

# Self-Perception About Digital Skills of Pre-Service Teachers in a Thailand University Context

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## Abstract

The digital revolution has significantly impacted education, with digital technology becoming an integral part of teaching and learning, resulting in the emergence of a digital society. Educational institutions at all levels currently demand new qualifications and knowledge from modern-day teachers, including digital skills for effectively transmitting knowledge to learners to ensure that learning outcomes align with societal needs. Developing pre-service teachers poses a challenge in being educators who effectively transfer knowledge to learners. This study examined the digital skills competence required for future teachers, linking these skills with Thailand's National Qualifications Framework for Higher Education, Professional Teacher Standards, and National Educational Standards. A total of 36 competencies across six areas have been identified. This paper analyzed 360 responses from a convenience sample of undergraduate education students in Thailand based on this validated instrument. The research findings indicated that users prioritize information technology and communication skills, necessitating a diverse range of skills, including search, tool usage, communication, and collaboration through technology. This data can be used to design learning management systems to develop digital skills aligned with the evolving needs and essential skills of future teachers.

**Keywords:** digital skills, 21<sup>st</sup> century skills, pre-service teachers, higher education, Thailand context

## 1. Introduction

### 1.1 Introduce the Problem

The study of education management at the tertiary level has undergone continuous changes. New educational perspectives have been applied in learner-centered learning emphasizing learner abilities and learning outcomes (Marcelo & Domínguez, 2019). In addition to classroom learning, there has been a novel approach to teaching that integrates classroom and online learning and the use of digital technology in teaching and learning, leading to the emergence of a digital society. The development of digital technology is unpredictable, but users can adapt to changes by continuously learning and keeping up with new digital technologies (Bonfield et al., 2020; Hoehe & Thibaut, 2020). This challenge has led to changes in education to better align with learning and work (Spante et al., 2018; Hoerlsberger, 2019; Karanasios et al., 2021). The European Union's Digital Agenda (2014) predicted that 90% of jobs will require basic skills in Information and Communication Technology (ICT), thus universities play a crucial role in enhancing and promoting digital skills among the younger generation. Currently, the digital skills of learners are particularly important in facing various challenges of the world, including abilities, knowledge, and digital skills, all of which should be promoted to enhance the understanding and capabilities of learners (Aparicio et al., 2016). At the tertiary level of education, technology is being applied to cultivate skills for fostering learning among professional education students, particularly prospective teachers, to adapt to change. Prospective teachers, who will be educators in the future, are pivotal in knowledge transfer and thus require digital skills to keep pace with change and apply them to students at all levels, as stated by the Office of the Higher Education Commission (2018). Teachers, being key figures in developing learners' readiness for life in an era of change, must possess professional competencies, and academic knowledge, be abreast of advancing global trends, and be

adaptable to continuous change. Consequently, readiness to apply information technology and digital media in learning is imperative; otherwise, instructional management issues may arise. Teachers unable to leverage technology may struggle to engage and effectively teach students. Moreover, teachers' digital competencies are crucial for fostering educational innovation, which is a pivotal factor in national development.

In the context of Thailand, the importance of digital skills among students has been recognized. The Professional Teacher Standards (2013), the Bachelor's Degree Qualification Standards (2018), and the National Education Standards (2018) have incorporated guidelines on digital skills. These guidelines serve as a framework for producing and developing human resources capable of supporting the digital economy and society. Standards aligning with the digital competencies of prospective teachers are delineated into three domains: learning and classroom management, research for learning development, and innovation and information technology in education. Therefore, universities must enhance students' digital skills to align with these standards. This article reflects on the new mission of universities to enhance students' digital skills, linking their digital skills with standard frameworks. This will enable the design of learning management strategies to develop digital skills in accordance with the evolving needs of future teachers.

### *1.2 Challenges for Educational Technology in Thailand*

Information technology and communication play a crucial role in educational management at all levels. The utilization of digital technology in administration and teaching facilitates extensive learning experiences for students by bringing the external world into the classroom and providing access to vast amounts of information. With the potential of digital technology, the current world is boundless, enabling constant communication across time and space. It also promotes individuals' ability to thrive in a rapidly advancing knowledge society, globally emphasizing technology investment and fostering new societies based on knowledge (Griffin, 2015; Ennouamani, 2017).

In Thailand's current educational reform context, the most significant process of reform is learning, teaching students how to learn, enabling them to synthesize new knowledge through self-directed learning. This approach aligns with constructivist learning theory, empowering learners with knowledge, abilities, and qualities to adapt to the changing world and confidently participate in the global arena, with essential tools being digital technology and communication (Cascio & Ramiro, 2016; Bower, 2019).

Therefore, in Thailand's era of educational reform, there is a concerted effort to develop education to enhance individuals' quality to contribute to national development. Technology serves as a powerful tool to improve educational management efficiency, including facilitating access to education, promoting lifelong learning beyond school systems, managing, and analyzing information, and enhancing efficiency in various educational activities, particularly in utilizing digital technology to aid teaching and learning (National Education Standards, 2018).

Currently, artificial intelligence (AI) is garnering increasing attention and plays a significant role in daily life (Dawes, 2017; Holmes et al., 2019; Chen et al., 2020). Research and development efforts predominantly focus on its diverse applications, leading to transformative changes in education for the better (Fernoaga, 2018). The proliferation of technology leads to smarter education systems capable of rapid operation and continuous support for both teachers and learners in knowledge and skill development (Kaplan, 2016; Pokrivcakova, 2019). With a continuous upward trend, AI is poised to play a crucial role in education, particularly in the era of Education 4.0, characterized by innovation-driven learning (Hwang et al., 2020).

Thus, educational institutions must ensure ubiquitous access to and familiarity with digital technologies, creating a learning environment that transcends time and place. Digital technologies facilitate convenient learning environments, fostering collaborative learning through communication networks connecting students and educators. This aspect contributes to the creation of a learning system accessible without spatial or temporal constraints, leading to sustainable development in teaching and learning based on technology and innovation (Crowe et al., 2017; Chassignol et al., 2018; Sharma, 2019).

### *1.3 Digital Skills for Pre-Service Teachers*

Entering an era of rapid global transformations across all dimensions—social, economic, educational, and technological—that propel individuals into the digital realm, adaptation to continuous learning and skill development is imperative to keep pace with the evolving landscape. Such preparation not only enhances readiness for the future but also increases the likelihood of success compared to those who are unprepared (Wu et al., 2018; Hera et al., 2021). Digital skills have become indispensable in the 21st century, significantly contributing to learners' success in navigating a society characterized by rapid digital changes (Qureshi et al., 2020). Consequently, educators, in addition to mastering teaching techniques, must cultivate adaptive thinking and teaching

methodologies to equip learners with sufficient skills to thrive in an era marked by swift changes. Professional educators, poised to transition into teaching roles, must adopt teaching modalities that are current and tailored to digital-native learners to effectively educate the new generation growing up amidst rapid digital transformations. This endeavor is crucial for national development as it fosters life skills among students. Therefore, professional educators must continuously self-develop to serve as role models for students, facilitating their adaptation to new life skills in response to ongoing changes and fostering awareness of digital literacy (Gerasimova, 2019; Motschnig et al., 2019; Zeehan et al., 2020).

Digital skills are deemed essential and should be promoted among professional educators, as outlined in the professional teacher standards, undergraduate qualification standards, and national educational standards. Professional teacher standards encompass three dimensions: learning management and classroom organization, research for learning development, and innovation and information technology in education. Undergraduate qualification standards relate to two dimensions: numerical analytical skills and pedagogical methodologies. National educational standards encompass three dimensions: learner engagement, innovation collaboration, and community engagement, as shown in Table 1.

Table 1. The alignment of digital skills of pre-service teachers with professional teacher standards, Thai qualification framework for higher education, and national educational standards.

Teacher Professional Standards (B.E.2013)	Thai Qualification Framework for Higher Education (B.E.2018)	National Educational Standards (B.E.2018)	Digital Skills of Pre-Service Teachers
1. Learning Management and Classroom Organization: Understanding various learning management methods to foster students' abilities in critical thinking, creativity, problem-solving, and practical application. 2. Research for Learning Development: Conducting research, utilizing research findings, and producing research works to enhance learning. Application of research outcomes in teaching practices. 3. Innovation and Information Technology in Education: Designing, applying, and evaluating media, innovations, and information technology for learning, technology literacy, and communication.	1. Proficiency in numerical analysis skills, communication, and effective utilization of technology through diverse methods and various formats of presentations, utilizing appropriate technology and innovation. Awareness of copyright infringement and plagiarism. 2. Pedagogical methodologies expertise, emphasizing student-centered approaches in diverse learning management methods. Ability to use suitable and creative media and technology.	1. In terms of students, possessing lifelong learning skills, keeping abreast of changes, adapting, being flexible, and being able to confront changes in the digital and future worlds. 2. In terms of collaborative innovation creators, the ability to participate in solving societal problems and generate innovations. 3. In terms of strong citizens, the courage to resist wrongful actions and copyright infringements.	The digital skills of pre-service teachers comprise 6 dimensions: 1. Research and utilization. 2. Creation and innovation. 3. Identity and quality of life. 4. Teaching or learning. 5. Tools and technology. 6. Communication and collaboration.

In analyzing the components of digital skills for pre-service teachers, guidance has been drawn from professional teacher standards, the Thai qualification framework for higher education, and national educational standards. These are delineated into 6 components, namely: 1) Research and utilization, 2) Creation and innovation, 3) Identity and quality of life, 4) Teaching or learning, 5) Tools and technology, and 6) Communication and collaboration. The objective of this study is to identify components relevant to digital skills of Pre-Service Teachers in a Thailand University Context.

## 2. Method

This research “Self-Perception about Digital Skills of Pre-Service Teachers in a Thailand University Context” was conducted as follows

### 2.1 Research Design

Exploratory factor analysis (EFA) was employed to identify components relevant to digital skills derived from guidelines based on the Professional Teacher Standards (BE 2013), Thai Qualification Framework for Higher Education (BE 2018), and National Educational Standards (BE 2018), as well as related research. Subsequently, these components were used to formulate questions about digital skills for professional education students.

## 2.2 Research Sample

The research sample consisted of undergraduate students enrolled in education faculties affiliated with state universities and Rajabhat universities in Thailand, who had completed at least 2 semesters of study. A simple random sampling technique was utilized, and all participants provided informed consent before questionnaire completion. In determining the appropriate sample size for analysis, Hair et al. (2010) suggested a ratio of 10 participants per variable. Given the 36 variables in this study, the minimum sample size required was therefore 360 participants.

## 2.3 Research Instrument

The researcher utilized an online survey to collect participants' perspectives on various aspects of digital proficiency. The selected measures were then adjusted to develop indicators aligned with the theoretical framework. The digital skills questionnaire, consisting of 36 competencies across six domains, employed a five-point Likert scale, ranging from 1 (lowest) to 5 (highest). Content validity was evaluated by a panel of five experts, resulting in values ranging from 0.80 to 1.00. To assess reliability, the questionnaire was piloted with a separate group of 30 individuals (not part of the main sample), yielding a Cronbach's alpha coefficient of .975. (as shown in Table 2)

Table 2. Categories of competence included in the instrument

Category	Indicators (items)	Cronbach's alpha
Data search and usage	1–12	.957
Creation and innovation	13–16	.935
Identity and quality of life	17–22	.895
Teaching or learning	23–26	.682
Tools and technology	27–31	.707
Communication and Collaboration	32–36	.957

## 2.4 Data Analysis

The data were analyzed using means and standard deviations, and the EFA was based on the Varimax rotation method after selecting components with an eigenvalue greater than 0.50 (Hair et al., 2010).

## 3. Results

The exploratory factor analysis (EFA) for digital skills involved the utilization of a questionnaire for analysis, employing the Principal Component Analysis method and Orthogonal Rotation through the Varimax Method. The significance of the matrix inter-correlations was assessed using the Kaiser-Meyer-Olkin (KMO) analysis and Bartlett's Test of Sphericity. Both tests were applied to evaluate the suitability of the sample group, with a KMO value above .50 indicating an adequate sample size and Bartlett's Test assessing if the correlation matrix of the population was an identity matrix. The KMO value obtained was .951 (exceeding .50), and Bartlett's Test was statistically significant at .00 (less than .05), indicating that the correlation matrix was not an identity matrix. Thus, the data collected from the sample group were deemed suitable for factor analysis of digital skills.

Furthermore, the factor analysis revealed that each component of digital skills had eigenvalues greater than 1.00. Collectively, these components accounted for 71.14% of the total variance. Subsequently, the Varimax method was employed to orthogonal rotation, illustrating the relationships between variables and components, as depicted in Figure 1.

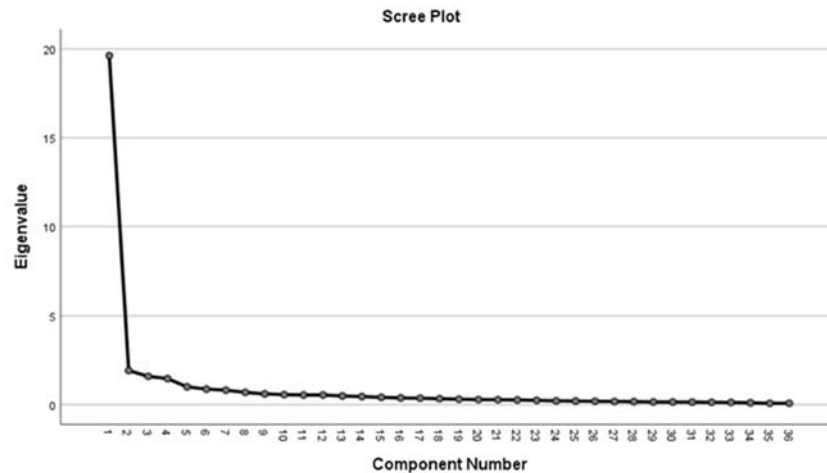


Figure 1. Variables Correlated with Components

During the varimax rotation, one variable remained unusable, leaving 35 variables that could be grouped into components. New names were assigned to the components to align with their nature. The analysis identified 35 indicators across four competence areas: digital technology and communication, learning for creative work, data search and digital data selection, and digital data credibility. Among these components, digital technology emerged as the most significant, followed by information technology and communication, with digital data credibility being the least significant, as shown in Table 3.

Table 3. Resulting factors of principal component analysis by varimax rotation

Factor	Indicators (items)	% of explained variance	Cronbach’s alpha
Digital Technology and Communication	1, 17–20, 27–31, 32–36	54.515	.957
Learning for Creative Work	7, 9, 11, 13–16, 23–26	5.331	.935
Data Search and Digital Data Selection	2–4, 21–22	4.436	.895
Digital Data Reliability	5, 6, 8	4.079	.682

The four factors identified were similar to the constructs the underlying theoretical framework defined. The variables that emerged, such as “Data Search and Usage,” were grouped under “Digital Technology and Communication,” “Learning for Creative Work,” “Data Search and Digital Data Selection,” and “Digital Data Reliability.” Additionally, “Identity and Quality of Life” were grouped under “Digital Technology and Communication” and “Data Search and Digital Data Selection,” as illustrated in Figure 2.

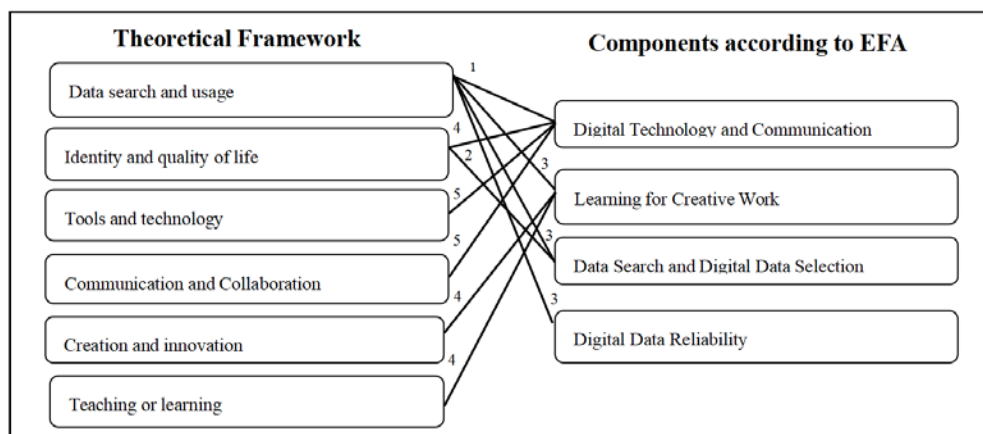


Figure 2. Relationship of Items Between the Categories of Theoretical Framework and EFA Results

The clarity of digital skills components has significantly improved, with notable attention to the “digital technology and communication” component. This component is considered of utmost importance by students, while digital data reliability is rated the lowest, as shown in Table 4.

Table 4. Resulting factors of principal component analysis by varimax rotation

Factor	Indicators (items)	Eigen Value	% of explained variance	Factor Loading
Digital Technology and Communication	15	19.625	54.515	.525-.762
Learning for Creative Work	11	1.919	5.331	.505-.748
Data Search and Digital Data Selection	6	1.597	4.436	.508-.680
Digital Data Reliability	3	1.469	4.079	.644-.772

#### 4. Discussion

One intriguing finding is the prioritization of the grouping of components related to digital technology and communication skills as of utmost importance. Overall, skills encompassing data search and digital usage, identity and lifestyle quality, tools and technology, and communication and collaboration are highly significant. These interrelated skills are influenced by social factors, technological advancements, and evolving communication paradigms, necessitating a focus on their development to align with contemporary needs. The integration of digital literacy skills and communication using technology to support learning in new environments underscores the prominence of information technology and communication skills, which exhibit the highest indicators. Having a well-rounded digital skillset is foundational for adapting to technological changes swiftly, fostering learning opportunities, and self-development in the rapidly evolving digital era. This corresponds with research by Di et al. (2018), emphasizing the pivotal role of digital literacy skills in learning and adaptation in the digital world. Beyond mere familiarity with digital technology, user thinking processes and technology are intertwined, aligning with findings from Hecker and Loprest (2019) that promote the importance of fostering digital technology literacy in the current era. In today’s technology-driven world, digital technology and digital literacy play crucial roles in daily life, spanning work, education, communication, and learning. Possessing digital literacy skills enhances competitiveness in the labor market and prepares individuals for rapid technological advancements, thus strengthening readiness in a swiftly changing technological landscape.

Furthermore, the reliability of digital data exhibits the lowest component. This may stem from the policies of Thailand 4.0, which emphasize knowledge acquisition, the ability to disseminate knowledge, and the utilization of information technology to promote knowledge dissemination, thereby fostering a learning society. Supporting educational development towards Digital Enterprises and creating learning and activities to integrate the use of information technology knowledge in self-protection and ethical use, rights, and responsibilities in ICT utilization (Office of the Prime Minister’s Secretariat, 2017). These skills are crucial for educators in today’s digital society, enabling pre-service teachers to use technology effectively in both the physical and online realms. They demonstrate cautious use and dissemination of information in social media and can protect themselves from virtual threats, fostering creative thinking and the application of information technology and communication skills for personal, school, and societal benefits.

#### 5. Conclusion

Presently, digital transformation is an inevitable option. Educational institutions must confront new technologies continuously. The ever-evolving digital landscape poses challenges for every organization, necessitating constant adaptation and learning to keep pace with change. Therefore, educational institutions, as pre-service teacher-producing organizations, must alter their practices and continuously adapt to produce graduates who are of high quality and keep up with the changes in the digital era. Research findings demonstrate the necessity of integrating essential technology-related skills, including search, tool usage, communication, and collaboration through technology. Educational institutions at all levels currently demand new qualifications and knowledge from modern-day teachers, including digital skills for effectively transmitting knowledge to learners to ensure that learning outcomes align with societal needs. Development of digital skills can be transformed into online training courses or nano-platforms, to cater to modern learners who prefer quick and comprehensible learning methods, allowing them to study independently and enhance their self-development opportunities continuously.

#### 6. Recommendation

Future research is necessary to increased emphasis on digital technologies’ intellectual property, which plays an

increasingly vital role in human daily life, for further analysis in the context of Thailand. This is to link necessary digital skills to design learning management systems aligned with the dissemination of technologies that enhance the education system's intelligence and operational efficiency and focused on teachers' learning style preferences, additional factors related to the characteristics of teachers should be considered in future studies.

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### **Authors' contributions**

Assoc. Prof. Dr. Chaiyos Paiwithayasiritham, Assoc. Prof. Dr. Gan Chanyawudhiwan and Asst. Prof. Dr. Seksan Amatmontree were responsible for study design and revising. Assoc. Prof. Kemmanat Mingsiritham drafted the manuscript and Assoc. Prof. Dr. Areewan Iamsa-ard revised it. All authors read and approved the final manuscript.

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### **Data availability statement**

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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