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ASSESSING STUDENTS' DIGITAL COMPETENCE: EVIDENCE FROM THAI NGUYEN UNIVERSITY OF EDUCATION

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ABSTRACT

In the context of digital transformation, digital competence has become an essential capability for university students in learning, communication, and future employment. This study aims to assess the digital competence of students at Thai Nguyen University of Education based on the DigComp framework and identify the factors influencing their digital competence. A quantitative research approach was employed through a survey of 350 students from different academic majors and years. Data were analyzed using descriptive statistical methods with SPSS software. The study evaluated five dimensions of digital competence, including information and data literacy, communication and collaboration, digital content creation, safety, and problem solving. The findings reveal that students' overall digital competence is at a moderate level, with safety skills receiving the highest evaluation, while digital content creation skills were the weakest area. Students showed relatively good communication and interaction abilities in digital environments but still faced limitations in critical information evaluation, creativity, and the application of digital technologies to problem solving. The study suggests that universities should strengthen digital infrastructure, integrate digital skills into curricula, and enhance digital learning environments to improve students' digital competence.

Keyword: digital competence, university students, digital transformation, DigComp, higher education.

1. INTRODUCTION

In the era of the Fourth Industrial Revolution, digital technologies are fundamentally transforming the way people learn, work, and interact. Advances in artificial intelligence, big data, the Internet of Things, and cloud computing have accelerated the process of digital transformation worldwide. In this context, digital competence is considered a prerequisite for individuals to adapt to the modern socio-economic environment.

In higher education, digital transformation is not merely the application of technology in teaching but also a comprehensive restructuring process of the educational system aimed at developing lifelong learners with critical thinking and creativity in digital environments. Although today's students were born and raised in a technology-rich environment, this does not necessarily mean that they possess sufficient digital competence for academic and professional purposes.

In Vietnam, digital transformation has been identified as one of the key strategies for developing the digital economy and digital society. However, recent studies indicate that students' digital competence remains at a moderate level, with significant limitations in applying technology to solve practical problems. This reflects the gap between everyday technology use and the academic and professional dimensions of digital competence.

One important issue is identifying the factors that influence students' digital competence. International studies have shown that, in addition to personal factors, demographic characteristics and socio-economic conditions play important roles in the development of digital competence. However, in the Vietnamese context, particularly in higher education institutions, empirical studies on this issue remain limited.

Based on this research gap, the present study aims to: (i) systematize the theoretical foundations of digital competence and its influencing factors; (ii) analyze the current status of students' digital competence; and (iii) identify the factors affecting the digital competence of students at Thai Nguyen University of Education.

2. THEORETICAL FRAMEWORK

2.1. Digital Competence

Digital competence is considered a combination of knowledge, skills, attitudes, and the ability to use digital technologies effectively, safely, and responsibly for learning, work, communication, and participation in the digital society. According to the European Commission, digital competence not only includes the ability to use information and communication technology tools but also involves critical thinking, information management, online communication, digital content creation, and personal data security.

According to Ferrari (2013), digital competence is defined as "the set of knowledge, skills, attitudes, strategies, and awareness required when using information and communication technologies and digital media to perform tasks, solve problems, communicate, manage information, collaborate, create, and share content effectively, appropriately, responsibly, and safely." This concept emphasizes the role of digital competence as a core capability in the context of digital transformation and the knowledge economy.

In addition, UNESCO considers digital competence as the ability to access, manage, understand, integrate, communicate, evaluate, and create information through digital technologies to meet the demands of life, learning, and work in the digital age. This approach indicates that digital competence extends beyond technical skills to include adaptability and lifelong learning in digitalized environments.

In higher education, students' digital competence refers to the ability to effectively use digital platforms and tools for information searching, online learning, academic communication, problem-solving, and knowledge creation. It is considered one of the essential competencies enabling students to adapt to the demands of the modern labor market and digital society.

2.2. Digital Competence Framework

The DigComp (Digital Competence Framework), developed by the European Commission, provides a comprehensive reference framework for assessing and developing citizens' digital competence in the context of digital transformation. DigComp is regarded as one of the most influential digital competence frameworks and has been widely applied in education, vocational training, workforce development, and public policy across Europe and many other countries worldwide (Vuorikari et al., 2022). The framework plays a significant role in standardizing the components of digital competence, thereby supporting individuals and organizations in determining levels of digital proficiency in learning, work, and participation in digital society.

According to DigComp, digital competence consists of five core competence areas: (1) Information and Data Literacy, (2) Communication and Collaboration, (3) Digital Content Creation, (4) Safety, and (5) Problem Solving. Each area represents a set of competencies required for individuals to use digital technologies effectively, safely, and responsibly in modern digital environments (Carretero et al., 2017).

- Information and Data Literacy refers to the ability to identify information needs, search for, access, evaluate, and manage data in digital environments. This competence includes skills such as searching and filtering digital information, assessing the reliability of data sources, and organizing and managing digital content effectively. In the age of information overload, critical analysis and evaluation of information are considered foundational components of digital competence.
- Communication and Collaboration emphasizes the ability to use digital technologies for communication, interaction, and collaboration in learning, work, and social life. This area includes competencies such as sharing information through digital environments, participating in online communities, collaborating via digital platforms, and managing digital identity. DigComp also highlights the importance of ethics and online etiquette to ensure respect and responsibility in digital communication.
- Digital Content Creation relates to the ability to create, edit, and develop digital content in various formats such as text, images, audio, and video. In addition to content creation, this area includes understanding copyright, digital licenses, and intellectual property principles in online environments. DigComp also

identifies programming competence as an important skill that enables users not only to consume but also to develop digital products.

- Safety focuses on protecting devices, personal data, and users' well-being in digital environments. This competence area includes skills related to information security, privacy protection, identifying cybersecurity threats, and using technology safely and responsibly. Furthermore, DigComp emphasizes awareness of the environmental and social impacts of digital technologies to promote sustainable digital practices.
- Problem Solving reflects the ability to identify and solve problems arising from the use of digital technologies. This competence includes selecting appropriate digital tools, troubleshooting technical issues, adapting to technological changes, and applying digital technologies for innovation and creativity. DigComp also stresses the importance of identifying digital competence gaps so that individuals can continuously improve their skills in rapidly changing technological contexts.

3. METHODOLOGY

The study employed a quantitative research approach to analyze the factors affecting the digital competence of students at Thai Nguyen University of Education. Research data were collected through a questionnaire survey administered to students currently studying at the university.

A total of 350 students from different academic majors and academic years participated in the survey to ensure the representativeness of the research sample. The questionnaire was developed based on theoretical foundations and previous studies related to students' digital competence.

The observed variables were measured using a five-point Likert scale ranging from 1 "Strongly disagree" to 5 "Strongly agree." After data collection, the responses were compiled and analyzed using SPSS software. Descriptive statistical methods were employed to examine the influence of factors on students' digital competence through indicators such as frequency, mean values, standard deviation, and percentages.

The use of descriptive statistics helped identify students' evaluation tendencies regarding each influencing factor, thereby providing a basis for proposing solutions to improve students' digital competence in the current context of educational digital transformation.

4. RESULTS

4.1. Information and Data Literacy

Information and data literacy reflects the ability to clearly identify information needs, search for information and resources in digital environments, organize, process, analyze, and interpret information, as well as critically evaluate the reliability and sources of information. The results indicate that among the information and data literacy competencies, the skill of "browsing, searching, and filtering data, information, and digital content" received the highest evaluation (2.52 points), reaching the advanced level. Meanwhile, the skills related to evaluating and managing data, information, and digital content were rated at a moderate level, with mean scores of 2.18 and 2.06, respectively. These findings suggest that students at Thai Nguyen University of Education possess relatively good information-searching skills (Table 1).

Table 1. Information and Data Literacy of Students at Thai Nguyen University of Education

Code	Contents	Mean	Level
ID1	Browsing, searching, and filtering data, information, and digital content	2,52	Advanced
ID2	Evaluating data, information, and digital content	2,18	Moderate
ID3	Managing data, information, and digital content	2,06	Moderate
ID	Information and data literacy	2,25	Moderate

Source: Compiled by the author

4.2. Communication and Collaboration

The findings reveal that communication and collaboration skills among students were evaluated at a moderate level, with an overall mean score of 2.33. Among these competencies, communication through the Internet received the highest score (2.68), indicating that students are capable of using various digital tools for online communication. With the rapid development of telecommunication infrastructure and social media platforms, students can communicate online quickly and conveniently.

Similarly, the skills of interacting through digital technologies and managing digital identity were rated at the advanced level (above 2.5 points). In contrast, participation in digital citizenship received the lowest score (1.73), indicating limited engagement in digital civic activities. These results suggest that although students demonstrate relatively strong online interaction abilities and are able to express themselves effectively in digital environments, their participation in digital citizenship activities remains limited and requires greater support from educational institutions and local authorities (Table 2).

Table 2. Communication and Collaboration Skills of Students at Thai Nguyen University of Education

Code	Contents	Mean	Level
CC1	Interacting through digital technologies	2,55	Advanced
CC2	Sharing through digital technologies	2,27	Moderate
CC3	Participating in citizenship through digital technologies	1,73	Basic
CC4	Collaborating in work through digital technologies	2,23	Moderate
CC5	Communicating via the Internet	2,68	Advanced
CC6	Managing digital identity	2,52	Advanced
CC	Communication and collaboration skills	2,33	Moderate

Source: Compiled by the authors

4.3. Digital Content Creation Skills

The digital content creation skills of students at Thai Nguyen University of Education were evaluated at a moderate level, with an overall mean score of 2.07. Among these competencies, the ability to integrate and re-elaborate digital content received the highest score (2.22), while programming skills were rated the lowest, reaching only the basic level with a mean score of 1.73. This situation can be partly explained by the fact that many students come from regions with relatively limited socio-economic conditions. Family circumstances and restricted access to technological resources may reduce students' opportunities to engage with and develop advanced digital skills (Table 3).

Table 3. Digital Content Creation Skills of Students at Thai Nguyen University of Education

Code	Contents	Mean	Level
DC1	Developing digital content	2,21	Moderate
DC2	Integrating and re-elaborating digital content	2,22	Moderate
DC3	Copyright and licenses	2,10	Moderate
DC4	Programming	1,73	Moderate
DC	Digital content creation skills	2,07	Moderate

Source: Compiled by the authors

4.4 Safety skills

The safety skills of students at Thai Nguyen University of Education were assessed at a relatively good level, with an average score of 2.41. Among the safety-related competencies, protecting devices received the highest evaluation (2.74), followed by protecting health and well-being (2.56). In contrast, protecting personal data and privacy was rated at a lower level (2.17).

The increasing incidents of personal data leakage among Vietnamese citizens, including university students, indicate that greater attention should be

paid to digital privacy and cybersecurity awareness. In addition, environmental protection in the context of digital technology use has not yet been sufficiently emphasized. Many individuals still lack adequate awareness of the environmental impacts associated with digital technologies (Table 4).

Table 4. Safety Skills of Students at Thai Nguyen University of Education

Code	Contents	Mean	Level
SS1	Protecting devices	2,74	Advanced
SS2	Protecting personal data and privacy	2,17	Moderate
SS3	Protecting health and well-being	2,56	Advanced
SS4	Protecting the environment	2,19	Moderate
SS	Safety skills	2,41	Moderate

Source: Compiled by the author

4.5. Problem-Solving Skills

Problem-solving skills refer to competencies related to the ability to identify technical problems and determine appropriate solutions when operating devices and using digital environments. These skills also include the ability to identify, evaluate, and select digital technologies creatively to solve specific tasks or problems and generate new knowledge, as well as the ability to continuously update one's own competencies and those of others. The problem-solving skills of students at Thai Nguyen University of Education were evaluated at a moderate level, with an average score of 2.31. Among these competencies, solving technical problems received the highest evaluation (2.53), while the ability to use digital technologies creatively obtained the lowest score (2.17) (Table 5).

Table 5. Problem-Solving Skills of Students at Thai Nguyen University of Education

Code	Contents	Mean	Level
PS1	Solving technical problems	2,53	Advanced
PS2	Identifying needs and technological responses	2,34	Moderate
PS3	Using digital technologies creatively	2,17	Moderate
PS4	Identifying digital competence gaps	2,21	Moderate
PS	Problem-solving skills	2,31	Moderate

Source: Compiled by the authors

4.6. Digital Competence of Students at Thai Nguyen University of Education

The findings indicate that the overall digital competence of students at Thai Nguyen University of Education remains at a moderate level, with an average score of 2.28. Among the five competence areas, safety skills achieved the highest score (2.41), approaching the advanced level, which suggests that students pay considerable attention to safety issues in digital environments. Communication and collaboration skills ranked second with a score of 2.33, indicating that students are relatively proficient in online communication and interaction. Problem-solving skills were also evaluated at a moderate level. In contrast, digital content creation skills received the lowest evaluation among all competence areas. These findings highlight several important challenges for educational administrators in improving students' digital competence in the context of ongoing digital transformation in higher education (Table 6).

Table 6. Digital Competence of Students at Thai Nguyen University of Education

Code	Contents	Mean	Level
ID	Information and data literacy	2,25	Moderate
CC	Communication and collaboration skills	2,33	Moderate
DC	Digital content creation skills	2,07	Moderate

SS	Safety skills	2,41	Moderate
PS	Problem-solving skills	2,31	Moderate
DCS	Overall digital competence	2,28	Moderate

Source: Compiled by the authors

5. CONCLUSION

The study systematized the theoretical foundations of digital competence and applied the DigComp framework to evaluate the current status of students' digital competence at Thai Nguyen University of Education. The survey results from 350 students revealed that students' digital competence remains at a moderate level, with an overall mean score of 2.28. This finding indicates that although students are capable of accessing and using technology in learning and daily life, their proficiency and ability to apply digital technologies to academic activities and practical problem-solving are still limited.

Among the five competence areas of the DigComp framework, safety skills received the highest evaluation with a mean score of 2.41, suggesting that students have a certain level of awareness regarding device protection, personal data security, and well-being in digital environments. In contrast, digital content creation skills received the lowest evaluation with a mean score of 2.07, particularly programming skills, which were assessed only at the basic level. This indicates that students still face limitations in developing digital content and applying technology to create new knowledge. In addition, competencies related to data management, digital citizenship participation, and creative use of technology have not yet met expected standards.

The findings also indicate that students' digital competence is influenced by various factors, including socio-economic conditions, access to technology, digital learning environments, and institutional support. In the context of rapid educational digital transformation, enhancing students' digital competence should be considered a key priority for higher education institutions. Universities need to strengthen digital infrastructure, innovate teaching methods, integrate digital skills into curricula, and organize digital skills training activities for students. At the same time, students themselves should proactively improve self-learning abilities, technological adaptability, and digital thinking in order to meet the demands of the labor market in today's digital economy.

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