizes educators' digital competence into six areas: professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence; the framework is designed for all levels of education, including higher education (Redecker, 2017). UNESCO ICT-CFT Version 3 connects technology with policy, curriculum and assessment, pedagogy, organization, administration, and professional learning, while allowing adaptation to national and institutional contexts (UNESCO, 2018). DigComp 2.2 adds examples of knowledge, skills, and attitudes related to data, safety, digital content, and emerging technologies (Vuorikari et al., 2022).

The rapid proliferation of artificial intelligence makes developing digital competence even more urgent. AI can support lesson planning, resource creation, feedback, translation, and personalization, but it also poses risks related to accuracy, bias, privacy, authorship, and academic integrity (Crompton & Burke, 2023; Zawacki-Richter et al., 2019). The AI Competency Framework for Teachers emphasizes a human-centered mindset, AI ethics, AI foundations and applications, AI pedagogy, and AI for professional development (Miao & Cukurova, 2024). Accordingly, AI competence cannot be equated with prompting skills; it also includes verifying outputs, being transparent about use, protecting data, and maintaining professional judgment (Miao & Holmes, 2023; Vincent-Lancrin & van der Vlies, 2020).

In Viet Nam, Circular No. 18/2026/TT-BGDĐT promulgates the Digital Competence Framework for teachers and managers of preschool, general, and continuing education institutions, comprising six domains and 20 component competencies (Ministry of Education and Training, 2026). The legal scope of the Circular does not include university lecturers. Therefore, this study does not treat the national framework as a standard directly applicable to higher education; rather, it uses the framework as an orienting reference point and adapts the units of action to course design, blended learning, higher education assessment, student autonomy, academic integrity, data governance, and the use of AI in academic activities.

International evidence indicates that exposure to technology does not automatically translate into advanced digital pedagogical competence. The TALIS 2024 country note for Viet Nam reports a high proportion of teachers using AI in their work, but an indicator of use does not directly reflect the quality of instructional design, the ability to verify outputs, or the degree of ethical compliance (OECD, 2025b). Professional development therefore needs to support lecturers in adapting pedagogy to digital environments rather than merely reproducing traditional practices in digital form (OECD, 2025a).

Ho Chi Minh City provides a suitable context for an exploratory survey of university lecturers' digital competence. In this study, all participants were drawn from public higher education institutions; therefore, the article does not compare institutions by ownership type.

The study addresses two questions: (1) Whether the 25-item instrument exhibits an appropriate six-factor structure at an exploratory level; and (2) How lecturers' self-assessed digital competence is manifested across items within each domain. The study addresses a specific gap: international frameworks provide strong conceptual guidance, but an instrument adapted to Vietnamese higher education that integrates digital pedagogy, professional collaboration, data responsibility, and AI competence still requires context-sensitive development and empirical examination. The contribution is therefore an adapted exploratory assessment instrument, not a new normative competence standard.

2. Research methods

The study used a cross-sectional quantitative design with a descriptive-exploratory orientation to initially validate the instrument structure and describe lecturers' self-assessed digital competence. The sample included 350 lecturers from five public higher education institutions in Ho Chi Minh City, of whom 53.4% were women and 46.6% were men. We recruited participants through convenience sampling, covering five disciplinary groups and varying levels of teaching experience and technology-use frequency. Data were collected online in March 2026; the final analytic dataset comprised 350 complete cases across all six domains. Because probability sampling was not used, the findings are interpreted within the study sample and are not statistically representative of all lecturers in Ho Chi Minh City.

Before completing the questionnaire, participants were informed of the study

purpose, voluntary participation, the right to discontinue participation, confidentiality principles, and that data would be reported only in aggregate form. The questionnaire did not collect directly identifying information. Existing records do not retain the initial number of responses, the number of excluded responses, or a detailed data-cleaning log; therefore, the study does not retrospectively add this information.

The instrument comprises 25 items rated on a five-point Likert scale from 1 = Strongly disagree to 5 = Strongly agree and is organized into six domains: organizing teaching and education in digital environments (ORG), technology-enhanced assessment (ASS), empowering learners in digital environments (EMP), general digital skills (DGS), professional development and digital collaboration (PDC), and AI in teaching and professional development (AIT). The items were developed by drawing on the orienting structure of the National Digital Competence Framework, adapting the units of action to the higher education context, and mapping them against DigCompEdu, UNESCO ICT-CFT, DigComp 2.2, and the AI Competency Framework for Teachers (Ministry of Education and Training, 2026; Redecker, 2017; UNESCO, 2018; Vuorikari et al., 2022; Miao & Cukurova, 2024). Table 1 presents the relationship between each domain, the observed content, and the corresponding reference framework group.

15 experts reviewed by 15 experts. The available study records support reporting the panel size and resulting I-CVI and CVR values but do not document sufficiently detailed expert-selection criteria or cognitive-interview procedures; we treated these

as limitations. I-CVI ranged from .933 to 1.000 and CVR from .867 to 1.000. We interpreted CVR following Lawshe (1975), and we considered instrument development in relation to scale-development guidance

(Boateng et al., 2018). A pilot survey of 30 lecturers yielded domain-level Cronbach's alpha values from .774 to .940. Given the small pilot sample, these coefficients are treated as preliminary screening evidence.

Table 1. Mapping each item to reference/theoretical frameworks

Domain	Item code	Content	Reference/theoretical framework
Organizing Teaching and Education in Digital Environments (ORG)	ORG1	Design digital lessons aligned with learning objectives	National Digital Competence Framework; DigCompEdu; UNESCO ICT-CFT
	ORG2	Select appropriate educational platforms for different learning modalities	
	ORG3	Effectively manage online and blended classes	
	ORG4	Personalize students' learning activities through digital tools	
	ORG5	Organize blended online-face-to-face learning activities	
Technology-Enhanced Assessment (ASS)	ASS1	Design digital assessments that ensure authenticity	National Digital Competence Framework; DigCompEdu
	ASS2	Collect diverse learning evidence through digital tools	
	ASS3	Analyze learning outcomes to improve teaching	
	ASS4	Provide timely feedback to students through digital platforms	
Empowering Learners in Digital Environments (EMP)	EMP1	Support students' autonomous learning in digital environments	National Digital Competence Framework; DigCompEdu; UNESCO ICT-CFT
	EMP2	Design collaborative activities among students using digital tools	
	EMP3	Ensure digital inclusion for all students	
	EMP4	Guide students in solving problems with technology in an ethical manner	

Domain	Item code	Content	Reference/ theoretical framework
General Digital Skills (DGS)	DGS1	Search for and evaluate reliable online information sources	National Digital Competence Framework; DigComp 2.2
	DGS2	Create digital content for teaching	
	DGS3	Communicate effectively through digital platforms	
	DGS4	Protect personal information and privacy when using technology	
Professional Development and Digital Collaboration (PDC)	PDC1	Communicate digitally with professional colleagues	National Digital Competence Framework; DigCompEdu; OECD
	PDC2	Share digital teaching resources with professional communities	
	PDC3	Participate in professional networks for professional development	
	PDC4	Independently learn new digital skills to enhance teaching competence	
AI in Teaching and Professional Development (AIT)	AIT1	Understand basic concepts of artificial intelligence	National Digital Competence Framework; UNESCO AI Competency Framework for Teachers
	AIT2	Apply AI to support teaching	
	AIT3	Use AI ethically and transparently in teaching	
	AIT4	Independently learn AI skills for professional development	

Source: Developed by the authors based on the Ministry of Education and Training (2026), Redecker (2017), UNESCO (2018), Vuorikari et al. (2022), and Miao and Cukurova (2024).

In *Table 1*, items within the same domain use the same reference frameworks, while the “Content” column is standardized to match the statements in the appendix and remains consistent across the results tables. This organization helps ensure alignment among the theoretical foundation, the instrument structure, and the description of the current status.

We performed statistical analyses using

jamovi version 2.7.37. We used exploratory factor analysis (EFA) with principal axis factoring and oblique Oblimin rotation. We assessed data suitability using KMO and Bartlett’s test and guided factor retention using parallel analysis, the scree plot, eigenvalues, and theoretical interpretability (Horn, 1965). Items were evaluated using the EFA summary statistics retained in the available analytic records, including primary factor-loading and

communality ranges by domain. We reported internal consistency using Cronbach's alpha and McDonald's omega. The retained analytic records contain summary EFA outputs rather than the complete item-by-factor pattern matrix and detailed Parallel Analysis output; accordingly, the factor-analytic findings are interpreted as initial exploratory evidence rather than as a complete validation of the measurement model.

Descriptive analysis focused on individual items within the six domains, using the mean (M), standard deviation (SD), and 95% confidence interval (95% CI); domain means served only as supplementary aggregate indicators. We interpreted item means descriptively as self-assessment tendencies. We did not conduct inferential tests of within-domain mean differences; accordingly, we do not treat small numerical differences among items as statistically established.

The study did not conduct CFA, SEM, measurement-invariance testing, or multilevel modeling. CFA and measurement-invariance testing are reserved for a confirmatory phase using an independent sample; SEM is not appropriate for the current objective because the study does not test structural or causal relationships; and data from five institutions do not provide enough clusters for reliable multilevel-model estimation. Given the constraints of time, resources, and study objectives, the analytic strategy therefore focused on EFA, reliability, and item-level description of the current status.

3. Results

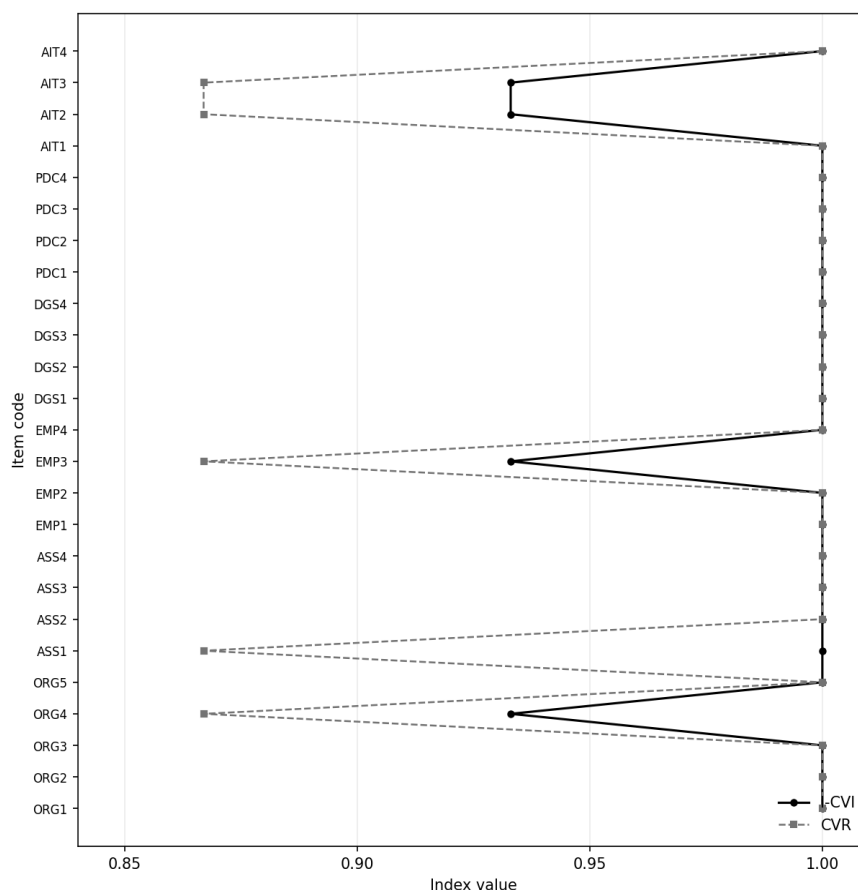
3.1. Content validity and pilot survey

Content validity was examined using both I-CVI and CVR to reflect two different aspects of expert judgment. I-CVI indicates the level of agreement regarding the relevance of each item to the content being measured, whereas

CVR reflects the extent to which experts consider an item essential to the competence structure. Among the 15 experts, 21/25 items achieved I-CVI = 1.000; four items - ORG4, EMP3, AIT2, and AIT3 - achieved I-CVI = .933, corresponding to 14/15 experts rating them as relevant. For CVR, 20/25 items achieved 1.000; ORG4, ASS1, EMP3, AIT2, and AIT3 achieved .867, meaning that 14/15 experts considered these contents essential.

This pattern of results indicates very high but not entirely uniform agreement. Notably, ASS1 achieved I-CVI = 1.000 but CVR = .867: all experts considered the content "Design digital assessments that ensure authenticity" relevant, but one expert did not classify it as essential. By contrast, ORG4, EMP3, AIT2, and AIT3 showed slight reductions in both indices, indicating somewhat greater variation in expert judgments regarding content related to personalization, inclusion, and AI. The expert data do not explain these differences; therefore, the results identify only items that warrant attention in interpretation and do not provide sufficient grounds to conclude that the content of those items is problematic.

By content group, DGS and PDC items achieved complete agreement on both I-CVI and CVR, whereas lower values were concentrated in ORG4, ASS1, EMP3, and the two AIT items AIT2-AIT3. This distribution does not support a conclusion that newer or more complex domains have lower validity, but it suggests that content related to personalization, inclusion, assessment authenticity, and AI use requires more precise conceptual description when transferred to the higher education context. This is also why expert judgment should be considered alongside empirical data: an item may be highly reasonable in content terms but should be retained only when participants' responses show it operates consistently with the other items in the same domain.

Figure 1. I-CVI and CVR by item (15 experts)

Note: I-CVI ranged from .933 to 1.000; CVR ranged from .867 to 1.000.

Source: Authors' analysis based on expert-review data (2026).

Figure 1 further clarifies the distribution of the two indices: most observations converge at 1.000, while lower values occur only for a small number of specific items and remain very close to complete agreement. This is more informative than reporting only the range because it shows that the minimum values are not widespread across the scale. The convergence at 1.000 is also consistent with the fact that the 25 items were developed within domains with clear reference foundations; however, high expert agreement establishes content plausibility only and does not demonstrate that actual respondents will organize the items according to the six

expected factors.

Accordingly, the pilot survey examined whether items within the same domain functioned consistently when lecturers answered them. The two types of evidence are complementary: expert review addresses the question of whether “the content is relevant and essential,” while reliability in the pilot sample indicates whether “items within the same domain form a sufficiently consistent response set.” Reading these forms of evidence sequentially helps avoid equating content validity with empirical measurement quality.

Table 2. Cronbach's alpha reliability in the pilot survey (n = 30)

Domain	No. of items	Cronbach's α	Minimum CITC	Maximum CITC
ORG	5	.794	.450	.711
ASS	4	.859	.643	.803
EMP	4	.903	.734	.860
DGS	4	.858	.686	.730
PDC	4	.774	.498	.684
AIT	4	.940	.782	.914

Source: Authors' analysis based on expert-review data (2026).

Table 2 shows that Cronbach's alpha in the pilot survey ranged from .774 to .940. AIT had the highest alpha (.940) and CITC values from .782 to .914, indicating very strong internal relationships among the four AI items in the pilot sample; by contrast, PDC had the lowest alpha (.774), with CITC values from .498 to .684, while ORG had alpha = .794 and a minimum CITC of .450. Despite differences in magnitude, all CITCs were positive and sufficiently large not to suggest any item clearly separated from its domain. With $n = 30$, these values should be regarded as preliminary screening signals rather than stable evidence of reliability.

Overall, the sequence of evidence from I-CVI/CVR through the pilot survey indicates that the 25 items have a clear content basis and that no sign emerged requiring immediate item removal at the initial stage. Nevertheless, the four items with I-CVI = .933 and the five items with CVR = .867 were retained for closer attention when interpreting the EFA and descriptive results, because relatively lower expert agreement may reflect aspects

that are newer, more complex, or more context-dependent than familiar forms of digital competence.

3.2. EFA and reliability in the main sample

The data were suitable for EFA (KMO = .781; Bartlett's $\chi^2(300) = 1799.86$, $p < .001$). The retained analysis records indicate that Parallel Analysis supported retention of six factors. EFA using principal axis factoring with Oblimin rotation yielded the proposed six-domain solution (Table 3). Primary factor loadings by domain ranged from .609 to .812; Cronbach's alpha ranged from .810 to .872, and McDonald's omega ranged from .811 to .872. These statistics provide initial exploratory support for the proposed structure; they do not confirm the measurement model. Because the complete item-by-factor pattern matrix and detailed Parallel Analysis output are not available in the retained analytic records, the present study reports the factor solution at the domain-summary level.

Table 3. Summary of scale quality: EFA and reliability

Domain	No. of items	EFA loading	h^2	α	ω
ORG	5	.659-.809	.511-.661	.852	.853
ASS	4	.675-.812	.484-.653	.826	.827
EMP	4	.682-.777	.485-.613	.826	.826
DGS	4	.609-.792	.415-.647	.810	.811
PDC	4	.666-.789	.470-.615	.818	.818
AIT	4	.745-.807	.562-.675	.872	.872

Note: KMO = .781; Bartlett $\chi^2(300) = 1799.86$, $p < .001$; Parallel Analysis = 6 factors; PAF + Oblimin.

Source: Authors' analysis based on the main survey (N = 350) (2026).

At the domain-summary level, primary loadings ranged from .609 to .812 and communalities from .415 to .675. Internal-consistency estimates were acceptable for exploratory purposes across all six domains. These results are interpreted as preliminary structural evidence and should not be read as a complete item-level validation of factor assignment or cross-loadings.

Cronbach's alpha and McDonald's omega were nearly identical across the six domains. Together with the KMO, Bartlett's test, and six-factor Parallel Analysis result, this pattern supports retaining the proposed structure for exploratory use, subject to inspection of the full item-level factor solution.

These findings support retaining the 25-item, six-domain structure at the exploratory stage, but they are not considered confirmatory evidence for the measurement model. The next phase should conduct CFA, convergent-discriminant validity testing, and measurement-invariance testing on an independent sample.

3.3. Self-perceived digital competence across six domains

Self-perceived digital competence is described across six domains at the item level. M, SD,

and 95% CI summarize response tendencies and dispersion. Because the study did not conduct inferential tests of within-domain item differences, numerical differences are interpreted descriptively rather than as statistically established rankings.

Composite domain scores are retained to provide overall context, while interpretation focuses on specific content in order to identify relatively stable aspects and areas that remain more differentiated across the lecturer cohort.

(1) Organizing Teaching and Education in Digital Environments (ORG)

The ORG domain reflects the ability to convert technological conditions into an organized teaching structure, from platform selection and class management to the design of blended and personalized activities. The composite score was $M = 4.05$ ($SD = 0.69$; 95% CI [3.98, 4.12]). At the item level, mean values ranged from 3.96 to 4.11, while SD ranged from 0.84 to 0.91. This range suggests a generally positive picture that is not entirely uniform across professional behaviors, while dispersion of nearly 0.9 points for most items indicates that meaningful differences in confidence and experience remain among lecturers (Table 4).

Table 4. Item-level self-assessment in the ORG domain (N = 350)

Item code	Content	M	SD	95% CI
ORG1	Design digital lessons aligned with learning objectives	4.01	0.89	[3.92, 4.11]
ORG2	Select appropriate educational platforms for different learning modalities	4.10	0.90	[4.01, 4.20]
ORG3	Effectively manage online and blended classes	4.06	0.84	[3.97, 4.15]
ORG4	Personalize students' learning activities through digital tools	3.96	0.91	[3.87, 4.06]
ORG5	Organize blended online-face-to-face learning activities	4.11	0.84	[4.02, 4.20]
Overall	Organizing Teaching and Education in Digital Environments	4.05	0.69	[3.98, 4.12]

Source: Authors' analysis based on the main survey (N = 350) (2026).

ORG5, "Organize blended online-face-to-face learning activities," had $M = 4.11$, $SD = 0.84$, and 95% CI [4.02, 4.20]; ORG2, "Select appropriate educational platforms for different learning modalities," had $M = 4.10$, $SD = 0.90$, and 95% CI [4.01, 4.20]. These two contents had almost equivalent means and strongly overlapping confidence intervals; therefore, the 0.01-point difference should not be interpreted as a substantive advantage. ORG3 on effective management of online and blended classes had $M = 4.06$ and shared the lowest SD with ORG5 (0.84), suggesting somewhat more concentrated self-assessments. ORG1 on digital lesson design had $M = 4.01$, while ORG4 on personalizing learning activities was lowest at $M = 3.96$; ORG4 also had the highest SD in the domain (0.91), indicating that personalization was not only lower on average but also more varied across respondents (Table 4).

This suggests that ORG development should not stop at training in platform use. Support systems need to connect technology with course design, learning data, and pedagogical

choices that can respond to differences in students' pace, motivation, and access conditions. If personalization is implemented without attention to transparency, autonomy, and accessibility, technology may deepen disparities rather than expand learning opportunities. The ORG domain therefore reflects both organizational competence and the extent of the shift from tool use to intentional learning-environment design (Redecker, 2017; UNESCO, 2018; Tondeur et al., 2017).

(2) Technology-Enhanced Assessment (ASS)

The ASS domain covers the digital assessment cycle from task design and evidence collection to analysis of results and feedback to students. The composite score was $M = 4.00$ ($SD = 0.72$; 95% CI [3.92, 4.08]). The four items had M values from 3.95 to 4.04 and SD values from 0.85 to 0.93, indicating similar means but not identical dispersion. Because all 95% CIs overlap substantially, view differences among items as descriptive tendencies within the assessment cycle rather than a definitive ranking.

Table 5. Item-level self-assessment in the ASS domain (N = 350)

Item code	Content	M	SD	95% CI
ASS1	Design digital assessments that ensure authenticity	4.02	0.87	[3.93, 4.11]
ASS2	Collect diverse learning evidence through digital tools	3.99	0.93	[3.89, 4.08]
ASS3	Analyze learning outcomes to improve teaching	4.04	0.85	[3.95, 4.13]
ASS4	Provide timely feedback to students through digital platforms	3.95	0.91	[3.86, 4.05]
Overall	Technology-Enhanced Assessment	4.00	0.72	[3.92, 4.08]

Source: Authors' analysis based on the main survey (N = 350) (2026).

ASS3, "Analyze learning outcomes to improve teaching," had $M = 4.04$, $SD = 0.85$, and 95% CI [3.95, 4.13]; it had both the highest mean and the lowest dispersion in the domain, indicating more concentrated self-assessment responses for this content. ASS1, "Design digital assessments that ensure authenticity," had $M = 4.02$, $SD = 0.87$, and 95% CI [3.93, 4.11]. ASS2, "Collect diverse learning evidence through digital tools," had $M = 3.99$ but the highest SD in the domain (0.93), indicating greater variation among lecturers even though its mean was only 0.05 points lower than ASS3. ASS4, "Provide timely feedback to students through digital platforms," had $M = 3.95$, $SD = 0.91$, and 95% CI [3.86, 4.05], making it relatively lower in mean while still showing considerable dispersion (Table 5).

Accordingly, improving ASS requires simultaneous attention to assessment design, data quality, and feedback processes. Digital systems create educational value only when evidence is interpreted transparently, feedback is provided at the right time, and students can understand what they need to adjust. These

requirements relate directly to equity in access to feedback, the right to explanations for academic decisions, and human responsibility as data become increasingly embedded in assessment. The ASS domain therefore can support assessment-quality governance in a way that not only digitizes processes but also ensures the regulatory function and academic accountability of assessment (Redecker, 2017; UNESCO, 2018).

(3) Empowering Learners in Digital Environments (EMP)

The EMP domain focuses on enabling students to learn autonomously, collaborate, participate inclusively, and solve problems ethically with technology. The composite score was $M = 3.76$ ($SD = 0.77$; 95% CI [3.68, 3.84]). Item means ranged from 3.72 to 3.83, while all SD values were 0.92-0.96, higher than those of most ORG, ASS, and DGS items. This indicates that the notable issue in EMP is not only a relatively lower mean but also greater variation in experience and confidence among lecturers (Table 6).

Table 6. Item-level self-assessment in the EMP domain (N = 350)

Item code	Content	M	SD	95% CI
EMP1	Support students' autonomous learning in digital environments	3.75	0.92	[3.65, 3.85]
EMP2	Design collaborative activities among students using digital tools	3.72	0.95	[3.62, 3.82]
EMP3	Ensure digital inclusion for all students	3.73	0.95	[3.63, 3.83]
EMP4	Guide students in solving problems with technology in an ethical manner	3.83	0.96	[3.73, 3.94]
Overall	Empowering Learners in Digital Environments	3.76	0.77	[3.68, 3.84]

Source: Authors' analysis based on the main survey (N = 350) (2026).

EMP4, "Guide students in solving problems with technology in an ethical manner," had $M = 3.83$, $SD = 0.96$, and 95% CI [3.73, 3.94]. Although it had the highest mean in the domain, it also had the largest SD, indicating widely dispersed self-assessments: some lecturers may feel fairly confident, whereas others may not have a comparable level of readiness. EMP1, "Support students' autonomous learning in digital environments," had $M = 3.75$, $SD = 0.92$; EMP3, "Ensure digital inclusion for all students," had $M = 3.73$, $SD = 0.95$; and EMP2, "Design collaborative activities among students using digital tools," had $M = 3.72$, $SD = 0.95$. The 95% CIs of all four contents overlap strongly, providing no basis for isolating any one item as a distinct deficit (Table 6).

Compared with several other domains, EMP showed lower self-assessment and greater dispersion within the sample. This pattern indicates heterogeneity in lecturers' perceived readiness concerning autonomy, collaboration, inclusion, and ethical problem solving; it does not demonstrate uneven actual

practice or institutional standardization.

The findings indicate that EMP development should focus on the quality of learning opportunities that technology creates for students. Collaborative activities need sufficiently clear structures to avoid becoming mechanical divisions of labor; autonomy should be supported so learners can make meaningful choices; inclusion should be considered from the design stage; and ethical problem solving requires both judgment and responsibility for the consequences of technology use. From this perspective, the EMP domain reflects not only the degree of "learner-centeredness" but also the extent to which technology is organized to expand participation rights, reduce barriers, and respect learner dignity (Redecker, 2017; Tondeur et al., 2017; UNESCO, 2018).

(4) General Digital Skills (DGS)

The DGS domain reflects foundational digital skills related to searching for and evaluating information, creating content, communicating through digital platforms, and protecting personal data. The domain

composite score was $M = 4.10$ ($SD = 0.69$; 95% CI [4.03, 4.17]), relatively higher than the other domains. At the item level, M ranged from 4.05 to 4.17 and SD from 0.83 to 0.91,

indicating generally positive self-assessments while still showing some differences among lecturers, particularly in areas related to interaction and data responsibility.

Table 7. Item-level self-assessment in the DGS domain (N = 350)

Item code	Content	M	SD	95% CI
DGS1	Search for and evaluate reliable online information sources	4.17	0.83	[4.08, 4.26]
DGS2	Create digital content for teaching	4.07	0.87	[3.98, 4.17]
DGS3	Communicate effectively through digital platforms	4.10	0.91	[4.00, 4.19]
DGS4	Protect personal information and privacy when using technology	4.05	0.86	[3.96, 4.14]
Overall	General Digital Skills	4.10	0.69	[4.03, 4.17]

Source: Authors' analysis based on the main survey (N = 350) (2026).

DGS1, "Search for and evaluate reliable online information sources," had $M = 4.17$, $SD = 0.83$, and 95% CI [4.08, 4.26], and it also had the lowest dispersion in the domain. DGS3, "Communicate effectively through digital platforms," had $M = 4.10$ but $SD = 0.91$, the highest in the domain, indicating that a relatively high mean was not accompanied by a corresponding degree of uniformity among respondents. DGS2, "Create digital content for teaching," had $M = 4.07$ ($SD = 0.87$), while DGS4, "Protect personal information and privacy when using technology," had $M = 4.05$ ($SD = 0.86$) (Table 7). The 95% confidence intervals overlap substantially; therefore, the four contents should be viewed as a cluster of foundational skills with fairly similar means rather than as clearly ranked competencies.

The high mean for DGS1 is consistent with the nature of academic work, which requires

lecturers to regularly search for, select, and evaluate information sources. However, the greater dispersion in digital communication indicates that technology-use experience is not entirely uniform across professional contexts and organizational environments. For data protection and privacy, the mean remained relatively high, but this content should be considered together with growing requirements for storing, sharing, and governing learning data; these issues extend beyond individual technical operations and depend partly on institutional regulations and infrastructure.

This finding is consistent with DigComp 2.2 and DigCompEdu, which view information, content, communication, and digital safety competencies as foundational conditions for effective and responsible participation in digital environments (Vuorikari et al., 2022; Redecker, 2017). However, the differences

between DGS and the EMP or AIT domains in the present study show that foundational digital skills cannot substitute for pedagogical competence, the ability to empower learners, or professional judgment regarding new technologies. DGS therefore serves as a foundation of the competence framework, but its developmental value is fully realized only when connected with the other domains.

(5) Professional Development and Digital Collaboration (PDC)

The PDC domain reflects the use of digital environments for professional communication, resource sharing, network participation, and self-directed learning. The composite score was $M = 4.05$ ($SD = 0.73$; 95% CI [3.97, 4.13]). The four items had very similar means (4.03 to 4.08), but SD ranged from 0.88 to 0.93, indicating that the content means were relatively uniform while individual experiences still showed considerable dispersion (Table 8).

Table 8. Item-level self-assessment in the PDC domain (N = 350)

Item code	Content	M	SD	95% CI
PDC1	Communicate digitally with professional colleagues	4.05	0.93	[3.95, 4.14]
PDC2	Share digital teaching resources with professional communities	4.08	0.90	[3.99, 4.18]
PDC3	Participate in professional networks for professional development	4.03	0.88	[3.94, 4.12]
PDC4	Independently learn new digital skills to enhance teaching competence	4.04	0.92	[3.94, 4.14]
Overall	Professional Development and Digital Collaboration	4.05	0.73	[3.97, 4.13]

Source: Authors' analysis based on the main survey (N = 350) (2026).

PDC2, "Share digital teaching resources with professional communities," had $M = 4.08$, $SD = 0.90$, and 95% CI [3.99, 4.18]. PDC1, "Communicate digitally with professional colleagues," had $M = 4.05$ but $SD = 0.93$, the highest in the domain; PDC4, "Independently learn new digital skills to enhance teaching competence," had $M = 4.04$, $SD = 0.92$; and PDC3, "Participate in professional networks for professional development," had $M = 4.03$ and $SD = 0.88$, the lowest in the domain. The largest difference among the means was

only 0.05 points, and all 95% CIs overlap substantially; therefore, the most salient feature of PDC is the closeness of the means rather than a ranking among items (Table 8).

The significance of PDC lies in its capacity to convert individual competence into collective competence through knowledge circulation and the formation of professional learning networks. If attention is limited to isolated training courses, new knowledge may remain at the individual level; by contrast, communities

of practice, resource sharing, and peer review can enable experience to be verified and accumulated at the organizational level. PDC development should therefore be viewed as part of knowledge governance and a learning culture in universities, where technology provides connective infrastructure rather than replacing professional relationships and the responsibility to share knowledge (OECD, 2025a; Redecker, 2017).

(6) *AI in Teaching and Professional Development (AIT)*

The AIT domain reflects foundational

understanding, the ability to apply AI in teaching, ethical and transparent AI use, and self-directed learning for professional development. The composite score was $M = 3.41$ ($SD = 0.82$; 95% CI [3.32, 3.50]), relatively lower and more dispersed than the other domains. At the item level, M ranged only from 3.37 to 3.48, while all SD values were 0.96-0.99, indicating that the salient feature of AIT is not one item falling far behind but the entire domain showing lower self-assessments and substantial differentiation (Table 9).

Table 9. Item-level self-assessment in the AIT domain (N = 350)

Item code	Content	M	SD	95% CI
AIT1	Understand basic concepts of artificial intelligence	3.48	0.96	[3.38, 3.58]
AIT2	Apply AI to support teaching	3.37	0.99	[3.26, 3.47]
AIT3	Use AI ethically and transparently in teaching	3.39	0.96	[3.29, 3.49]
AIT4	Independently learn AI skills for professional development	3.40	0.97	[3.30, 3.50]
Overall	AI in Teaching and Professional Development	3.41	0.82	[3.32, 3.50]

Source: Authors' analysis based on the main survey (N = 350) (2026).

AIT1, "Understand basic concepts of artificial intelligence," had $M = 3.48$, $SD = 0.96$, and 95% CI [3.38, 3.58]. AIT4, "Independently learn AI skills for professional development," had $M = 3.40$, $SD = 0.97$; AIT3, "Use AI ethically and transparently in teaching," had $M = 3.39$, $SD = 0.96$; and AIT2, "Apply AI to support teaching," had $M = 3.37$, $SD = 0.99$, and 95% CI [3.26, 3.47]. AIT2 had the largest SD in the entire domain, indicating substantial differences in readiness to apply AI among lecturers. However, the 95% CIs

of all four items overlap strongly; therefore, there is no basis for treating application, ethics, or self-directed learning as completely separate gaps (Table 9).

The combination of a lower mean and SD values close to 1.0 indicates greater dispersion in self-assessed AI competence within the sample. The data do not establish differences in actual AI performance or maturity. Future research should directly test possible explanations involving exposure, institutional support, or professional standards.

The AIT results support treating AI-related competence as an integrated development area rather than as tool training alone. Professional development should connect system limitations and pedagogical application with output verification, transparency, data protection, academic integrity, and human responsibility. These priorities are consistent with the AI Competency Framework for Teachers and related guidance (Miao & Cukurova, 2024; Miao & Holmes, 2023; Vincent-Lancrin & van der Vlies, 2020).

4. Discussion

The findings are broadly consistent with the multidimensional conception of digital competence in DigCompEdu, UNESCO ICT-CFT, and DigComp 2.2, while the comparatively lower self-assessment and greater dispersion in AIT support examining AI competence explicitly in the current higher education context (Redecker, 2017; UNESCO, 2018; Vuorikari et al., 2022; Miao & Cukurova, 2024). Foundational digital skills received relatively high self-assessments, whereas learner empowerment and AI-related content showed lower means and/or greater dispersion. This pattern is compatible with prior research emphasizing that technology integration depends on pedagogical orientations and professional practice rather than tool use alone (Bond et al., 2018; Tondeur et al., 2017). Accordingly, digital transformation in university teaching should be understood as a change in how learning experiences, assessment, and learner support are organized, rather than simply as expanded platform use.

The findings on assessment, learner empowerment, and AI can be interpreted through the distinction between digitizing activities and creating pedagogical value. DigCompEdu and UNESCO ICT-CFT emphasize the pedagogical use of assessment evidence, while reviews of AI highlight

continuing concerns regarding design, verification, privacy, and accountability (Crompton & Burke, 2023; Zawacki-Richter et al., 2019). This study builds on these works by integrating foundational digital skills, digital pedagogy, professional development, and AI within a single exploratory assessment instrument for university lecturers. Its contribution lies in contextual adaptation and initial empirical examination rather than in establishing a definitive competence standard.

This contribution should nevertheless be considered within the scope of a descriptive-exploratory study. Given time and resource limitations, the study focused on developing an initial assessment framework, examining its structure with EFA, and applying it to describe self-perceived digital competence; it did not confirm the measurement model or test structural and causal relationships. Convenience sampling at five public institutions, cross-sectional and self-reported data, the absence of cognitive interviews, and the unavailability of the complete item-by-factor EFA pattern matrix and detailed Parallel Analysis output in the retained analytic records limit the strength and reproducibility of the measurement evidence. Future research should report full item-level factor loadings and cross-loadings, replicate factor retention in an independent sample, conduct CFA, test convergent-discriminant validity and measurement invariance, broaden the range of participating institutions, and combine self-report data with course products, observations of practice, platform data, and student feedback.

This study has several limitations. *First*, convenience sampling from five public higher education institutions limits the generalizability of the findings beyond the study sample. *Second*, the cross-sectional self-report design captures lecturers' self-perceived rather than demonstrated digital

competence. *Third*, the available analytic records retain summary EFA results but not the complete item-by-factor pattern matrix or detailed Parallel Analysis output; therefore, the reported factor structure should be interpreted as initial exploratory evidence rather than a complete validation of the measurement model. *Fourth*, the authors did not conduct documented cognitive interviews during instrument development. Future research should replicate the factor structure in an independent sample, report full item-level loadings and cross-loadings, conduct CFA and measurement-invariance testing, and combine self-report data with evidence of actual practice.

5. Conclusion and recommendations

The study of 350 lecturers at five public higher education institutions in Ho Chi Minh City developed a 25-item digital competence instrument across six domains and obtained initial exploratory evidence supporting its proposed structure. The EFA and reliability results are appropriate for exploratory use, while item-level analysis identifies areas of relatively higher or lower self-assessment and differing dispersion within the sample. The instrument should not yet be regarded as a confirmed measurement model or as a measure of demonstrated performance competence.

Within the study sample, foundational digital skills received relatively high self-assessments, whereas learner empowerment and especially AI-related competence showed lower means and/or greater dispersion. These patterns should inform professional-development priorities rather than rank actual competence or generalize to all university lecturers in Ho Chi Minh City.

Higher education institutions can use the six domains as an initial diagnostic map for designing professional development,

provided that administrative decisions remain linked to pedagogical goals, conditions for learner participation, requirements for equity in digital access, and principles of autonomy, responsibility, and integrity. These directions are exploratory; future research needs to confirm the structure in an independent sample and combine self-report data with evidence of practice before using the instrument for high-stakes assessment decisions.

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APPENDIX

SURVEY QUESTIONNAIRE ON UNIVERSITY LECTURERS' DIGITAL COMPETENCE

Dear Lecturer, this questionnaire collects data on university lecturers' self-perceived digital competence. Participants are informed about the study purpose, voluntary participation, confidentiality, and the principle that results will be reported only in aggregate form. Please select the option that most closely reflects your current practice. There are no right or wrong answers.

Section A. Demographic Information

1. Gender: Male / Female
2. Disciplinary group: Education / Engineering and information technology / Economics and business / Languages / Social sciences and humanities
3. Teaching experience: Less than 5 years / 5-10 years / 11-20 years / More than 20 years
4. Frequency of technology use: Daily / Several times/week / Several times/month / Limited

Section B. Assessment of Lecturers' Digital Competence

Rating scale: 1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree.

Item code	Statement	1	2	3	4	5
ORG1	I can design digital lessons aligned with learning objectives.	☐	☐	☐	☐	☐
ORG2	I can select appropriate educational platforms for different learning modalities.	☐	☐	☐	☐	☐
ORG3	I can effectively manage online and blended classes.	☐	☐	☐	☐	☐
ORG4	I can personalize students' learning activities through digital tools.	☐	☐	☐	☐	☐
ORG5	I can organize blended online-face-to-face learning activities.	☐	☐	☐	☐	☐
ASS1	I can design digital assessments that ensure authenticity.	☐	☐	☐	☐	☐
ASS2	I can collect diverse learning evidence through digital tools.	☐	☐	☐	☐	☐
ASS3	I can analyze learning outcomes to improve teaching.	☐	☐	☐	☐	☐

Item code	Statement	1	2	3	4	5
ASS4	I can provide timely feedback to students through digital platforms.	☐	☐	☐	☐	☐
EMP1	I can support students' autonomous learning in digital environments.	☐	☐	☐	☐	☐
EMP2	I can design collaborative activities among students using digital tools.	☐	☐	☐	☐	☐
EMP3	I can ensure digital inclusion for all students.	☐	☐	☐	☐	☐
EMP4	I can guide students in solving problems with technology in an ethical manner.	☐	☐	☐	☐	☐
DGS1	I can search for and evaluate reliable online information sources.	☐	☐	☐	☐	☐
DGS2	I can create digital content for teaching.	☐	☐	☐	☐	☐
DGS3	I can communicate effectively through digital platforms.	☐	☐	☐	☐	☐
DGS4	I can protect personal information and privacy when using technology.	☐	☐	☐	☐	☐
PDC1	I can communicate digitally with professional colleagues.	☐	☐	☐	☐	☐
PDC2	I can share digital teaching resources with professional communities.	☐	☐	☐	☐	☐
PDC3	I can participate in professional networks for professional development.	☐	☐	☐	☐	☐
PDC4	I independently learn new digital skills to enhance my teaching competence.	☐	☐	☐	☐	☐
AIT1	I understand basic concepts of artificial intelligence.	☐	☐	☐	☐	☐
AIT2	I can apply AI to support teaching.	☐	☐	☐	☐	☐
AIT3	I use AI ethically and transparently in teaching.	☐	☐	☐	☐	☐
AIT4	I independently learn AI skills for professional development.	☐	☐	☐	☐	☐