Digital Competence of Lecturers at the Universities of Education: In the Context of Education Digital Transformation Vietnam

Tuong Sy Hoang, My Loc Thi Nguyen, Long Ngoc Pham, Thanh Huyen Thi Nguyen, and Loan Thi Nguyen

***Abstract*—This study aims to assess the digital proficiency of lecturers as well as the experiences and practices of digital technology in the teaching process in Vietnam Universities of Education. In this study, qualitative and quantitative survey methods were used. The study was conducted with 320 lecturers, 150 managers, training experts, and leaders at the top three Universities of Education in Vietnam. In the study, the digital competency questionnaire was used as a data collection tool. It is built based on the digital competence framework (DigComp 2.1 model), The European Framework for the Digital Competence of Educators (DigCompEdu), DigComp SAT. After the analysis and evaluation processes of the results, it is stated that the digital competence of lecturers at pedagogical schools in Vietnam is about the average and it varies by genders, academic degrees and awareness levels of digital capabilities. The results will help the leaders understand the needs, information about digital capabilities and things to focus on training so that lecturers at Vietnam pedagogical schools can meet these requirements.**

***Index Terms*—Digital competence, education, universities of education, digital skills.**

I. Introduction

Nowadays, the world is increasingly being digitized strongly and deeply, especially in the explosive context of the industrial revolution 4.0 [1], [2]. Like other countries in the region and the world, Vietnam has been determined not to miss the opportunity that the digital revolution brings with the principle of "leaving no one behind" [3], [4]. With this trend and determination, whether like it or not, fast or slow, every citizen has to live and work in a digital environment and the Internet-connected world [5]. Since 2021, Vietnam has made significant progress; however, further efforts should be made to address the digital capacity gaps [6], [7]. This is to ensure that no one is left behind in the pursuit of the nation's digital economic achievements. In the development of digital competence, there is no one-size-fits-all approach [5], [8]. The skills and capabilities of the workforce require continuous development as the country enters the digital world [9]-[11].

The study aims to find out which level of digital competence of lecturers at the Universities of Education is and especially to find out their shortcomings in applying digital technologies. The research serves as the purpose to assess the readiness of digital use and the practice of digital education as a tool to develop the proficiency in using digital media. The study mainly focused on the level of digital competence of lecturers, as well as the factors affecting it.

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II. Background

In our research, the criteria are based on the European Digital Competence Framework, specifically DigComp 2.1 model, the Digital Competence Framework (DigComp 2.1) includes 5 dimensions [1], [12]:

Dimensions 1: Competency areas identified as part of digital proficiency. They are: 1) information and data literacy; 2) communication and collaboration; 3) digital content creation; 4) safety; 5) problem solving.

Dimensions 2: Descriptions of competencies and titles relevant to each area. There are 21 competencies.

Dimensions 3: Proficiency levels for each competence. There are 4 main levels (foundation, intermediate, advanced, and highly specialized) and their decompositions. Each level represents an advanced step in lecturers' attainment of competence in terms of their perceived ability, the complexity of the task they can handle, and their autonomy in completing the task [13], [14].

Dimensions 4: Knowledge, skills and attitudes applied to each competency.

Dimensions 5: Examples of uses and the ability to apply competencies for different purposes.

The proposed grading scale includes 4 levels [12], [15]:

1) I'm not sure I can do this task on myself; I need some help (Foundation);
2) I can perform the tasks on myself, and I can solve problems that arise in the course of work (intermediate);
3) I can help others when performing the task, I can give some advice or help somebody to solve a problem (advanced);
4) I can create a digital resource that contains useful references, recommendations, instructions and to provide help (Highly specialized).

Scoring of the Sampling Questionnaire using the Digital Competence Framework Self-Assessment Tool (DigCompSat) shown in Table I [12], [16].

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TABLE I: ASSESSMENT SCALE

Selection	Score
I'm not sure I can do this task on myself, I need some help	0 points
I can perform the tasks on myself, and I can solve problems that arise in the course of work	1 points
I can help others when performing the task, I can give some advice or help somebody to solve a problem	2 points
I can create a digital resource that containing useful references, recommendations, instructions and to provide help	3 points

III. METHODOLOGY

A. Population and Sample

A total of 500 academics, administrators, and training experts from Vietnam's top three universities of education, including Thai Nguyen University of Education, Hanoi National University of Education, and Ho Chi Minh National University of Education, took part in the survey. However, 30 questionnaires were incorrectly completed and were excluded from the study. Table II presents an overview of the study's participants' information:

TABLE II: THE MAIN CHARACTERISTICS OF THE PARTICIPANTS

Feature	Meaning	Frequency/Percent
Gender	Male	244/58.7
	Female	172/41.3
Occupation	BA, MA	186/44.7
	Ph.D.	182/43.8
	Prof., A. Prof.	48/11.5

B. Methods and Data Collection Tool

The survey tools include a digital competency questionnaire developed by the research team based on the Digital Competence Framework for the European (DigComp 2.1) as the research data collection tool. The survey forms cover five aspects of the DigComp 2.1 model (information and data literacy; communication and collaboration; digital content creation; safety and problem solving.) [1].

TABLE III: PHASES OF THE PRELIMINARY STUDY

Phases	2021		
Toolkit design	March	April	
Practical survey	May	June	July
Quantitative and qualitative data processing	August		
First result	September	October	
Conclusion of the first result	October	November	

TABLE IV: READING THE QUESTIONS

Groups of questions	Variables	Scale of evaluation	Intervals of evaluation
Information and data literacy	NLIF1-NLIF6	Ordinal	1..4
Communication and collaboration	NLCC1-NLCC6	Ordinal	1..4
Digital content creation	NLDC1-NLDC4	Ordinal	1..4
Safety	NLIS1-NLIS5	Ordinal	1..4
Problem-solving	NLPS1-NLPS6	Ordinal	1..4

The actual research process consists of 3 stages: toolkit design, practical survey (including questionnaires, in-depth interviews, group discussion guide) and data processing. Each phase has different purposes, methods, objects, time, and research content.

In our questionnaire, we determine variables, scales of evaluation, and time intervals, which are shown in Table IV below.

C. Data Analysis

In our analysis, all descriptive statistics were computed using a combination of methodologies and models in our analysis [17]. The choice of certain indicators was influenced by the data type, the evaluation scale, and the limitations of the method application. To calculate, the data obtained after the actual survey was processed by the program SPSS 24.0 [17], which was used in the Windows environment to process the quantitative survey data. Most of the features selected for digital capacity assessment during the survey were estimated on the ordinal 4 scale. In addition, Cramer's V, the redundancy factor, and the Pi factor, which were referred to as the associated ordinal scales, were also calculated. These coefficients varied from 0 to 1 and allowed us to conclude about the strength of the relationship between the functions.

After completing the survey form based on the theoretical framework, the research team organized a seminar to get comments and propose revisions. The survey was tested on a random sample of 50 people, and the data was processed to determine the reliability of the scale. The results are shown in Table V:

TABLE V: RELIABILITY STATISTICS OF THE SCALE, FACTOR ANALYSIS, EXTRACTION OF VARIANCE

Scale	N of Items	Cronbach's Alpha	Corrected Item-Total Correlation
NLIF	6	0.854	0.575 - 0.700
NLCC	6	0.874	0.620 - 0.751
NLDC	4	0.832	0.595 - 0.706
NLIS	5	0.870	0.626 - 0.743
NLPS	6	0.892	0.569 - 0.817

Factor Analysis (EFA)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.909
Bartlett's Test of Sphericity	Approx. Chi-Square	8849.837
	df	351
	Sig.	.000

The data in the table above indicate that the Cronbach's Alpha coefficient of the 5 scales ranges from 0.832 to 0.874. The Corrected Item - Total Correlation coefficient is all greater than 0.3, showing that the observed variables addressed the right problem. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value of 0.909 proved that the data used for factor analysis is completely appropriate [17]. The result of Bartlett's test is 8849,837 with the Sig significance level. = 0.000, reflecting variables that are correlated with each other and satisfy the conditions for factor analysis. Performing factor analysis according to Principal components with Varimax rotation: The results showed that the original 27 observed variables are divided into 5 groups. The total extracted variance 69.331% reflects

these 5 factors and explains 69.331% of the variation of the data. The Eigenvalues of the factors are all high (>1), the fifth factor has the lowest Eigenvalues of 1,079> 1.

Thus, we can see that the scale ensures the high reliability of the toolkit and is decided to be the official scale.

IV. Results

The data in Table VI shows that the digital competence of lecturers ranges from "Foundation" to "Advanced" and mainly at the "Intermediate".

The skill group that the lecturers rated at the average level is (NLDC 3) "pay attention to copyright and license when developing digital content", the average score is 2.61. This is the lowest mark of the manifestations of digital competence. Skills at the end of the average mark range are (NLDC 4) "using programming languages in a digital environment" (3.29); (NLDC1) "development and innovation of content and digital technology" (3.36); (NLIS1) "knows things that need to be paid attention to when creating digital identities (profiles) in the online environment", (3.23); (NLIS 5) "protection of personal data and privacy in the digital environment (3.26); or "identify the cause of technical problems I encounter when using digital media and devices" (NLPS1, 3.20).

Among those skills, the only skill of "ability to build and practice codes of conduct in a digital environment" (NLCC) with an average score of 5,4.39, is at "advanced" level.

The remaining skills are at the "intermediate" with a fluctuating range from 3.41 to 4.2.

Gender and Digital Competence: During the survey, the factor of genders has been questioned if it has a great influence on the digital competence of lecturers. When comparing the two independent results, a slight difference between the digital competence of "Male" and "Female" has been noticed;

Information and data literacy: Meaningful differentiated skills such as "NLIF 2, M:3,8; F:3.99); sig= 0.002" "NLIF 5, M:3.74; F:4,1; sig= 0.000" in "Female" are higher than "Male".

Information and data literacy: Meaningful differentiated skills such as "NLIF 2, M:3,8; F:3.99); sig= 0.002" "NLIF 5, M:3.74; F:4,1; sig= 0.000" in "Female" are higher than "Male".

Communication and collaboration: (NLCC1, M:3.64; F:3.47; sig=0.029); NLCC 4, M:3.88; F:3.67; sig=0.016); NLCC 5, M:4.57; F:4.13, sig=000. The figures in this area of "Male" are higher than "Female".

TABLE VI: Criteria of Value of Scores on Different Fields of Digital Competencies among the Groups of Respondents

Digital competence areas	Digital competence questionnaire items	Mean	SD	Teaching Experience				Sig	Gender		
				=<10	11=<20	21=<30	>30		M	F	Sig
Information and data literacy	NLIF1	3.89	0.708	4.20	3.85	3.93	3.73	0.002	3.92	3.86	0.414
	NLIF 2	3.87	0.633	4.02	3.89	3.84	3.69	0.055	3.80	3.99	0.002
	NLIF 3	4.03	0.666	4.17	4.05	4.16	3.62	0.000	4.07	3.98	0.160
	NLIF 4	3.82	0.640	3.91	3.83	3.75	3.77	0.502	3.79	3.86	0.263
	NLIF 5	3.89	0.736	3.83	3.87	3.99	3.88	0.627	3.74	4.10	0.000
	NLIF 6	3.96	0.681	4.09	3.93	4.07	3.77	0.039	3.93	3.99	0.416
Communication and collaboration	NLCC1	3.56	0.800	3.70	3.47	3.76	3.58	0.026	3.64	3.47	0.029
	NLCC 2	3.76	0.803	4.04	3.80	3.81	3.23	0.000	3.8	3.71	0.312
	NLCC 3	3.80	0.656	4.04	3.78	3.84	3.58	0.003	3.76	3.85	0.186
	NLCC 4	3.79	0.835	4.02	3.62	4.20	3.73	0.000	3.88	3.67	0.016
	NLCC 5	4.39	0.691	4.65	4.33	4.48	4.23	0.004	4.57	4.13	0.000
	NLCC 6	3.32	0.766	3.22	3.32	3.52	3.19	0.060	3.34	3.3	0.618
Digital content creation	NLDC1	3.36	0.820	3.72	3.40	3.27	3.00	0.000	3.34	3.4	0.533
	NLDC 2	3.69	1.012	4.04	3.57	3.95	3.54	0.001	3.79	3.55	0.014
	NLDC 3	2.61	0.886	3.06	2.53	2.59	2.50	0.001	2.64	2.56	0.369
	NLDC 4	3.29	0.795	3.69	3.14	3.64	3.08	0.000	3.3	3.29	0.928
Safety	NLIS1	3.23	0.763	3.35	3.16	3.52	3.00	0.000	3.23	3.23	0.987
	NLIS 2	3.76	0.784	4.11	3.63	4.03	3.65	0.000	3.8	3.71	0.229
	NLIS 3	3.40	0.727	3.50	3.40	3.57	3.08	0.001	3.42	3.38	0.626
	NLIS 4	3.67	0.838	3.87	3.62	3.95	3.27	0.000	3.71	3.6	0.175
	NLIS 5	3.26	0.865	3.80	3.20	3.40	2.77	0.000	3.3	3.2	0.222
Problem-solving	NLPS1	3.20	0.857	3.80	3.08	3.27	3.00	0.000	3.2	3.2	0.991
	NLPS 2	3.75	0.814	3.96	3.55	4.13	3.85	0.000	3.83	3.63	0.014
	NLPS 3	3.88	0.778	3.94	3.88	4.09	3.54	0.001	3.97	3.77	0.012
	NLPS 4	3.74	0.789	4.06	3.73	3.85	3.35	0.000	3.85	3.59	0.001
	NLPS 5	3.68	0.776	4.09	3.70	3.69	3.12	0.000	3.8	3.51	0.000
	NLPS 6	3.43	0.730	3.61	3.43	3.60	3.00	0.000	3.43	3.44	0.830

Digital Content Creation: NLDC 2; M:3.79, F:3.55, sig=0.014.

Safety: NLIS 4; M: 3.71, F: 3.6, sig=0.175

Problem Solving: The capacity of the "Male" lecturer tends to be higher than that of the "Female", the average score of 4/6 skills of the "Male" trainer is higher than that of "Female", this difference is significant (sig<0.05).

Digital Competency and Work Experience: This study has raised a question that is: "Does more work experience mean greater digital competence?"

The data in Table VI above reflect that there is a difference in digital competence between groups of lecturers, the difference shown in the average score and the sig value of 23/27 items is less than 0.05 (difference is meaningful). However, the expertise in digital media does not reflect the experience in teaching but in the opposite way.

V. Conclusion

Digital competence is a highly complicated issue, it frequently depends on technological and institutional developments. With the participation of 320 lecturers, 150 administrators, training experts, and leaders at the Universities of Education in Vietnam in this study and the aims to identify the competency in digital media and the shortcomings in this area, the survey results allow us to conclude:

1) The group of skills such as "pay attention to copyright and licensing when developing digital content", "use programming languages in a digital environment", "protect personal data and privacy in a digital environment", "identify the cause of technical problems I experience when using digital media and devices" of lecturers is rated "Intermediate" when compared to other Digital Competence knowledge and skills. This happens probably due to the quick and frequent "as usual" infringement of intellectual property rights in Vietnam, as well as the fact that the authors and owners have no awareness of the copyright infringement. It is not widely acknowledged that they should protect their own "intellectual" property by the registration of protection of intellectual property rights. The Digital Competence training programs for lecturers are focused too much on theoretical knowledge; hence, they lack practice for content development and technical issues. The study has also figured out that lecturers are gradually confident in "developing and practicing rules of conduct in a digital environment," which may happen during the COVID-19 pandemic. During this time, they are required to regularly use digital technologies in their daily life and teaching process, so they become proficient in this field. Information and data literacy, communication and collaboration, and safety are attributed to their use of digital technologies in their daily lives in line with these areas.
2) The level of ICT use capacity of young lecturers is much higher than that of older lecturers. The capacity level of respondents with limited (or no access) access to resources is much lower than that of respondents with full access to resources.
3) In terms of genders, the research results show that there is little difference in digital competence between "Male" and "Female", however, "Male" figures are still recorded higher than "Female" ones in identifying and accessing information, data and digital content related to information and data capabilities. This shows that male lecturers have a better capacity to implement online privacy and safety measures to protect devices and digital content in the safety sector.

Since the analysis of the obtained data confirms the high reliability of the questionnaire developed by the authors, this helps us to form clear conceptions of further research in the future. It is also beneficial to academics, experts, and leaders at the Universities of Education regarding the creation and development of digital competence training modules according to Digital Competence Framework for the European (DigCom 2.1 Model).

VI. Limitation

The limitation of this study is the data collection process through surveys and discussions about figures analysis because they were primarily performed in basic categories, and results were evaluated through SPSS 24.0. Therefore, there is a paramount need to focus on measurement studies to develop all areas in DigComp 2.1 Model in further studies.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Tuong Sy Hoang is the main author of the paper, who wrote the main body of the paper. My Loc Thi Nguyen and Long Ngoc Pham revised and edited the manuscript. Loan Thi Nguyen and Thanh Huyen Thi Nguyen completed the manuscript. All of the authors provided important ideas in conceptualizing of the paper.

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