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How capable are they of Becoming a Digital Teacher? Correlation Analysis of Individual Characteristics, Digital Self-efficacy, and Digital Citizenship among Pre-service Teachers in Northeast Thailand

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Abstract

Understanding pros and cons of digital technology is an essential competency for pre-service teachers so that they are able to conduct online instruction appropriately. They need to prepare themselves comprehensively to be able to use the new educational technology that is now widely accessible particularly since the Covid-19 pandemic incidence. This paper investigates the relationship between individual characteristics, digital self-efficacy, and digital citizenship among pre-service teachers in higher education. Cluster sampling was used to select 384 pre-service teachers from three higher education institutes located in the northeast of Thailand. A research tool used in the research was an online questionnaire. The data analysis utilized descriptive statistics, the Chi-square test, and the Pearson correlation. The research discovered that pre-service teachers had a relatively high level of digital self-efficacy, while having relatively low level of digital citizenship. Correlation analysis observed a positive relationship among individual characteristics, digital self-efficacy and digital citizenship. The implications of this research highlighted the significance of implementing civic education in higher education level in order to foster adequate knowledge, skill, and awareness of citizenship in pre-service teachers.

Keywords: digital citizenship, educational technology, higher education, pre-service teacher, self-efficacy

1. Introduction

1.1 Significance of the Study

The development of contemporary technology has contributed to the acceleration of change across a range of domains which include the economic, social, and cultural spheres. Linkages have developed between numerous aspects of society and these have become manifested in people's everyday lives. Advances in communication technology have significantly impacted upon people's ways of life, with internet access and many forms of information technology becoming vitally important. Digital technology has greatly aided the growth of the country in various ways, including within the education aspect. Education establishments have increased their utilization of digital technology as a teaching assist and tool. Consequently, it has become essential for educators to improve their skills in this field due to digital technology becoming an integral source of knowledge. Today, a wide range of knowledge is freely available to both students and educators, which raises student accomplishment in those fields (Singh, 2021). Furthermore, the COVID-19 pandemic, which severely hindered student success, raised the profile of digital technology and its importance has been expanded significantly. Accordingly, digital technology has been widely implemented in order to minimize educational disparities by broadening students' access to learning materials and to remove any obstacles that may hinder their progress (Haleem et al., 2022).

Due to the COVID-19 pandemic, the government decided to close schools and shift to an online learning platform. This change led to the widespread adoption of digital technology in online classrooms. Many educational institutes have also shifted their pedagogical approach to emphasize the use of digital tools for student instruction. Several evidence suggest that both students and teachers have adopted online learning or use the blended learning approach (Masalimova et al., 2022; Bashir, 2021; Wart, 2020). The internet is a vital component for the success of online classrooms, allowing both students and teachers to connect with each other and access a wealth of educational materials. Students and teachers now have the freedom to create a classroom

of their own from anywhere with internet access (Shehzadi et al., 2020). However, information on the internet comes from a wide range of sources all over the world and is presented in a variety of formats. Without adequate screening measures, it is possible to easily access the internet and import unreliable information or inappropriate learning materials into the classroom. This situation raises problematic questions regarding the authenticity of some internet content. Those who utilize online information without discernment run the danger of being deceived or of getting poor quality information (Chamnien and Chamnien, 2018), which could obstruct student achievement. Furthermore, several articles have highlighted concerns regarding student online conduct. It has been noted that many students consume internet media without the use of critical thinking, or they may lack the ability to critically evaluate the information they obtain (Jantan et al., 2020).

It is essential to include digital resources within the classroom. To effectively train students and comprehend the implications of employing digital technology, educators at all levels must acquire digital technology skills and knowledge (Ruenphongphun et al., 2021). Therefore, it is essential for stakeholders in the education sector to understand and have a firm grasp of the concept of digital citizenship.

The adoption of digital technologies in education is crucial. Teachers, students, and educational support personnel must improve their digital technology knowledge to be able to offer effective instruction and to comprehend the implications of utilizing digital technology (Ruenphongphun et al., 2021). Therefore, education-related stakeholders must have a firm grasp of digital citizenship, which goes beyond digital literacy, in order to move forward. Digital citizenship can provide instructors and students with the knowledge and skills necessary to fully utilize digital technology in the modern classroom. Furthermore, it can help them to comprehend the digital transition and the ethical challenges involved through the implementation of digital technology in education (Ribble, 2015). Several research of digital citizenship in education have focused on the level of digital citizenship among students enrolled at basic education and higher education (Phornprasert et al. (2020); Chaowakeeratiphong and Wongnayat, 2020; Kaeduang et al., 2019;) However, there are few studies focusing on factors associated with the development of digital citizenship in higher level students. Several studies (Coklar and Tatli, 2020; Choi et al., 2018; Al-Zahrani, 2015; Bandura, 1997) have emphasized the significance of self-efficacy in the use of digital technology in everyday life, including its use for online learning. It is accepted that many students are increasingly confident in their ability to utilize their technological skills. They are confident in their ability to make judicious decisions that will assist them in achieving their goals, such as selecting various digital media for use in their online learning. Therefore, it is plausible to conclude that self-efficacy is a measure of the relationship between everyday operation success and individual performance (Bandura, 1986).

The objective of this study examines the relationship between individual characteristics, digital self-awareness and digital citizenship among pre-service teachers in higher education who would become fully-fledged in-service teachers at various educational institutions following graduation. Preparing pre-service teachers to be aware of digital intelligence is essential for them to remain in-step with the rapid evolution of educational technology and to develop that awareness in their pre-service teacher digital citizenship. The findings of this study can be utilized in policy making to increase the efficacy of future instructors in the usage of digital technology, including co-existence within a sustainable digital society.

1.2 Exploring digital self-efficacy and digital citizenship in education settings

Current psychological theory recognizes that self-efficacy is an important aspect in a field of educational psychology. Bandura (1989) describes self-efficacy as a person's perception of how they are dealing with and how to achieve the goals effectively. Self-efficacy is a belief in individual abilities that relate on human behavior in various ways. In general, people tend to choose activities they feel they are capable or avoid activities they are unable to do. Such choices they made are based on their own self-efficacy in which it could help individuals decide how much effort to deal with the tasks (Bandura, 1989).

At present, individual’s activities have been facilitated by digital technology. Everyone uses digital technology to access information, work, and live in digital society. Digital self-efficacy therefore is introduced in order to deal with the development of digital technology. Many studies view digital self-efficacy in several aspects. Digital self-efficacy can be measured through abilities in computer usage (Weigel & Hazen, 2014; Compeau and Higgins, 1995) or individual judgment while using computers (Marakas et al., 1998). By the way, there are arguments about measuring digital self-efficacy through computer usage only. Digital self-efficacy should not be measured on the basis of computer proficiency as the only indicator because we are now in a borderless world that everyone can access information. For this reason, ability to use internet has been suggested as an additional measure of digital self-efficacy (Torkzadeh & Van Dyke, 2002). Internet self-efficiency is typically measured by

several objectives regarding internet use such as internet problem solving, or access to online community (Eastin & LaRose, 2000). Additionally, those who spent more time with social media would have greater social and digital self-efficacy (Hocevar et al., 2014).

Digital self-efficacy has been recognized in education for decade. Bong and Skaalvik (2003) describe digital self-efficacy as the extent to which students believe they can successfully use digital media to meet their objectives and goals. Moreover, digital media self-efficacy is also an indicator of a learner's digital media skills (Liu et al. 2021). Lee and Wu (2012) indicated that students with good academic attitudes were more likely to be associated with computer use, and they were also more confident in using web-based information technologies. They also suggest that reading performance may not be a student's goal when working with computers. Rather, it is their attitude and confidence towards computers and information technology that will allow them to engage in more online reading activities. It is to accumulate students' online reading experience and ultimately increase students' reading efficiency. Kuttanuwat & Pontanya (2022) found that academic self-efficacy, digital literacy, and social support have associated with psychological wellbeing among higher students. Digital literacy is an important skill for higher students. Therefore, universities should enhance such skills to students. This will encourage students to deal with online learning effectively. In conclusion, it can be defined that digital self-efficacy, both computer literacy and internet literacy, is an important part for students to become a digital literate person.

Digital Citizenship is an essential competency of the global population and it is a skill that needs to be instilled in people from a young age. Digital citizenship is defined as a multidisciplinary character that describes the characteristics of a person who is digitally literate, interacts appropriately and creatively with others around the world, and can take advantage of digital technology effectively (Ribble, 2009; Mossberger, 2008). Ribble (2015) defines digital citizenship as person's competencies to engage in digital technology. Elements of digital citizenship comprises of digital access, digital etiquette, digital law, digital literacy, digital commerce, digital communication, digital security, digital health and wellness, and digital rights and responsibilities. Choi et al., (2018) suggests that indicators to determine digital citizenship comprise of ethics, media and information literacy, engagement and participation, and critical resistance. Additionally, civic engagement is considered as digital citizenship manner (Peart et al., 2020; Jones & Mitchell, 2016).

In an educational context, digital citizenship is a skill that is transferred to students from elementary to higher education levels. Digital citizenship is recognized by educators as another important learning activity for fostering correct daily living habits through appropriate use of computers and communication technologies (Detsom & Vehachart, 2021; Ng, 2012). A number of studies suggest that digital citizenship improves learner behavior to build respect among online users and increase online citizen participation in appropriate activities. (Hollandsworth et al., 2017; Jones & Mitchell, 2016), and creative use of social media platforms (Krutka & Carpenter, 2017). While Thanakijcharoensuk & Punlumjeak (2020) suggested that ubiquitous learning is an effective tool to promote digital citizen skills of higher education students. In addition, instructional approaches today use a variety of technologies to foster digital citizenship in learners and help increase student achievement and motivation to learn in subjects such as social studies or science (Tapingkae et al., 2020; Fielder et al., 2016; Hwang et al., 2015). In conclusion, this study categorized elements of digital citizenship into three categories (Ribble, 2015) including 1) respect yourself and others (digital access, digital etiquette, and digital law), 2) educate yourself and others (digital literacy, digital commerce, and digital communication), and 3) protect yourself and others (digital security, digital health and wellness, and digital rights and responsibilities).

2. Method

2.1 Population and Sample Size

This research applied quantitative research methodology to examine the relationship between individual characteristics, digital self-efficacy, and digital citizenship among pre-service teachers in higher education. Self-efficacy (Bandura, 1989) and digital citizenship (Ribble, 2015; Choi et al., 2018) were used as main concepts in this research. Participants in this study were pre-service teachers enrolled in higher education institutions in northeastern Thailand. Due to the indeterminate number of students enrolled at the beginning of the academic year 2022, the total population of each higher education institute was not able to be determined. Therefore, Cochran's formula for unknown population (Cochran, 1977) was applied to calculate the sample size, which was 384 pre-service teachers. By employing cluster sampling, pre-service teachers from universities in the provinces of Khon Kaen, Nakhon Phanom and Ubon Ratchathani, in northeastern Thailand, were selected. The inclusion criteria was that the selected participants must have been enrolled in a faculty of education for at least one year.

2.2 Characteristics of Participants

The majority of the pre-service teachers were female (71.4 percent), male (24.2 percent), and LGBTQ+ (4.4 percent), respectively. The age groups were represented as 20-21 years old (48.7 percent), 18-19 years old (45.8 percent), and over 21 years old (5.5 percent). Additionally, the pre-service teachers were enrolled in the third year (33.1 percent), the second year (31.8 percent), and the first year (28.6 percent), respectively (Table 1)

Table 1. Characteristics of pre-service teachers in the northeast region, classified by gender, age, and education enrollment

Characteristics	Frequency	Percentage
Gender		
Male	93	24.2
Female	274	71.4
LGBTQ+	11	4.4
Total	**384**	**100.0**
Age		
18-19 years old	176	45.8
20-21 years old	187	48.7
Above 21 years old	21	5.5
Total	**384**	**100.0**
Education enrollment		
First year	110	28.6
Second year	122	31.8
Third year	127	33.1
Fourth year	20	5.2
Fifth year	5	1.3
Total	**384**	**100.0**

2.3 Research Instruments

The study employed an online questionnaire to collect quantitative data from the selected pre-service teachers. The questionnaire was developed by studying document reviews on self-efficacy and digital citizenship. The questionnaire consisted of three sections: pre-service teacher characteristics, digital self-efficacy and digital citizenship. Twenty five of the four-scale question items were designed to examine level of pre-service teacher' self-efficacy and digital citizenship. The questionnaire was validated by academic experts to ensure its content validity and reliability. The questionnaire was then given a reliability level of 0.90, which represented a high reliability level (Hulin et al., 2015). Independent variables consisted of sex, age, enrollment year and online self-efficacy, while digital citizenship was the dependent variable.

After the questionnaire passed a content validity and reliability test, collection of research data was almost ready to commence. Prior to the start of data collection, a research ethics review by the Center for Research Ethics in Humans Khon Kaen University was undertaken to ensure that the research tools created would not affect the rights and privacy of the subjects. Data collection was carried out using an online format through a Google form application. A request for assistance in collecting the research data was made to the higher education institutions in the target area and publicized among the students and teachers within those institutions. The online data collection took place over a total period of 3 weeks. Researchers made their selections sequentially in relation to the time the questionnaire was returned and resulted in obtaining a total of 384 questionnaires.

2.4 Data Analysis

Data obtained from the online questionnaires were checked to verify the coding accuracy before being processed using a computer package for statistical analysis of social science research (SPSS for Windows). Quantitative data analysis was employed using descriptive statistics including percentage, frequency, mean and standard deviation. Max and Min were used to show the distribution of the data and describe the general characteristics of the sample. Chi-square statistics were then used to test the statistical significance of the correlation of the variables. Contingency Coefficient (CC.) was employed, Pearson's Product Moment Correlation was used to indicate the degree of correlation between variables. The criteria for interpreting the relative coefficients (Mukaka, 2012) are as follows:

The correlation coefficient between 0.00 – 0.39 means that the correlation is low.

The correlation coefficient between 0.40 – 0.69 means that the relationship is moderate.

The correlation coefficient between 0.70 – 1.00 means that the relationship is high.

3. Results

3.1 Digital Self-efficacy and Digital Citizenship of Pre-service Teachers in the Northeast Region

The results indicate that the level of overall digital self-efficacy of the pre-service teachers was relatively high (48.4 percent). A total of 29.4 percent of them had self-efficacy at a high level while a relatively low level was achieved by 19.0 percent. Moreover, it was indicated that the majority of pre-service teachers had a relatively low level of self-efficacy in computer usage (33.9 percent), while they had a relatively high level of self-efficacy in Internet usage (44.5 percent). (Table 2)

Table 2. The level of digital self-efficacy and the level of digital citizenship of pre-service teachers in the northeast region

Level of self-efficacy	**Frequency(n)**	**Percentage**
Overall self-efficacy		
Low	12	3.1
Relatively low	73	19.0
Relatively high	186	48.4
High	113	29.4
Total	**384**	**100.0**
Mean = 9.85 SD = 2.93	Min = 0.0	Max = 14.0
Self-efficacy in computer usage		
Low	22	5.7
Relatively low	130	33.9
Relatively high	103	26.8
High	129	33.6
Total	**384**	**100.0**
Mean = 5.33 SD = 1.93	Min = 0.0	Max = 8.0
Self-efficacy in internet usage		
Low	9	2.3
Relatively low	79	20.6
Relatively high	171	44.5
High	125	32.6
Total	**384**	**100.0**
Mean = 4.52 SD = 1.38	Min = 0.0	Max = 6.0

An overall analysis of the digital citizenship of pre-service teachers in the northeast region indicated that the majority of them had a relatively low level of digital citizenship (38.0 percent), followed by those with a relatively high level of digital citizenship (33.3 percent), and those with a high level of digital citizenship (14.4 percent). Roughly half of the pre-service teachers had digital citizenship that was relatively low (52.3 percent), while recording a high level of digital citizenship in educating/communicating with others (33.3 percent). Lastly, they had digital citizenship in protecting others at a relatively high level of 44.8 percent. (Table 3)

Table 3. The level of digital citizenship of pre-service teachers in the northeast region

The level of digital citizenship	Frequency (n)	Percentage
Overall digital citizenship		
Low	53	13.8
Relatively low	146	38.0
Relatively high	128	33.3
High	57	14.8
Total	**384**	**100.0**
Mean = 36.74 SD = 8.43	Min = 18.0	Max = 54.0
Respect yourself and others		
Low	63	16.4
Relatively low	201	52.3
Relatively high	76	19.8
High	44	11.5
Total	**384**	**100.0**
Mean = 11.63 SD = 3.23	Min = 5.0	Max = 18.0
Educate yourself and others		
Low	40	10.4
Relatively low	112	29.2
Relatively high	104	27.1
High	128	33.3
Total	**384**	**100.0**
Mean = 13.73 SD = 3.21	Min = 6.0	Max = 18.0
Protect yourself and others		
Low	30	7.8
Relatively low	117	30.5
Relatively high	172	44.8
High	65	16.9
Total	**384**	**100.0**
Mean = 11.38 SD = 3.35	Min = 2.0	Max = 18.0

3.2 Relationships between Individual Characteristics, Digital Self-efficacy and Digital Citizenship of Pre-service Teachers in the Northeast Region

The results revealed that an individual characteristic, education level, was significantly related to the digital citizenship of pre-service teachers in the northeast region at a .05 level with a correlation coefficient of 0.232, which was a low relationship (Table 4).

Table 4. Percentage of pre-service teachers, classified by individual characteristics and digital citizenship

Individual characteristics	Level of digital citizenship of pre-service teachers				
	Low	Relatively low	Relatively high	High	Total
1. Gender					
Male	19.4	29.0	32.2	19.4	100.0 (384)
Female	12.4	40.1	33.9	13.5	100.0 (384)
LGBTQ+	5.9	52.9	29.4	11.8	100.0 (384)
Chi-square = 8.389 df = 6 Sig. = 0.211					
2. Age					
18-19 years old	18.8	37.5	31.8	11.9	100.0 (384)
20-21 years old	9.1	38.0	35.3	17.6	100.0 (384)
Above 21 years old	14.3	42.9	28.6	14.3	100.0 (384)
Chi-square = 8.754 df = 6 Sig. = 0.188					
3. Education level					
First year	23.6	39.1	27.3	10.0	100.0 (384)
Second year	11.5	35.2	38.5	14.8	100.0 (384)
Third year	8.7	36.2	36.2	18.9	100.0 (384)
Fourth year	5.0	60.0	20.0	15.0	100.0 (384)
Fifth year	20.0	40.0	20.0	20.0	100.0 (384)
Chi-square = 21.899 df = 12 Sig. = 0.039* CC = 0.232					

An analysis of the relationship between digital self-efficacy and digital citizenship of pre-service teachers in the northeast region found that the digital self-efficacy was significantly related to their digital citizenship at the .01 level with a correlation coefficient of 0.276, which was a low relationship. Additionally, digital self-efficacy was significantly related to their digital citizenship in the dimensions of respect yourself and others, educate yourself and others, and protect yourself and others at the .01 level (Table 5).

Table 5. Correlation coefficients between digital self-efficacy and digital citizenship of pre-service teachers in the northeast region

Variables	1	2	2.1	2.2	2.3
1. Self-efficacy	1	0.266**	0.215**	0.195**	0.238**
2. Digital citizenship; overall	0.266**	1	0.813**	0.774**	0.748**
2.1 Respect yourself and others	0.215**	0.813**	1	0.599**	0.561**
2.2 Educating yourself and others	0.195**	0.774**	0.599**	1	0.430**
2.3 Protect yourself and others	0.238**	0.748**	0.561**	0.430**	1

Note. ** Statistically significant at the .01 level

4. Discussion

According to the findings, the majority of pre-service teachers are indicated to have a relatively high degree of digital self-efficacy. It is commonly acknowledged that digital technology now plays an important part in daily life and the pre-service teachers have been using digital technologies for instructional activities. Following the Covid-19 pandemic, online learning has become a viable method for delivering education. Digital technology is now very important to both the students and their instructors. The findings are in line with Hatlevik and Hatlevik (2018), who demonstrated that teachers' digital competence was positively associated with the intensity of ICT use in the classroom. This indicates that if the instructors have self-efficacy and experience in the use of digital devices, including both software and hardware, they will be more effective when using information technology to teach their students in a variety of activities. Obtaining these skills can improve the learning capacity of both teachers and students when searching for information via the Internet or in utilizing other educational programs.

This study discovered that many pre-service teachers had a low degree of self-efficacy in computer usage, but a high level of self-efficacy in Internet usage. It seems likely that the pre-service teachers feel comfortable utilizing the Internet to search for information or for other everyday purposes. However, they also appear to be unaware of the wider use of computer technology. In regard to computer software and hardware issues, they appear to have little inkling of how to find appropriate solutions. Furthermore, several students indicated that they never read the terms and conditions before utilizing software or hardware. This conclusion contradicts other

studies that show a high degree of computer usage among students, particularly those in Generation X. (Katsarou, 2021; Kustono, 2021). Consequently, supporting pre-service teachers to become computer literate would assist them in increasing their effectiveness when employing information technology to provide optimal learning achievement.

Pre-service teachers in the northeast display digital citizenship to a relatively low degree. It was intriguing to delve further into why this should be the case. Consequently, it was discovered that half of these teachers displayed little regard for others when engaging in online activities. Many of the students utilized digital tools for reasons other than learning in class. They displayed a lack of judgment when using social media, which could lead to undesired actions including cyberbullying or duplicating other people's professional activities without reference or permission. This issue is congruent with a study conducted by Jantan et al. (2020), which discovered that higher education students often lack judgment in obtaining information and use digital media in inappropriate ways. It was also discovered that pre-service teachers still do not fully comprehend digital technology and are not always prepared for the use of online learning tools.

The year of enrollment and digital self-efficacy were related to the pre-service teachers' digital citizenship in an analysis of the relationship between individual characteristics, digital self-efficacy and digital citizenship of the pre-service teachers in the northeastern region. The findings demonstrated the significance of the pre-service teachers' experiences in higher education. Enrolling in a university provides them with the opportunity to study a wide range of disciplines. This can enable students to gain access to more information, skills and attitudes that should help them to become quality digital citizens. According to Liu et al. (2021) and Hatlevik and Hatlevik (2018), self-digitization provides a vital indication of the development of digital citizenship for instructors. Furthermore, self-efficacy in computer and internet usage is positively related to digital citizenship. When the pre-service teachers obtain a greater familiarity with computers and the Internet, their digital citizenship as instructors and as learners improves.

The findings of this paper indicate a relatively low degree of digital citizenship attributes being displayed among the pre-service teachers. This reflects the rapid changes that are occurring during the digital age. An enormous amount of information appears on the Internet every day, pre-service teachers should be ready to receive information from various sources and have the skills to select only the reliable information to pass-on to their students. Cognitive skills such as analytical thinking and critical thinking are necessary to allow them to become a qualified in-service teacher who is aware of the changes taking place in the continually evolving digital era. Additionally, the findings show a relationship between digital self-efficacy and digital citizenship. This reflects the importance of a holistic approach when creating a learning experience for pre-service teachers to become proficient in using digital technologies.

5. Recommendations

Digital citizenship is an important competency for pre-service teachers to have in the 21st century. It is especially important for higher education students to develop instructional methods that can enhance digital citizenship abilities. Learning about digital citizenship must be established so that it encompasses all aspects of becoming a digital citizen; respecting the rights of others, digital literacy, safeguarding and strengthening the digital security of others. Today, it is no longer merely sufficient to educate pre-service teachers in the specific technical competencies of educational technology; it is also important to foster citizenship attributes in them. Citizenship attributes will assist these teachers in gaining a greater understanding of how to manage learning when using digital technologies.

According to the importance of learning implementation discussed previously, an instructional policy covering the trans-disciplinary domains of digital citizenship, such as digital literacy, learning technology implementation and global citizenship should be established. These competencies will provide a gateway that can connect with everyone. To ensure educational sustainability, an instructional policy for digital citizen competency will be required that must encompass all of the learning domains, including the cognitive domain, social and emotional domain and learner behavior.

The focus of this study was to find the relationship between two variables, hence it is difficult to comprehend the relationships between other variables. To eliminate this limitation, future studies should include a multivariate analysis to determine the influence of factors on the digital citizenship of pre-service teachers. In addition, a quantitative study of the relationship between variables may be inadequate for expressing the relationships in great detail. Therefore, it should be recommended that future research utilize a mixed-method approach to explain the digital citizenship of pre-service teachers. This will facilitate observation and implementation of digital citizenship among these teachers.

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