

Synthesizing Digital Teacher Competencies for Teaching Profession Students in Higher Education

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Abstract

The synthesis of digital teacher competencies for students in the higher education teaching profession aims to: 1) synthesize digital teacher competencies for teacher students in higher education 2) assess how suitable these digital teacher competencies are for students in the teaching profession within higher education. This study employed document analysis and exploratory research. The researcher conducted an in-depth analysis of research papers and articles published from 2014 to 2023 related to digital teacher competencies in higher education students. These papers had been published in research database and were selected based on their titles and keywords. In total, 22 research papers were initially considered. After a rigorous review, 12 studies in both Thai and English were shortlisted for further analysis. The researcher synthesized a theoretical framework and a design framework. Then, a questionnaire was administered to 5 experts in the field, and their responses were analyzed using statistical measures, including averages and standard deviations.

The results of the research showed that 1) digital teacher competencies for higher education teacher students consist of 9 competencies, namely: Competency 1. Knowledge, skills, abilities about digital technology, Competency 2. Adaptation and change of technology. Competency 3. Solving problems and using digital technology and organizing virtual environments 4. Ethics, morality and technological safety 5. Communication and team work 6. Teaching strategies and ICT application 7. Innovative education creators and evaluators 8. expected characteristics and learned lesson, and 9. Connecting knowledge and fostering collaboration; 2) the results of the assessment of the suitability of digital teachers for higher education students by experts are at the most appropriate level, with a mean (\bar{x}) score of 4.51, a standard deviation (S.D.) of 0.21.

Keywords: digital teacher competency, student teacher, digital technology, virtual learning environment, connectivist

1. Introduction

Nowadays, digital technology plays a crucial role in our daily lives, and the modern world is rapidly becoming more digital. This shift towards digitalization has significantly impacted the way we teach and learn. In higher education, we've witnessed the emergence of online distance learning (Howard et al., 2022), where teaching techniques and digital technologies have been integrated, fostering innovation and influencing the future of teaching methods. Many institutions have adopted online and blended learning approaches (Singh & Thurman, 2019). The competence of students in handling digital tools and technologies, often referred to as digital competence, reflects their knowledge and skills related to Information and Communication Technologies (ICT) for performing tasks (Meng et al., 2019). One of the most crucial components of becoming a digital citizen in the twenty-first century is having digital competence. Recent research has affirmed the significant influence of students' perceived ICT competence on their academic success (Park & Weng, 2020). Understanding global trends in mobile, internet, and social media usage is also recognized as crucial in this context (We Are Social & Hootsuite, 2020). Digital competency is equally vital for educators, especially in the context of creating online and blended learning experiences (Bolliger et al., 2019). Teachers' digital competence is essential for effectively integrating digital technology into the educational process (Muhammed & Volkan, 2023). These shifts have been spurred by the rapid globalization and lifestyle changes, with Information and Communication Technology being

used extensively. There's been an exponential growth in data creation, and digital media resources are being utilized in new ways (Trust & Whalen, 2020). In educational contexts, digital competency has been a hot topic. It involves a combination of knowledge, skills, and attitudes that teachers need to effectively use technology in their teaching (Basilotta et al., 2022). Identifying which digital competencies are essential and the support needed to implement changes in teaching practices is critical (Bruggeman et al., 2021). Challenges to technology integration in learning environments often include limited access to technology, time constraints, lack of computer and information experience, and resistance to using technology for teaching. Some educators may also lack the skills to leverage innovative technologies (Elmalı & Balkan, 2022). Digital competence reflects a person's ability to use digital technology in a meaningful, collaborative, and creative manner. In addition, the person should have knowledge, skills, and attitude to be perceived as capable to some extent (Suwanroj et al., 2019). Olga Gizatullina (2023) underscores the importance of introducing various digital tools like computers, tablets, mobile phones, and interactive whiteboards to enhance logical thinking and data capabilities. This digital literacy should ideally begin at a young age since young people are already exposed to digital information through various devices and activities (Ilomäki et al., 2016). Cabero et al. (2020) emphasize that digital competence is a core skill that both the public and teachers need in the future society. Future teachers are expected to quickly adapt to modern technology, become proficient in new learning tools, and apply effective teaching methods, all while developing digital skills. This is crucial for the successful organization of digital education environments in educational institutions (Juan & Erla, 2022). Competence is a combination of knowledge, skills, attitudes, and personal qualities in a specific professional context, and digital competence is a key issue in the digital age. Building digital competence is essential for both future university students and professors (Juan & Erla, 2022). In many countries, the development of competencies has been systematically reviewed to meet the needs of society. While some educators may have reservations about defining teacher competencies due to the complexity of teaching, well-defined teacher competencies provide valuable guidance for teachers' professional growth (Alqawi & Ezzeldin, 2015; Hatlevik, 2017). Bülent ALAN and Meral GÜVEN (2022) describe teacher competency as a commitment to learning and teaching, with teachers working to promote individual differences. Digital technology is not merely a support tool but a direct influencer of teaching, research, and academic communication management. The digital competence of students and teachers in higher education in this regard, such as in Ukraine digital competencies consist of two aspects 1) digital and communication capabilities and 2) competency in using digital resources professionally (Kuzminska et al., 2018). Assessing digital competence can greatly benefit educational institutions, as it guides teaching designers and education policymakers in creating effective teaching and learning strategies (Bond et al., 2021). Understanding the process of developing digital teacher competencies is crucial for teacher training and development, aligning with government policies such as the 20-year National Strategy of the National Education Plan 2017-2036. Researchers have studied and synthesized digital teacher competencies for higher education students, aiming to enhance digital teacher development. The research objectives include 1) synthesizing digital teacher competencies for the higher education teaching profession and 2) evaluating the suitability of these competencies for students aspiring to become higher education teachers.

Research synthesis involves drawing conclusions from various research studies. There are several methods for conducting research synthesis, including Narrative Review, which summarizes the content of research studies through narrative and content analysis and provides a broad overview of the issues studied, and Systematic Review, which is more rigorous and aims to answer specific research questions by collecting experimental data suitable for answering those questions. It is valuable for reducing bias and providing reliable results for decision-making and drawing conclusions. This approach This approach can be systematic management and synthesis simultaneously.

Katerina Tzaflikou et al. (2022) introduced a scale that considers recent technological trends and previous studies on digital competence frameworks. This scale provides a conceptual basis for understanding the main components of digital competence in the context of remote education. It includes six factors: (1) Search, Find, Access; (2) Develop, Apply, Modify; (3) Communicate, Collaborate, Share; (4) Store, Manage, Delete; (5) Evaluate; and (6) Protect. Jamilah Sulaiman and Siti Noor Ismail (2020) conducted a study on teacher competencies in the 21st century. The study aimed to identify the relationship between these competencies and their impact on teaching skills. The research involved 242 high school teachers and found a strong positive correlation between professional ability and skill. The study showed that various dimensions, including personal attributes, teaching skills, and information and communication technology, significantly contribute to the development of teacher skills. Ozan Filiz and Adile Aşkim Kurt (2022) investigated the impact of a flipped learning approach on teachers' digital capabilities and innovation. The study included 58 students and found a statistically significant increase in both digital and innovative abilities after implementing flipped learning. This

approach eliminates time constraints in the classroom and allows teachers to effectively use technology, fostering their digital capabilities and innovation. Jo Tondeur et al. (2023) developed the Higher Education Digital Competency Framework (HeDiCom). This framework identified teachers' digital competencies, which encompass coaching, empowering students for the digital society, digital literacy, and teacher professional development. Muhammed Murat Gümüş and Volkan Kukul (2023) defined the digital competencies required for teachers to acquire new skills emerging from technological changes and developments. These competencies include "security," "information knowledge," "problem-solving," "digital content creation," "communication and collaboration," and "ethics." These studies and frameworks provide valuable insights into digital competence and teacher competencies in the ever-evolving digital landscape of education.

2. Method

"Synthesis of Digital Teacher Competencies for Teaching Profession Students in Higher Education" involves a two-stage research process targeting experienced teachers in the field of information technology. For assessment and research purposes, a panel of 5 experts, each with at least 5 years of teaching experience, is involved.

Stage 1: Research and Document Review

In the initial phase, researchers collect and review relevant documents and theories. This includes an examination of 21st-century teacher competencies, digital teacher competencies, classroom management, and related topics. The goal is to establish a framework for developing digital teacher competencies tailored to students pursuing careers in higher education teaching. Additionally, this stage focuses on synthesizing these competencies.

Stage 2: Assessment of Digital Teacher Competency Suitability

After gathering data and enhancing digital teacher competencies, experts evaluate the suitability of these competencies for students in the higher education teaching profession. They consider interpretation, content coverage, and practicality for implementation. Feedback on the components and stages of digital teacher competency development is crucial. This feedback is gathered using a method to assess question consistency. A revised model of digital teacher competency development is then presented to experts for assessment through group discussions. Their input and suggestions are used to refine the model, and the findings are summarized for further action.

3. Result

3.1 Effects of Synthesizing Digital Teacher Competencies for Higher Education Teacher Professional Students

In this section, we highlight nine distinct competencies, as visualized in Figure 1. These competencies have undergone an assessment to determine their suitability for digital teacher competence. This assessment was carried out by a panel of five experts, each possessing diverse knowledge and expertise in various areas such as competency development, virtual classroom model creation, and knowledge-linked teaching and learning. The primary focus of this assessment is to consider the enhancement of digital teacher competencies for students in the teaching profession. It also includes recommendations for further development in this regard. The assessment results, which are illustrated in Figure 1, provide a visual representation of these effects.

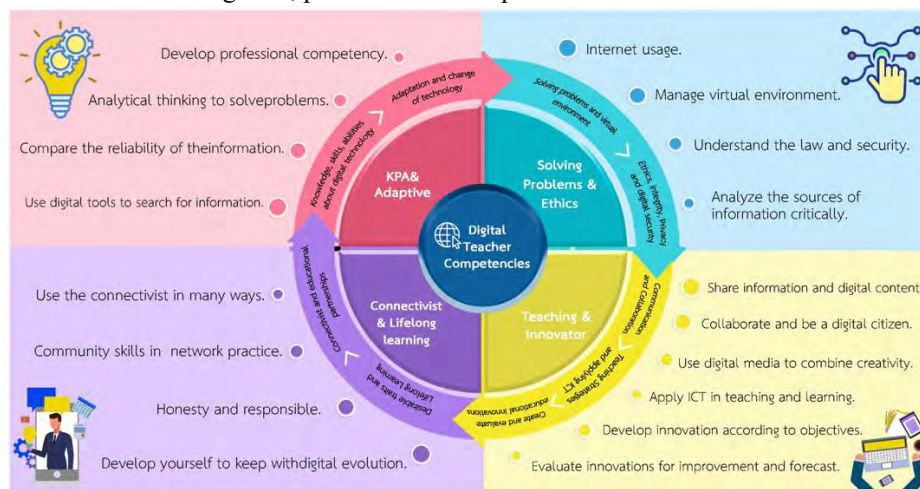


Figure 1. Digital teacher competency model for higher education teacher profession students

According to Figure 1, the synthesis of digital teacher competencies for students pursuing a higher education teaching profession revealed nine key competencies, which are outlined as follows:

Competency 1: Knowledge, Skills, and Abilities Related to Digital Technology

This competency entails the capacity to browse, evaluate, manage, search, and filter information and digital content effectively (Olga Nessipbayeva,2012; Jamilah Sulaiman & Siti Noor Ismail, 2020; INTEF, 2017,TPQI,2018; EDRU, 2023), including

- 1.1 Use digital tools to find information
- 1.2 Compare data reliability

Competency 2: Adaptation and Change of Technology

This competency centers on the ability to adapt to evolving technological landscapes effectively. Being capable of adapting to changing situations. Improve self-performance to keep pace with the world. (Olga Nessipbayeva,2012; Jamilah Sulaiman & Siti Noor Ismail, 2020; TPQs, 2017; EDRU,2023), including

- 2.1 Think critically to solve problems
- 2.2 Develop professional competencies

Competency 3: Solve problems using digital technology and arrange virtual environments

This competency entails the capability to address challenges by utilizing digital tools and creating virtual settings effectively. Being able to make decisions and use digital tools or technology to solve various problems appropriately. Identifying needs and use resources according to objectives (Olga Nessipbayeva,2012; INTEF, 2017; Mohamed Ally,2019; Skov, 2016; Pakdee Siripan & Surachet Noilid,2022), including

- 3.1 Use the Internet to manage information and information
- 3.2 Manage virtual environments

Competency 4: Ethics, Integrity and Digital Safety

This competency revolves around ethical behavior, integrity, and ensuring digital safety. It involves interactions with fellow teachers, school personnel, community members, and collaborative problem-solving for the benefit of learners

(Mohamed Ally, 2019; Skov, 2016; Deniz Koyuncuoglu, 2020; TPQs, 2017; EDRU, 2023), including

- 4.1 Understand laws and security in digital technology
- 4.2 Analyze sources critically

Competency 5: Communication and Collaboration as an Online Citizen

This competency revolves around effective communication and collaboration in the digital realm, encompassing the concept of online citizen engagement (INTEF, 2017; Mohamed Ally,2019;Feddrick Mork Rokenes & Rune Johan Krumsvik, 2014; TPQs, 2017; EDRU, 2023), including

- 5.1 Share information and digital content
- 5.2 Collaborate and become a digital citizen

Competency 6: Teaching Strategies and Application of ICT for Integration of Subject Knowledge

This competency focuses on the effective utilization of teaching strategies and the application of ICT (Information and Communication Technology) to integrate subject knowledge. It emphasizes flexibility in teaching and learning approaches while enhancing skills in applying digital technology for teaching (Olga Nessipbayeva,2012; Mohamed Ally,2019; Bülent ALAN and Meral GÜVEN, 2022; Tingting Liu & Haibin Sun, 2022; Pakdee Siripan & Surachet Noilid, 2022), including

- 6.1 Use digital media to create and create a combination
- 6.2 Application of ICT in teaching and learning management

Competency 7: Creating and Evaluating Educational Innovations

This competency is centered on the ability to create and assess educational innovations, conduct research to enhance teaching, learning, and student development. It emphasizes the use of research outcomes to manage learning, develop innovations for learners, and measure and evaluate learners' progress (Mohamed Ally,2019; Feddrick Mork Rokenes & Rune Johan Krumsvik, 2014; TPQs, 2017; EDRU, 2023), including

7.1 Develop innovation according to objectives

7.2 Evaluate innovations to improve and forecast

Competency 8: Desirable Attributes and Lifelong Learning

This competency centers on cultivating desirable personal attributes and emphasizing lifelong learning. It focuses on nurturing characteristics such as responsibility, integrity, and self-development. It further encourages the use of one's knowledge and abilities to be a responsible citizen and engage with various stakeholders in the educational community to collaboratively address and resolve challenges (Tingting Liu & Haibin Sun, 2022; EDRU, 2023), including

8.1 Develop yourself to keep pace with digital evolution

8.2 Honesty and responsibility

Competency 9: Connectivist and Educational Partnerships

This competency focuses on building connections and educational partnerships with parents and communities. It emphasizes the coherent resolution of challenges using digital tools (Fedrik Mork Rokenes & Rune Johan Krumsvik, 2014; TPQs, 2017), including

9.1 Community-based skills

9.2 Use a variety of knowledge connections

3.2 The Assessment of the Suitability of Digital Teacher Competencies for Higher Education Students Involved a Panel of Five Experts with a Minimum of Five Years of Experience in Related Fields

Table 1. Results of Digital Teacher Competency Suitability Assessment by experts

Performance	Digital teacher competencies for student teachers in higher education	Opinion level		Fitness level
		x	S.D.	
1	Knowledge, skills, abilities about digital technology	4.70	0.45	very good
2.	Adaptation and change of technology	4.10	0.74	Good
3.	Solving problems and virtual environment	4.50	0.53	Good
4.	Ethics, integrity, Privacy and digital security	4.60	0.52	very good
5.	Communication and Collaboration	4.70	0.48	very good
6.	Teaching Strategies and applying ICT	4.80	0.42	very good
7.	Create and evaluate educational innovations	4.60	0.52	very good
8.	Desirable traits and Lifelong Learning	4.50	0.53	Good
9.	Connectivist and educational partnerships	4.50	0.53	Good
average		4.51	0.21	very good

As shown in Table 1, The assessment of digital teacher competencies for students pursuing a higher education teaching profession, conducted by five experienced experts, yielded the following findings: Digital teacher competencies for higher education students received the most favorable assessment results, with an average performance score (\bar{x}) of 4.51 and a standard deviation (S.D.) of 0.21. Specifically, teaching strategies and the application of ICT scored the highest, with an average score (\bar{x}) of 4.80 and an S.D. of 0.42. Next in line are ethical, moral, and digital safety competencies, along with competencies related to innovation and educational assessment, which achieved an average score (\bar{x}) of 4.60 and an S.D. of 0.52.

4. Discussion

Region and learner level determine the differences in competency development and digital skill levels education. The document analysis associated with the development of digital teacher competencies for students in the higher education teaching profession has revealed a comprehensive set of competencies. These competencies encompass the following domains: 1) Knowledge, skills, and abilities related to digital technology. 2) Adaptation and change in technology. 3) Problem-solving and virtual environment management. 4) Ethics, integrity, privacy, and digital security. 5) Communication and collaboration. 6) Teaching strategies and the application of ICT. 7) Creation and evaluation of educational innovations. 8) Cultivation of desirable traits and commitment to lifelong learning. 9) Establishment of connectivist and educational partnerships. These competencies collectively form a robust foundation for preparing students in the higher education teaching profession to effectively integrate digital technology into their teaching and provide enhanced educational experiences.

Previous digital competencies of the student, such as Juan Silva-Quiroz¹ and Erla Mariela Morales-Morgado

(2022) to ascertain the degree of growth of digital competence among first-year pedagogy students at public universities in Chile in the issues of problem-solving, network security, digital content, creation online, communication and collaboration, and information and digital literacy, which assesses these problems. It is a competency that should be present in digital citizens and there is research by Basilotta Gómez Pablos et al. (2022) emphasizes that teacher's digital competencies are one of the challenges facing university teaching and it is likely that digital capabilities will continue to increase for two reasons. It is imperative for teachers to learn the meaning, importance, and scope of digital; another is the impetus for the digital transformation of education from the COVID-19 health crisis, which is the starting point for integrating digital capabilities into universities. Esteve et al. (2020); indicate that the study of digital competence has become. The study of digital competence has emerged as a potent research area today.

The evaluation of the digital teacher competency synthesis's suitability has finally produced results that indicate its appropriateness, usefulness, and potential for developing the competencies of both undergraduate and graduate education teaching professional students. The abilities of digital educators can be evaluated using these competencies. The development of digital technology in education, including social media, smart devices, cyber security, and online or remote learning is ongoing. For the learners to stay relevant in the modern world, they should possess digital skills.

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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