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The Effect of School Capacity and Teacher Capacity on Student Experience in Using Digital Devices: A Comparative Study in Thailand and Taiwan

Nguyen-Bich-Thy Bui[1,2], Romi Aswandi Sinaga[1], Suphannee Arsairach[1]

1 National Dong Hwa University, 2 Ho Chi Minh City University of Education

This study aimed to compare the levels and relationships between school capacity, teacher capacity, and student experience in Thailand and Taiwan. Moreover, school types and school locations were examined to explore these differences. The secondary data from PISA 2018 were analyzed by quantitative approach. The results revealed that only school types had differences in teacher capacity in Thailand, whereas other demographic information did not. Other results showed different directions of correlations between school capacity, teacher capacity, and student experience. School capacity in both countries was able to predict teacher capacity. Other factors as predictors of the student experience are recommended.

Cette étude visait à comparer les niveaux et les relations entre la capacité des écoles, la capacité des enseignants et l'expérience des étudiants en Thaïlande et à Taïwan. En outre, les types d'écoles et les lieux d'enseignement ont été examinés pour explorer ces différences. Les données secondaires de PISA 2018 ont été analysées en employant une approche quantitative. Les résultats ont révélé que seuls les types d'écoles étaient associés aux différences dans la capacité des enseignants en Thaïlande, alors que les autres informations démographiques ne l'étaient pas. D'autres résultats ont montré différents types de corrélations entre la capacité des écoles, la capacité des enseignants et l'expérience des élèves. Dans les deux pays, la capacité des écoles a permis de prédire la capacité des enseignants. Il est recommandé d'utiliser d'autres facteurs pour prédire l'expérience des élèves.

In recent years, digital technologies have been a key element in everyday life. On average, most countries are close to meeting the Sustainable Development Goal targets of ensuring schools have access to the Internet for pedagogical purposes (Organization for Economic Cooperation and Development [OECD], 2019, 2020). This shift means that students in this era use digital devices more frequently (OECD, 2016). They have used digital devices in different contexts, not only at home but also in school. However, there is increasing evidence that the rising time students are spending on technological devices at home and in school has a negative impact on their development (Park et al., 2019; Sakamoto et al., 2022). These studies indicated that there is still controversy in education circles regarding how digital devices are used effectively in schools

(Badri et al., 2017; Gür & Türel, 2022).

At schools, digital devices play an important role in diversifying learning environments and learning activities, especially in developing countries (Basak et al., 2018; OECD, 2020). However, providing digital devices in schools is not enough without understanding how to use them for educational purposes (Bozkuş, 2021). Thus, the issue of foremost importance is to instruct students on the suitable ways of utilizing digital devices for their studying purposes (McCain, 2005). However, making pedagogical changes in response to the potential of digital devices are complex process (Pöntinen & Räty-Záborszky, 2020). It needs responsibility on the part of schools and teachers. For example, with the methods for teaching digital competence or proficient digital skills, teachers can create opportunities for students to use digital devices through authentic activities (Ilomäki et al., 2016). On the other hand, schools that lack digital devices may not be able to support teacher and student activities in this technology-integrated era. When digital devices are used to support learning activities, they increase students' classroom participation (Passey et al., 2003; Sivin-Kachala & Bialo, 2000), and also provide opportunities for students to search for available information for their learning process (Jack & Higgins, 2019). Moreover, when students had access to or the ability to use mobile devices, they increased their learning potential and satisfaction, suggesting they are ready for autonomous learning using mobile devices in partnership with their 21st-century learning skills (Howlett & Waemusa, 2019). Mobile devices give students the flexibility to follow their own interests and move at their own pace, which can increase their motivation to pursue learning opportunities (West & Vosloo, 2013). In an early study, Holec (1981) emphasized that learner autonomy is the ability to take charge of one's own learning and the potential capacity to act in a learning situation. Thus, school capacity and teacher capacity for using digital devices are the main aspects of supporting student experience in learning at school, particularly for student autonomy.

Thailand and Taiwan are Asian countries that are outstanding in advanced technology development in the field of education (Kong et al., 2017; Wongwuttiwat & Lawanna, 2018). In Thailand, the government introduced one tablet per child policy, namely "One Tablet Per Child" in 2012 (Hardy & Nanni, 2015). After that, this project was replaced by the "smart classroom" initiative in 2014, where the schools were authorized to have one smart classroom with information and communication technology facilities, with an aim to integrate cloud-computing services and Microsoft Office 365 (The Nation Thailand, 2014; Wongfan, 2020). Although these policies brought a great change to Thailand's education, the methods to integrate digital devices into regular classroom teaching are still ambiguous for educators and researchers. Especially, the role of schools in terms of developing the student experience of using digital devices is rare to study (Sureephong et al., 2015). In 2016, in Taiwan, the government formally launched the *Mobile Learning Promoting Plan* for junior high schools to lift teachers' competence in applying mobile devices to classrooms as well as enhance students' competence in adopting mobile learning (Sinaga et al., 2022). Nevertheless, the results of such efforts were unexpected. Some participating schools lamented that the integration of digital devices into teaching was difficult (Lo et al., 2021). Accordingly, most schools in Taiwan are still hesitant to adopt mobile learning as their major pedagogy because it is not clear what benefits school members will get, how valuable the possible benefits are, or what drawbacks might be encountered.

Despite policies promoting the use of digital devices at schools in both Thailand and Taiwan, there are still challenges in using digital devices as a tool for learning. This can be for a multitude of reasons, but primarily come from educational inequality (Howlett & Waemusa, 2019). The various studies pointed out the inequality of a "digital divide" between the rural and urban areas

in Thailand (West & Vosloo, 2013). With many disparities between urban and rural contexts, Thailand's students have been influenced by the practicality of incorporating mobile devices into their classes (Howlett & Waemusa, 2019). Meanwhile, the educational context in Taiwan is different from Thailand. The Taiwanese Ministry of Education promotes educational policies and programs, as well as takes action to enhance digital learning in elementary through high schools by providing internet access for all classrooms and tablet computers for all students (Tubplee, 2019). The K–12 Education Administration in Taiwan also provides schools in remote areas with subsidies to acquire digital facilities (Pruet et al., 2016). Selwyn (2010) argued that "… greater attention now needs to be paid to how digital technologies are actually being used—for better and worse—in 'real-world' educational settings" (p. 66)—in particular the social, economic, and cultural contexts. Thus, this research aims to find how the school capacity in providing infrastructure of digital devices and teacher capacity in using digital devices affect student experiences; as well as the effect of digital divide in Thailand's and Taiwan's context among urban/rural school locations and public/private school types. Therefore, this study is concerned with the following questions:

1. What are the levels of school capacity, teacher capacity, and student experience in using digital devices in Thailand and Taiwan?
2. Are there significant differences in school capacity and teacher capacity among school types and school locations in Thailand and Taiwan?
3. What are the relationships between school capacity, teacher capacity, and student experience in using digital devices in Thailand and Taiwan?

Literature Review

Using Digital Devices in Thailand and Taiwan's Educational Context

Currently, the government is pushing Thailand 4.0 through an economic model that promotes a "smart Thailand" of creativity, innovation, and educational technology (Koanantakool, 2016). This suggests that Thailand's policymakers have an agenda for incorporating technology and a more learner-centered approach. However, several teachers and schools have been left unaware of how to transition to integrating digital technologies into the classroom because of the indistinct mobile device policy and opposing comments from the Prime Minister asking teachers to restrict mobile phone use (Howlett & Waemusa, 2019; Pheeraphan, 2013).

Moreover, a prominent argument against allowing in-class usage of digital devices is the inequality of a traditional divide between those who have access to digital devices and those who do not (West & Vosloo, 2013). Thailand is a developing country that has been faced with this problem in recent years, though the overall levels of access have been rapidly increasing (Srinuan et al., 2012). In urban areas, internet subscriptions in Thailand more than doubled, from 21.2% of the population in 2005 to 44.9% in 2014. In rural areas, it increased three-fold from 8% to 26.9%, but the gap between urban and rural areas during this period remained relatively wide with a margin of approximately 13–19% (Malisuwan et al., 2016). The utilization of computers has followed a similar trend, with a margin of approximately 15–19% between urban and rural users (Malisuwan et al., 2016). There are some urban-rural gaps in Thailand's educational context regarding the use of digital devices in the classroom (Lounkaew, 2013).

In Taiwan, over 90% of all households owned a computer, and 82.8% of these had internet

access in 2010 (Foreseeing Innovative New Digiservices [FIND], 2010). High-speed internet has been successfully installed in 100% of the nation's elementary and junior high schools. The government is also providing additional funding of NT$20 billion (US$668.3 million) to continue outfitting classrooms with improved wireless internet and to purchase 610,000 digital learning devices, in particular one tablet computer for every student attending a rural school (Ministry of Education, 2022). However, the digital divide remains an issue in remote areas of Taiwan. Studies have demonstrated that the uneven distribution of information resources can be attributed to the distance between urban and rural areas (Graham, 2002; Parker, 2000). For example, computer ownership and internet usage rates are far higher in northern Taiwan (which is more metropolitan) than in other regions. Internet access rates also vary according to the degree of urbanization (Research, Development and Evaluation Commission, 2010). The integration of technology in classrooms in Taiwan has experienced challenges due to different reasons. There are some factors impacting the integration of digital devices in teaching, including environmental, personal, social, and curricular issues (Chanlin et al., 2006; Chen et al., 2019). In general, government policies may not be really effective to eliminate barriers to the usage of emerging technologies in remote areas (Huang, 2015).

School Capacity in Using Digital Devices

Apart from technology-related teaching skills, the accessibility of digital technologies in schools plays a particularly important role in the use of technology and learning activities that are related to technology. School capacity in using digital devices refers to the number of digital devices used in schools, the school's ability to provide support, the availability of digital devices for teachers and students in their teaching and learning processes, and school practices for using digital devices to enhance the effectiveness of teaching and learning in the classroom (Castillo-Manzano et al. 2016; Janssen & Bodemer, 2013; OECD, 2018). Several countries are bringing a collection of digital devices into their schools and classrooms, for example, computers, information and communications technology equipment, laptops, tablets, computer-assisted learning programs, internet connectivity, interactive whiteboards, etc. (OECD, 2018; Sailer et al., 2021). Therefore, in the digital era, digital devices are necessary as pedagogical tools to facilitate teachers and students for several purposes, for example, to support teaching and learning processes, to enhance interaction and engagement among teachers, students, and others, and also to increase teaching and learning experiences (Stegmann, 2020).

Previous studies (Fraillon et al., 2019; OECD, 2020) revealed that students in schools that have a higher capacity to enhance teaching and learning using digital devices have higher scores in reading, and there is also a positive relationship between the availability of digital devices with internet connectivity and student experience. Furthermore, the necessity of technology-related school equipment links to the frequency of digital technology use in teaching and learning. However, researchers and policymakers are concerned about the effectiveness of school capacity for increasing teaching and learning by using digital devices (Dolan, 2016). To enrich student experiences, schools need to develop their practices in the effective use of digital devices and provide more support from principals, administrators, teachers, school staff, and scholars (McKnight et al., 2016; Means, 2010).

In particular, the school type is seen as the external variable that influences teaching efficacy and the number of hours per day teachers and students spent on digital devices (Badri et al., 2017). In detail, private schools charge higher tuition fees from parents and invest in better facilities than

public schools, including computers and internet networks (Kim et al., 2021). It explains the higher teacher capacity and student experience with digital devices in the classroom at the private school. Moreover, the school locations should be noticeable in terms of using digital devices. Compared with schools in rural areas, teachers in urban areas are also exposed to technology more in their teaching and are trained in technical skills better because of the better school support (Kanthawongs & Kanthawongs, 2013; Sailer et al., 2021). Thus, students in big cities have more opportunities to use digital devices for learning tasks.

However, there is limited empirical evidence on the level of the school capacity, how it affects student experience in using digital devices, and whether teacher capacity for digital devices in the classroom has an influence on the student experience. Thus, this study investigates the mentioned aspects of the student experience.

Teacher Capacity of Integrating Digital Devices Into the Classroom

Teacher capacity refers to the teacher's ability or skill to integrate digital technologies to increase teaching and learning processes in the classroom, and the use of digital devices to support the teacher's preparation and implementation of lessons and learning activities (Backfisch et al., 2021; Castaño Muñoz et al., 2021). Previous studies have suggested that teacher capacity involves teachers' needs, motivation, and resource availability for professional development on technology integration (Iliško et al., 2014; Li, 2014; Winter et al., 2021). In the teaching context, educational technologies should be adopted by teachers when teaching in the classroom. A variety of hardware (e.g., mobile phones, tablets) and software applications are utilized in specific processes of teaching (Beauchamp et al., 2015; Danniels et al., 2020; Dukuzumuremyi & Siklander, 2018). The 2013 International Computer and Information Literacy Study (ICILS; Fraillon et al., 2014) reported teachers' perspectives on the use of digital devices during their lessons. They use various digital tools, as follows: 30% of teachers used word processing and presentation software in most or all of their lessons, and 23% of teachers used computer-based information resources in their lessons (Fraillon et al., 2014). In ICILS 2018, when compared to 2013, 43% of teachers used word processing and presentation software, and 32% of them used computer-based information resources (Fraillon et al., 2019).

From 2013 to 2018, a higher number of teachers from participating countries frequently used computers during their daily teaching; however, a variety of technology usage in the classroom significantly varied between countries. The results revealed that digital technologies have spread into schools and become part of teaching and learning practices (Sailer et al., 2021). Moreover, the highest uses of digital technologies among teachers included searching for digital resources and communicating with the school community via email, blogs, or websites (Castaño Muñoz et al., 2021). Using digital devices in technology integration could be divided into two levels: quantitative and qualitative aspects. In terms of the quantitative aspects, it refers to the frequency of using technology integration or how often a specific digital technology is used when teaching is delivered in the classroom, whereas the qualitative one involves the effectiveness of the integration, for example, enhancing teaching quality (Fraillon et al., 2014; OCED, 2015). The quality of technology exploitation indicates teacher capacity in the implementation of educational technologies to scaffold students' learning (Backfisch et al., 2021; Endberg, 2019; Hamilton et al., 2016). Furthermore, studies by the OECD (2015) and the U. S. Department of Education (2017) found that teacher capacity to integrate technologies for classroom practice enabled students to engage in the digital society and support their learning.

As aforementioned, teacher capacity to integrate digital devices into their classroom practice in both quantitative and qualitative aspect is associated with student experience. The teacher capacity to use digital technology for their teaching has relationships with student experience of learning through PISA 2012 (OECD, 2015). However, data have changed continuously. Thus, a study that investigates relationships between the teacher capacity and student experience based on PISA 2018 should be conducted.

Student Experience in Using Digital Devices

In recent decades, there has been a growing use of digital technologies to transform the way people engage in activities, including learning activities. The effectiveness of student digital literacy skills can create positive social change as students would be better prepared to safely and efficiently live and interact in a digitally-based society (Erwin & Mohammed, 2022). In the school context, students use digital devices to make their learning efficient, to search for information, and to discuss with their teachers and peers virtually. However, schools need to provide digital devices that are useful to support teachers' needs in teaching and students' learning. Stefl-Mabry et al. (2010), in a case study of middle and high school students, found teachers used minimal technology in class and the slow, restrictive, and frequent crashing of school computers inhibited learning. This study indicated the role of teachers in integrating their classes with technology so that students may experience in learning with digital devices.

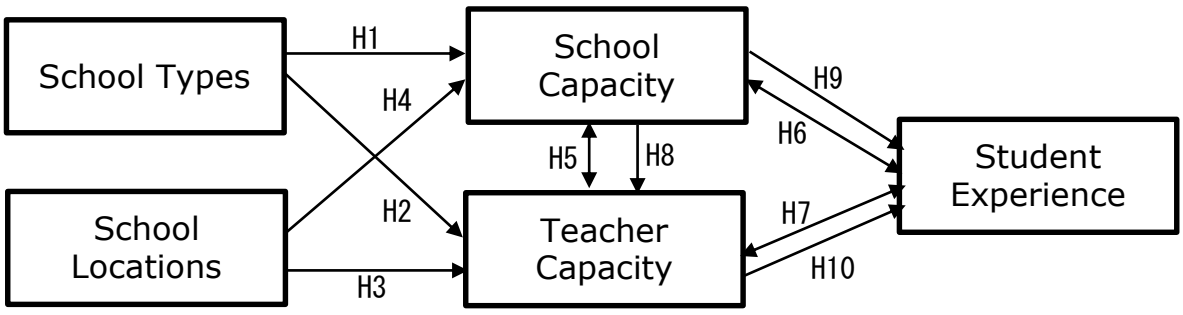
Several studies stated other benefits of using digital devices to increase student experience in learning at schools. The use of digital settings in the class, such as personal email, improved both the student experience and academic performance (Dart & Spratt, 2021). Digital game-based learning environments enable students to realize their own learning and encourage them to have experiences in problem-solving, reasoning, proving, and transfer (Gök & İnan, 2021). These learning strategies use technologies to engage students for effective learning.

Theoretical Framework

Based on the literature review and research questions, this research created the theoretical framework with the cause-effect model. The theoretical model is described in Figure 1.

Figure 1

The Research Framework of This Study



According to the theoretical framework of this study, ten research hypotheses were proposed based on Figure 1 in the context of using digital devices; namely H1 to H10. The hypotheses are specified as follows:

- H1 and H2: There are significant differences in school capacity and teacher capacity among school types in Thailand and Taiwan.
- H3 and H4: There are significant differences in school capacity and teacher capacity among school locations in Thailand and Taiwan.
- H5: There are positive correlations between school capacity and teacher capacity in Thailand and Taiwan.
- H6: There are positive correlations between school capacity and student experience in Thailand and Taiwan.
- H7: There are positive correlations between teacher capacity and student experience in Thailand and Taiwan.
- H8: School capacity has an effect on teacher capacity.
- H9 and H10: School capacity and teacher capacity have effects on student experience.

Materials and Methods

Research Design

This research used the questionnaire developed by PISA Governing Board (OECD, 2018). PISA 2018 results provide data about the use of digital devices in learning administered to principals and students in several countries. A standard survey of 482 principals and 2359 students in both Thailand and Taiwan was conducted in 2018. The main purpose of this survey was to understand the quality of using digital devices in the classroom based on various factors assessed in the survey in different locations ranging from urban and rural areas. Based on the PISA 2018 questionnaire, this comparative study employed the quantitative method to provide the whole picture of using digital devices in schools between Thailand and Taiwan (Cohen et al., 2007). Particularly, this study examined the level and relationship between school capacity, teacher capacity, and student experience in terms of using digital devices.

Participants

Thailand and Taiwan collected data were used to compare the use of digital devices in the learning context in these two countries. After deleting the missing data and matching the equal number between principals and students to conduct further data analysis, the results were based on data from 282 principals and 282 students in Thailand and 183 principals and 183 students in Taiwan. The participants are illustrated in Table 1.

Instruments

The PISA 2018 questionnaire provided school capacity, teacher capacity, and student experience as three selected variables in this research. The school capacity questionnaire has seven items on

Table 1

The Demographic Background of the Participants

Country	Principals	Students	School type		School location	
			Public	Private	Rural/suburban	Urban
Thailand	282	282	89.37%	10.63%	73.12%	26.88%
Taiwan	183	183	59.56%	40.44%	42.15%	57.85%

a four-point Likert scale, and the teacher capacity questionnaire has four items on a four-point Likert scale. In both school capacity and teacher capacity questionnaires, possible responses to each item were: *strongly disagree* (01), *disagree* (02), *agree* (03), and *strongly agree* (04). Moreover, the student experience questionnaire has ten items on a five-point Likert scale. Possible responses to each item were: *never or hardly ever* (01), *once or twice a month* (02), *once or twice a week* (03), *almost every day* (04), and *every day* (05) (see Appendix).

An exploratory factor analysis (EFA) based on the alpha factoring extraction method was also done to reveal the factor structure of 21 items in the school capacity, teacher capacity, and student experience questionnaires. The commonality values of both items 6 and 7 in the school capacity questionnaire are below .40 in Thailand and Taiwan, hence these two items were to be removed from further steps of factor analysis (Costello & Osborne, 2005). Moreover, item 6 of the student experience questionnaire was removed from further steps of factor analysis because of cross-loaded for this factor model. To confirm the new factor structure, a confirmatory factor analysis (CFA) based on the alpha factoring extraction method was done in Table 2.

As shown in Table 2, for the school capacity questionnaire, Cronbach's α was .93 in Thailand and .91 in Taiwan, showing an excellent level of internal reliability for the total questionnaire (Creswell, 2010). All 5 items formed the same factor, with loadings from .85 to .92 with 61.17% of the variance explained in Thailand, as well as factor loadings from .71 to .90 with 58.20% of the variance explained in Taiwan. It is a similar tendency to the teacher capacity questionnaire (Taherdoost et al., 2022). For the student experience questionnaire in Thailand, the first 4 items formed factor 1, with loadings from .64 to .79. The other 5 items formed factor 2, with loadings from .62 to .78. Factor 1 explained 30.61% of the variance and had a Cronbach's α .82. Factor 2 explained 25.52% of the variance and had a Cronbach's α .80. Moreover, the student experience questionnaire in Taiwan also presented a similar factor loading structure as in Thailand. The first 4 items formed factor 1 with loadings from .61 to .74. Additionally, the other 5 items formed factor 2 with loadings from .62 to .76. Factor 1 explained 28.75% of the variance and had a Cronbach's α .78, whereas factor 2 explained 22.49% of the variance and had a Cronbach's α .75. Factor 1 had items related to the students' experience in exploration, and factor 2 had items related to the students' experience in doing tasks.

Data Analysis

The quantitative method approach was utilized to analyze the data collected from the PISA 2018 questionnaire, which is available on the OECD PISA website. The data processing was done with SPSS Statistics version 2.5. Accordingly, the methods of data analysis were as follows: descriptive statistics, independent sample t-test, Pearson's correlation, and regression.

First, the mean (M) with the standard deviation (SD) was used to calculate the school capacity, teacher capacity, and student experience variables. Moreover, an independent sample *t*-test was

Table 2

Construct Validities and Reliabilities of the Thailand and Taiwan Models

Factors	Items	Thailand			Taiwan		
		λ	%	*α*	*λ*	%	*α*
SC	SC1	.85	61.17	.93	.90	58.20	.91
	SC2	.92			.85		
	SC3	.88			.88		
	SC4	.85			.82		
	SC5	.88			.71		
TC	TC1	.76	51.26	.86	.74	50.07	.85
	TC2	.84			.78		
	TC3	.67			.82		
	TC4	.81			.65		
SEE	SE1	.64	30.61	.82	.69	28.75	.78
	SE2	.70			.74		
	SE3	.79			.67		
	SE4	.66			.61		
SEDT	SE5	.63	25.52	.80	.64	22.49	.75
	SE7	.62			.62		
	SE8	.73			.65		
	SE9	.78			.76		
	SE10	.71			.73		

Note. *λ*: factor loading; %: percentage of variance, *α*: reliability coefficient, SC: School capacity, TC: Teacher capacity, SE: Student experience, SEE: Student experience in exploration, SEDT: Student experience in doing the tasks.

performed to test the school capacity and teacher capacity between the public school and the private school, as well as rural-suburban area and urban area.

Second, Pearson correlation coefficients were computed to determine the relationship between school capacity, teacher capacity, and student experience. The difference between the correlation coefficients was tested using the *z* test.

Third, single regression was used to examine the effect of the school capacity on the teacher capacity. Moreover, multiple regression analyses were conducted to analyze the effects of school capacity and teacher capacity on student experience and to determine which of the predictors consistently makes the largest contribution. This was accomplished by computing the proportion of variance that can be predicted by all but one of the predictors, and then determining the additional variance (the change in multiple R^2) that can be explained by the addition of remaining variables.

Results

Levels of School Capacity, Teacher Capacity, and Student Experience

To determine the first research question about levels of school capacity, teacher capacity, and

Table 3

Level of School Capacity, Teacher Capacity, and Student Experience in Using Digital Devices in Thailand and Taiwan

Factors	Thailand		Taiwan	
	M	*SD*	*M*	*SD*
School Capacity	2.80	.66	3.08	.55
Teacher Capacity	2.97	.54	3.00	.51
Student Experience	2.96	.86	1.77	.65

student experience in using digital devices in Thailand and Taiwan, descriptive statistics were used as shown in Table 3.

Overall factors in Thailand and Taiwan were perceived to pose a moderate level of concern. Regarding Thailand, the participants received the highest agreement about teacher capacity (M = 2.97, SD = .54), next was student experience (M = 2.96, SD = .86), and the lowest one was school capacity (M = 2.80, SD = .66). Regarding Taiwan, school capacity received the highest agreement (M = 3.08, SD = .55), followed by teacher capacity (M = 3.00, SD = .51), and the lowest agreement was student experience (M = 1.77, SD = .65). Interestingly, the school capacity and teacher capacity for using digital devices in Taiwan were higher than those for using digital devices in Thailand. In contrast, Thailand showed higher agreement on student experience than Taiwan.

School Capacity and Teacher Capacity Across School Types and School Locations

To examine the second question of whether there were any differences in school capacity and teacher capacity among school types and school locations in Thailand and Taiwan, the independent *t*-test is used, and the results are shown in Tables 4 and 5.

Table 4 illustrates that the school capacity of public schools in Thailand (M = 2.77, SD = .72) was lower than that of private schools (M = 2.82, SD = .74). Moreover, the teacher capacity in public schools in Thailand (M = 2.96, SD = .53) was lower than that in the private ones (M = 3.03, SD = .65). However, there were no significant differences in both school capacity and teacher capacity between Thailand's public and private schools (t = -.37, p = .83 and t = -.59, p = .11, respectively).

Differently, public schools always got lower scores than private schools in Thailand. In contrast, Taiwan's public schools showed higher scores than private schools on both school capacity (M = 3.14, SD = .61, and M = 3.10, SD = .55, respectively) and teacher capacity (M = 3.04, SD = .53, and M = 2.96, SD = .46, respectively). Additionally, both school capacity and teacher capacity did not show significant differences between public and private schools in Taiwan (t = .36, p = .16 and t = 1.15, p = .14, respectively). Because of no significant differences, the effect size of school capacity and teacher capacity in both Thailand and Taiwan were small, ranging from .07 to .17. However, the Cohen's d of Thailand was slightly larger than Taiwan.

Furthermore, to examine differences in school capacity and teacher capacity among school locations in Thailand and Taiwan, an independent *t*-test was conducted (Table 5).

Table 5 shows that the school capacity of the schools in rural-suburban areas in Thailand (M = 2.69, SD = .70) was lower than that in urban areas (M = 2.99, SD = .71). The teacher capacity in rural-suburban areas in Thailand (M = 2.90, SD = .50) also had a lower level than urban areas (M = 3.17, SD = .58). There was no significant difference in school capacity between schools located in Thailand's rural-suburban areas and urban areas (t = -3.07, p = .63); however, there was significantly difference on teacher capacity between Thailand's rural-suburban areas and urban areas (t = -3.67, p < .05).

Otherwise Thailand' schools in urban areas got the higher scores than rural-suburban areas whereas in Taiwan, score of school capacity in the rural-suburban areas showed as equal as the score derived from urban areas (M = 3.12, SD = .64, and M = 3.12, SD = .54, respectively). Moreover, teacher capacity in the rural-suburban areas (M = 3.08, SD = .53) had higher scores than the urban areas (M = 2.96, SD = .48). Both school capacity and teacher capacity did not show a statistically significant difference between schools in rural-suburban areas and urban areas in Taiwan (t = .04, p = .12 and t = 1.60, p = .42, respectively).

Additionally, the effect sizes of school capacity and teacher capacity in rural-suburban areas and urban areas in Taiwan showed small at .03 and .24 (Cohen, 1988), respectively, due to no significant differences. The effect size of school capacity in Thailand was small at .06 owning to no significant differences. Noticeably, although the effect size of teacher capacity was on medium side at .63, significant differences in teacher capacity between rural-suburban areas and urban areas in Thailand were found. It meant that differences in teacher capacity were medium between schools in rural-suburban areas and urban areas in Thailand.

Table 4

The Differences Between Public and Private Schools in School Capacity and Teacher Capacity in Thailand and Taiwan

Factors	School types	Thailand				Taiwan			
		M	*SD*	*t(sig)*	*d*	*M*	*SD*	*t(sig)*	*d*
School Capacity	Public	2.77	.72	-.37	.15	3.14	.61	.36	.07
	Private	2.82	.74	(.83)		3.10	.55	(.16)	
Teacher Capacity	Public	2.96	.53	-.59	.17	3.04	.53	1.15	.13
	Private	3.03	.65	(.11)		2.96	.46	(.14)	

Table 5

The Differences Between School Locations on School Capacity and Teacher Capacity in Thailand and Taiwan

Factors	School Locations	Thailand				Taiwan			
		M	*SD*	*t(sig)*	*d*	*M*	*SD*	*t(sig)*	*d*
School Capacity	Rural/suburban	2.69	.70	-3.07	.06	3.12	.64	.04	.03
	Urban	2.99	.71	(.63)		3.12	.54	(.12)	
Teacher Capacity	Rural/suburban	2.90	.50	-3.67*	.63	3.08	.53	1.60	.24
	Urban	3.17	.58			2.96	.48	(.42)	

Note. * = p < .05

The Relationships Between School Capacity, Teacher Capacity, and Student Experience

To determine the third research question about the relationships between school capacity, teacher capacity, and student experience, Pearson Correlation, Simple Regression, and Multiple Regression analyses were used.

As illustrated in Table 6, in Thailand, the result indicated a very strong positive correlation between school capacity and teacher capacity (r = .76). The correlation was statistically significant with p < .01. The correlation was statistically significant with p < .01. There were weak negative correlations between school capacity and student experience in using digital devices for exploration (r = -.10), school capacity and student experience in using digital devices for doing the tasks (r = -.10). However, there was no significant correlation between them. The other result revealed weak negative correlations between teacher capacity and student experience in using digital devices for exploration (r = -.08), teacher capacity and student experience in using digital devices for doing the tasks (r = -.07). However, there was no significant correlation between them. In addition, there was a strong positive correlation between student experience in exploration and student experience in doing tasks (r = .62). The correlation was statistically significant with p < .01.

Meanwhile, in Taiwan, the result indicated a very strong positive correlation between school capacity and teacher capacity (r = .75). There were weak positive correlations between school capacity and student experience in using digital devices for exploration (r = .05), school capacity and student experience in using digital devices for doing the tasks (r = .09). However, there was no significant correlation between them. The other result revealed weak positive correlations between teacher capacity and student experience for exploration (r = .06) and student experience for doing the tasks (r = .09). In addition, there was a moderately positive correlation between student experience in exploration and student experience in doing the tasks (r = .44). The correlation was statistically significant with p < .01.

The Effect of School Capacity on Teacher Capacity

To examine the third research question about the effect of school capacity on teacher capacity in Thailand and Taiwan, a single regression was used to collect the data. The result is shown in Table 7.

Table 6

The Correlations Between School Capacity, Teacher Capacity, and Student Experience in Thailand and Taiwan

Factors	Thailand				Taiwan			
	SC	TC	SEE	SEDT	SC	TC	SEE	SEDT
SC	1	.76**	-.10	-.10	1	.75**	.05	.09
TC		1	-.08	-.07		1	.06	.09
SEE			1	.62**			1	.44**
SEDT				1				1

Note. ** = p < .01. SC: School capacity, TC: Teacher capacity, SE: Student experience, SEE: Student experience in exploration, SEDT: Student experience in doing the tasks.

Table 7

The Predictor of Teacher Capacity

Country	Factors	Predictor	*B*	*SE* b	*β*	R^2	Δ R^2	*F*
Thailand	TC	SC	.62	.03	.76	.58	.58	381.33***
Taiwan	TC	SC	.69	.05	.75	.56	.56	227.57***

Note. B: Unstandardized Coefficients B; *SE b*: Unstandardized Coefficients Std. Error, *β*: Standardized Coefficients Beta, R^2: *R* Square, *Δ* R^2: Adjusted *R* Square, *** = $p < .001$. SC: School capacity, TC: Teacher capacity, SE: Student experience.

Table 8

The Predictor of Student Experience

Country	Factors	Predictor	*B*	*SE* b	*β*	R^2	Δ R^2	F (sig)
Thailand	SEE	SC	-.13	.12	-.09	.02	.01	1.36 (.26)
		TC	-.01	.15	-.01			
	SEDT	SC	-.19	.14	-.12	.02	.01	1.48 (.23)
		TC	.04	.18	.02			
Taiwan	SEE	SC	.01	.19	.01	.01	-.01	.35 (.71)
		TC	.11	.21	.06			
	SEDT	SC	.06	.13	.05	.01	-.01	.84 (.43)
		TC	.07	.14	.05			

Note. B: Unstandardized Coefficients B; *SE* b: Unstandardized Coefficients Std. Error, *β*: Standardized Coefficients Beta, R^2: *R* Square, Δ R^2: Adjusted *R* Square. SC: School capacity, TC: Teacher capacity, SE: Student experience, SEE: Student experience in exploration, SEDT: Student experience in doing the tasks.

As shown in Table 7, school capacity was a statistically significant predictor for teacher capacity in using digital devices in Thailand, $\beta = .76$, $p < .001$. The regression model explains 58% of the variation in teacher capacity that could be predicted by school capacity, $R^2 = .58$, adjusted $R^2 = .58$, $F(1, 280) = 381.33$, $p < .001$. Similarly, the percentage of teacher capacity explained by the school capacity in using digital devices in Taiwan is 56%, $R^2 = .56$, adjusted $R^2 = .56$, $F(1, 181) = 227.57$, $p < .001$. Moreover, school capacity was also a statistically significant predictor for teacher capacity in using digital devices, $\beta = .75$, $p < .001$. From the two countries, it could be concluded that higher school capacity for supporting digital devices would lead to higher teacher capacity for integrating digital devices into the lesson.

The Effect of School Capacity and Teacher Capacity on Student Experience

Besides the predictor of teacher capacity with a single regression, to examine the effect of school capacity and teacher capacity on the student experience in Thailand and Taiwan, a multiple regression was used to conduct the data. The results are shown in Table 8.

Table 8 shows that the percentages of the student experience in using digital devices for exploration in Thailand explained by the school capacity and teacher capacity was 2%, $R^2 = .02$, adjusted $R^2 = .01$, $F(1, 280) = 1.36$, $p = .26$. It meant both school capacity and teacher capacity were low predictions and not statistically significant predictors for student experience in using

digital devices for exploration. Moreover, experience in using digital devices for doing tasks was also explained by the school capacity and teacher capacity of only 2%, $R^2 = .02$, adjusted $R^2 = .01$, $F(1, 280) = 1.48$, $p = .23$. It meant both school capacity and teacher capacity in Thailand were low predictions and not statistically significant predictors for student experience in using digital devices for doing the task.

Furthermore, Taiwan's data showed the same tendency as Thailand's data. For both student experiences in using digital devices for exploration and for doing the tasks, the school capacity and teacher capacity had a low percentage of prediction at 1%, $R^2 = .01$, adjusted < $R^2 = .01$ with $p = .71$ and $p = .43$, respectively. It meant both school capacity and teacher capacity were not statistically significant predictors of student experience in Thailand.

Discussion

Comparing Levels of School Capacity, Teacher Capacity, and Student Experience in Thailand and Taiwan

The school capacity, teacher capacity, and student experience in Thailand and Taiwan were at a moderate level. The finding was aligned with Hero (2019); Goga & Grigoras (2016); Ghavifekr & Rosdy (2015) which revealed that even though students and teachers realized the importance of using digital devices for learning and teaching, schools have struggled to facilitate the use of digital devices. When school and teacher capacity are lower, they may be unable to integrate technologies into learning activities. It may impact student experience. Moreover, success of student experience and technology-based teaching and learning should be supported by teacher capacity with adequate preparation for digital devices and digital capacity.

Comparing School Capacity and Teacher Capacity Among School Types and School Locations in Thailand and Taiwan

According to school types, there were no differences in school capacity and teacher capacity between school types (i.e., public and private schools) in Thailand and Taiwan (H1 and H2 rejected). The findings were confirmed by Demissie et al. (2022); Johnson et al. (2016); Love et al. (2020); Ruggiero & Mong, (2015) which revealed that technology integration or digital device usage in the classroom was an external challenge on school capacity and teacher capacity in both public and private schools. Schools and teachers under government and private organizations needed to be trained and supported in their knowledge and skills for using digital devices as well as facilities for education. Since the lack took place in public and private schools in Thailand and Taiwan, school types were not an issue, leading to differences in two factors.

Regarding school locations, school capacity was not significantly different in two areas: rural-suburban areas and urban areas in Thailand and Taiwan (H3 and H4 rejected, except for the teacher capacity in Thailand). The finding was contrasted with studies such as Rundel & Salemink (2021); Wang (2013); Wang et al. (2022), which claimed that school capacity in using digital devices had differences among rural-suburban and urban areas. However, Thailand and Taiwan governments launched projects promoting the capacity of digital devices and technology integration in classrooms (Sinaga et al. 2022; The Nation Thailand, 2014; Wongfan, 2020); which might cause different findings in this study.

Likewise, in Thailand there was a difference in teacher capacity in the schools located in

different locations. This conformed to Guillén-Gámez & Mayorga-Fernández (2022); Kormos & Wisdom (2021); Wang et al. (2022), which claimed that teachers in rural schools tended to have errors in technology integration in the classroom because of lack of knowledge and skills for digital acquisition. Teacher training and support on technology and digital adoption should be provided to teachers in rural schools more intensively. However, in Taiwan, the teacher capacity in using digital devices was not different among school locations. This finding was opposite of previous studies (Liao et al., 2016; Wang, 2013) which claimed that teachers in rural areas faced gaps in digital inequality that were even wider.

Comparing Correlations Between School Capacity, Teacher Capacity, and Student Experience in Thailand and Taiwan

School capacity and teacher capacity in Thailand and Taiwan had very strong correlations (H5 accepted). It was approved that digital infrastructure was correlated to teacher capacity, as Gerick et al. (2017) and Drossel et al. (2017) reported in their studies. There was a different direction of correlations between school capacity and student experience in using digital devices for exploration, and school capacity and student experience in using digital devices for doing the tasks in Thailand and Taiwan. The result reported negative correlations between those variables in the Thailand context (H6 rejected), but positive correlations in the Taiwan context (H6 accepted). The findings in Thailand were in contrast to previous studies and the findings in Taiwan confirmed previous studies that school capacity enhanced student experience (Heck & Hallinger, 2009; Leithwood et al., 2010).

There was a different direction of correlations between teacher capacity and student experience in using digital devices for exploration and teacher capacity and student experience in using digital devices for doing the tasks in Thailand and Taiwan. The result reported negative correlations between those variables in the Thailand context (H7 rejected). In the Taiwan context, the correlations between those variables were positive (H7 accepted). The findings in Thailand were in contrast to previous studies and the findings in Taiwan support previous studies related to enhancing student learning through teacher capacity in integrating digital devices into instruction (Chen, 2016; Foulger & Jimenez-Silva, 2007; Lacina, 2004). Moreover, the correlation between student experience in exploration and student experience in doing tasks in Taiwan was higher than the result in Thailand.

Comparing Effects School Capacity and Teacher Capacity on Student Experience in Thailand and Taiwan

In terms of the effect of school capacity on teacher capacity in using digital devices for their teaching in the classroom in Thailand and Taiwan, they were quite similar in that school capacity impacted the teacher capacity in integrating digital devices into their teaching (H8 accepted). This result confirmed the results of previous research (Ertmer, 2015; Inan & Lowther, 2010; Kim et al., 2013; Petko, 2012; Sang et al., 2011). It could be explained that increasing infrastructure support from schools would help teachers who try to integrate digital technologies into their teaching methods would not be discouraged by the lack of devices. Moreover, having these technologies in their classroom would encourage the teachers, even if they do not feel comfortable using them. Therefore, the findings of this research emphasized that the sufficient infrastructure of digital devices from the school had an impact on teacher capacity to use them.

Meanwhile, the effect of school capacity and teacher capacity on the student experience showed similar tendencies between Thailand and Taiwan. However, the previous research found that the infrastructure of digital devices within the school affected the student experience more than the teacher capacity using digital devices (Sun et al., 2018). This study pointed out that both school capacity and teacher capacity presented low predictions and no significant predictors for student experience in using digital devices for their learning at school (H9, H10 rejected). This was an interesting finding that needs to be researched in the future. Studies should employ different methodologies to reveal the reasons behind this. Especially, qualitative methods could be of help. An assumption for this might be that students had a high level of experience using digital devices because of peer support, their technical skills, or their own interest in digital devices. As a meta-analysis, Jack and Higgins (2019) investigated the effects of student achievement and attitude toward their experience using digital devices. That meant other factors, besides the school capacity and teacher capacity, influencing the student experience of using digital devices should be considered.

Findings and discussions that show the differences in school capacity and teacher capacity toward student experiences between Thailand and Taiwan, reveal that these capacities in Taiwan are better than in Thailand. They are beneficial for the Thailand and Taiwan governments to promote the national policies on digital technologies in educational sectors in terms of the development of digital technology for education in Thailand and the decrease of digital divides between schools in rural and urban areas in Taiwan (Huang, 2015; Voratitipong et al., 2019). The Thailand government can learn about Taiwan's substantial success in the field of information technology and apply it to Thailand's educational context, while Taiwan can learn the situations involving school capacity, teacher capacity, and student experiences in different types and locations of schools in Thailand for proposing diverse perspectives to their schools, teachers, and students.

Conclusions and Implications

This comparative study aimed to determine the levels and relationships of school capacity, teacher capacity, and student experience and the differences between school location and school types on school capacity and teacher capacity in Thailand and Taiwan. The results indicated that both Thailand and Taiwan have similar moderate levels of school capacity, teacher capacity, and student experience. There was no difference between public and private schools in school capacity and teacher capacity in Thailand and Taiwan. There was no difference between rural and suburban and urban schools in both countries. School locations in Thailand had a difference in teacher capacity, whereas Taiwan did not.

Thailand and Taiwan's school capacities and teacher capacities were slightly different. There were negative correlations between school and teacher capacity and student experience in exploration and doing the task in the Thailand context, the correlations between those variables were positive in Taiwan context. They were quite similar in that school capacity impacted the teacher capacity to integrate digital devices into their teaching. Moreover, both Thailand and Taiwan's school capacity and teacher capacity presented did not significantly predict student experience using digital devices for their learning at school.

This study has some limitations that need to be addressed. The first limitation is the sample size. In Thailand, the number of school types (public school, private school) and school locations (rural-suburban area, urban area) is not equal. It could be explained that the data was collected

from PISA 2018 questionnaire, the authors cannot decide the sample size. Because of the small sample size of private schools and urban areas, it should be careful to generalize the results or explain about the differences between the testing groups. The second limitation is due to personal factors among the participants, including the financial support from the government for school infrastructure, teachers' teaching experience, teacher training for using digital devices in their teaching, student motivation, and students' digital skills. Because the relationship between school capacity, teacher capacity, and student experience was quite weak in this study, what other factors that influence student experience in using digital devices? This question needs to be explored in the future.

For the implications, the results showed that there are strong relationships between school capacity and teacher capacity, especially school capacity is a strong predictor of teacher capacity. Therefore, both Thailand and Taiwan schools are suggested to prepare enough digital devices that could enhance the teacher capacity to integrate digital devices into their teaching. Secondly, there are significant differences in teacher capacity of using digital devices in their teaching between rural areas and urban areas in Thailand. This result points out the important role of the government, which can promote policies or action plans to invest more in digital devices for schools in rural areas.

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Nguyen-Bich-Thy Bui is a PhD Candidate in the Department of Education and Human Potentials Development at National Dong Hwa University. She is also currently employed as a lecturer at the Ho Chi Minh City University of Education. Her research interests are Teacher Education, Language and Literacy Development, Learning and Teaching Methods, Technology Integrated Teaching and Learning. Contact at email: thybnb@hcmue.edu.vn
https://orcid.org/0000-0002-1511-7696

Romi Aswandi Sinaga is a PhD Candidate in the Department of Education and Human Potentials Development, National Dong Hwa University, Taiwan, with concentrations in curriculum and instruction since 2021. His research focuses on curriculum and instructional technology (i.e., TPACK, mobile learning, distance learning, and virtual reality) and language education (i.e., teaching English as a foreign language and bilingual education) in the Asia region. Contact at email: mionaga@gmail.com
https://orcid.org/0000-0002-3191-8928

Suphannee Arsairach is a PhD Candidate in the Department of Education and Human Potentials Development, National Dong Hwa University, Taiwan. She holds degrees of Master of Education in Teaching English as a Foreign Language and Master of Arts in English-Thai Translation. Her research focuses on English language education, teaching reading, and teacher professional development. Contact at email: suphannee.arsairach@gmail.com

Appendix: The Survey Items

Factors		Items
School Capacity	SC1	The number of digital devices connected to the Internet is sufficient.
	SC2	The school's Internet bandwidth or speed is sufficient.
	SC3	The number of digital devices for instruction is sufficient.
	SC4	Digital devices are sufficiently powerful in terms of computing capacity.
	SC5	The availability of adequate software is sufficient.
	SC6	An effective online learning support platform is available.
	SC7	The school has sufficient qualified technical assistant staff.
Teacher Capacity	TC1	Teachers have the skills to integrate digital devices into instruction.
	TC2	Teachers have sufficient time to prepare lessons integrating digital devices.
	TC3	Effective professional resources for teachers to learn to use digital devices.
	TC4	Teachers are provided with incentives to integrate digital devices in teaching activities.
Student Experience	SE1	Use digital devices at school: <Chatting on line> at school.
	SE2	Use digital devices at school: Using email at school.
	SE3	Use digital devices at school: Browsing the Internet for schoolwork.
	SE4	Use digital devices at school: Downloading, uploading or browsing material from the school's website (e.g. <intranet>).
	SE5	Use digital devices at school: Posting my work on the school's website.
	SE6	Use digital devices at school: Playing simulations at school.
	SE7	Use digital devices at school: Practicing and drilling, foreign language learning or math.
	SE8	Use digital devices at school: Doing homework on a school computer.
	SE9	Use digital devices at school: Using school computers for group work and communication with other students.
	SE10	Use digital devices at school: Using learning apps or learning websites.