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SPECIALTY SECTION

This article was submitted to
Teacher Education,
a section of the journal
Frontiers in Education

RECEIVED 02 April 2022

ACCEPTED 23 November 2022

PUBLISHED 19 December 2022

CITATION

Chen Y-J and Hsu L (2022) A comparative
research on teachers' knowledge in five
Asia-Pacific countries in the COVID-19
pandemic: The case of tourism and
hospitality education.
Front. Educ. 7:911182.
doi: 10.3389/feduc.2022.911182

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A comparative research on teachers' knowledge in five Asia-Pacific countries in the COVID-19 pandemic: The case of tourism and hospitality education

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The COVID-19 outbreak at the beginning of 2020 has drastically impacted almost every aspect of our daily life. Empirical evidence is lacking on which sector of knowledge in technology-enhanced teaching needs to be developed further for tourism and hospitality programs conducted online. The present study investigated teachers' technology, learners, pedagogy, academic discipline content knowledge, and context knowledge (TLPACK) in tourism and hospitality online education settings using comparative research methods. A total of 173 participants from five countries (Indonesia, Philippines, Taiwan, Thailand, and Vietnam) were surveyed online. The results revealed that, despite the fact that they were from different countries, all teachers reached a consensus that their knowledge about learners was the lowest during the online teaching period of the pandemic; meanwhile, they all ranked academic knowledge as the highest among these five variables except Vietnamese teachers who considered their knowledge on pedagogy to be the highest. Additionally, their TLPACK revealed significant differences in various countries and differences in academic discipline content knowledge are caused by the interaction of nationality and gender. This study overcomes a major limitation of previous studies on how the pandemic has affected educational praxis as the focus of previous research has been on the situation in a single country. Therefore, the present study's findings can serve as a reference for practitioners of tourism and hospitality online education in Asia-Pacific region when facing unprecedented and urgent changes of educational practices during and post the COVID-19 pandemic.

KEYWORDS

tourism and hospitality online education, TLPACK, COVID-19 pandemic, Asia-Pacific countries, Bayesian statistics

Introduction

The coronavirus disease of 2019 (known as COVID-19) refers to an infection caused by the severe acute respiratory syndrome coronavirus 2, a novel virus that is transmitted primarily through close contact between people (Carlson, 2020). The outbreak of COVID-19 in the beginning of 2020 has drastically impacted almost every aspect of our daily life, including the way the instruction activities are imparted (Aristovnik et al., 2020; Daniel, 2020). Because traditional face-to-face interactions in the educational context are believed to facilitate the spread of COVID-19 (Carlson, 2020; Aboagye et al., 2021), measures taken by governments related to health restriction, social distancing, and lockdowns have affected teaching and learning locally and globally (Matei, 2021). In order to comply with social distancing requirements, alternative work patterns had to be attempted (O'Leary, 2020; Papagiannidis et al., 2020). Efforts have been made by governments around the world to use distance learning through online learning to replace traditional classroom teaching so that education can continue without the risk of the virus being spread (Widodo et al., 2020). The domain of tourism and hospitality education has also been disrupted by COVID-19 in terms of the teaching and learning of the subject matter. Online learning was an alternative that was both feasible and effective for learning (Carlson, 2020; Dwivedi et al., 2020; Widodo et al., 2020). Hence, the adoption of information and communication technology (ICT) in instruction may soon become normalized (Carroll and Conboy, 2020; Dwivedi et al., 2020). Despite several institutions having planned to integrate technology with instruction, the pandemic has forced a sudden transition in instruction to be implemented without sufficient time for planning and preparation (Daniel, 2020; Chen and Hsu, 2021). Thus, empirical evidence is still lacking on which sector of knowledge in technology-enhanced teaching needs to be developed further for tourism and hospitality programs conducted online.

Previous academic research on teachers' knowledge of using technologies in teaching mainly adopted Mishra and Koehler's technological pedagogical content knowledge (TPACK) framework, whose limitations have been reported (i.e., Angeli and Valanides, 2009; Archambault and Barnett, 2010; Adam, 2016; Aydin et al., 2016; Baser et al., 2016; Peng and Daud, 2016), as well as other frameworks based on TPACK (i.e., Angeli and Valanides, 2009; Saad et al., 2012; Hsu and Chen, 2019). The present study adopted Hsu and Chen (2019) technology, learners, pedagogy, academic discipline content, and context knowledge (TLPACK) framework. Compared with TPACK, TLPACK has two additional variables – knowledge on learners and context – that diversify the framework, helping simultaneously detect various factors in teaching. This study investigates the TLPACK of teachers of tourism and hospitality programs at post-secondary levels in five countries – Indonesia, Philippines, Taiwan, Thailand, and Vietnam. It, thus, overcomes a major limitation of previous studies on how the pandemic has affected educational praxis, which have all focused on the situation in a single country (Aristovnik et al.,

2020). Moreover, there is scarce pertinent research on how tourism and hospitality education in Asia-pacific countries have been affected by the pandemic. To bridge this gap, two research questions were proposed:

RQ1: What is the TLPACK of tourism and hospitality teachers from Indonesia, Philippines, Taiwan, Thailand, and Vietnam during the COVID-19 pandemic?

RQ2: Do teachers of tourism and hospitality programs from these five countries have significantly different TLPACK?

The importance of addressing these two research questions for the academia is twofold; firstly, gaining understandings of hospitality and tourism teachers' TLPACK at higher education level from these five countries serves as a bedrock for future curriculum development of these fields. Secondly, exploring the similarities and differences for hospitality and tourism teachers' TLPACK may help program designers of these five countries learn from others' strong points to offset one's weakness. As for the industry, the employers would know how their prospective staff/employees were trained by teachers who had various TLPACK during the pandemic era. As such, those who were trained by teachers who lack proper knowledge in technology might possibly not acquire expected competence in their hospitality and tourism knowledge as well as their technology ability.

Literature review

Measures taken by higher education institutes in five Asian countries during the pandemic

Among the five countries compared in this study, Indonesia, the Philippines, and Thailand have implemented long-distance teaching policies. Indonesia discovered its first confirmed case of COVID-19 on 2 March 2020 and, since then, the number of cases has increased significantly, causing the Indonesian government to take action by reducing interactions between people to prevent the spread of the virus. The Ministry of Education and Culture issued Circular Letter No. 4 of 2020 to trigger full-scale distance learning nationwide (Aristovnik et al., 2020); a similar situation occurred in the Philippines and Thailand. The Philippines placed major cities under lockdown and schools of all levels were closed in mid-March of 2020; in other words, face-to-face education had to be replaced with online learning (Baticulon et al., 2021). Thailand's government announced a closure of all educational institutions on 17 March 2020 and schools at all levels were ordered to suspend classes. COVID-19 also has made educational institutes move instructional activities to virtual environments and online learning has become the norm, although students' and teachers'

limited Internet access remains a challenging issue (Vanpetch and Sattayathamrongthian, 2020).

However, the situation is different in Vietnam and Taiwan. When this survey was conducted, Vietnam's distance education policy was relatively short, while Taiwan's distance education only conducted exercises, i.e., drills for helping teachers to be familiar with online teaching. In Vietnam, the concept of learning can only take place at school (Tran et al., 2020). E-learning or online learning plays a peripheral role in the educational system because of the government's conservative attitude; nevertheless, the status of online learning has changed drastically because of the COVID-19 pandemic (Pham and Ho, 2020). In its early stage, the Ministry of Education and Training imposed the policy of 'suspending school, not stopping learning'; accordingly, traditional face-to-face education needed to be replaced by online education and the government provided immediate training to teachers. However, in Taiwan, due to its past experience of combatting the severe acute respiratory syndrome (SARS) epidemic in 2003, the Taiwanese government had been on very high alert, paying utmost attention to taking specific measures for border control, case identification, and containment. Because of these proactive measures, the pandemic has been effectively controlled in the country. As such, Taiwan is one of the few countries where schools are functioning normally (Cheng et al., 2020). During the pandemic, only one high school and a kindergarten were closed for 14 days because there were confirmed cases among their students. Even so, the Ministry of Education still advised that schools of all levels should be well-prepared for full-scale online education.

The reason these countries were selected was due to the fact that Indonesia, Philippines, Vietnam, and Thailand rank among the top 11 countries in Southeast Asia in terms of total population, constituting more than 86.10% of the population in this region. However, Vietnam, Indonesia and Philippines had the most death caused by the pandemic in this region because of the low vaccine coverage (Duong and Antriandarti, 2022) which pointed out the gravity of their preparation for online education. Given the fact that

some countries in Southeast Asia region may encounter greater challenges caused by the pandemic because of the fact that less resources in technology available to students for online learning (Liu and Gao, 2022), it is critical to have some understandings about how teachers of these countries cope with the pandemic and continued to carry on their teaching tasks. Among the studied countries, full or partial distance online teaching measures in response to COVID-19 were undertaken, except in Taiwan, where schools remained opened and only rehearsals for online education were conducted. Therefore, the findings from analyzing and comparing surveys would make valuable and significant contributions in extending our knowledge on the impact of COVID-19 in relation to teachers of tourism and hospitality programs in the five countries. The solutions adopted by educational institutes in these five countries during the COVID-19 pandemic are summarized as shown in Table 1.

Academic studies on tourism and hospitality teachers' technology, learners, pedagogy, academic discipline content knowledge, and context knowledge

Although the call for integrating technologies in pedagogy was made many years ago, successful implementation remains problematic if other factors such as teachers' readiness are not taken into consideration (Vrasidas, 2015). Teachers' readiness can be ensured with adequate understanding of their knowledge in both ICT and pedagogy and the provision of training and support when they need assistance (Ali, 2020). There is a need to extend our understanding on how instructors' content knowledge can be effectively delivered through technologies and how solutions to students' learning problems can be provided with proper pedagogies (Wang, 2019). TPACK is a theoretical framework developed by Mishra and Koehler (2006) based on Schulman's

TABLE 1 Solutions adopted by educational institutes in five countries during the COVID-19 pandemic.

Country	Implemented solutions	Adopted online learning platforms
Indonesia	The government suspended classes (K-12 and higher education) from mid-March 2020 and cancelled national examinations for grades 6, 9, and 12; distance learning was implemented in areas affected by the pandemic	Rumah Belajar, SPADA
Philippines	Since mid-March 2020, schools at all levels were suspended successively; schools would remain closed until August 24 of the same year and restarted. The subsequent courses adopted a hybrid combination of both physical and online lessons	DepEd Commons
Taiwan	Only two universities, one high school, and one kindergarten in Taiwan temporarily suspended classes for 14 days in accordance with the government's policy. The rest of the schools at all levels continued traditional face-to-face teaching	Microsoft Teams, e-Learning
Thailand	Since March 17, 2020, schools at all levels were ordered to suspend classes; schools were reopened in early July 2020 depending on the situation of the pandemic. If the situation in some areas had not alleviated, online learning continued	Zoom, Google Classroom, Digital Learning Centre, Edmodo
Vietnam	During March and April 2020, online education was adopted by schools at all levels until May	Taphuan, Microsoft Teams, and Google Classroom

MIC AISP database (2020, June). Available at: <https://mic.iii.org.tw/aisp/Reports.aspx?id=CDOC20200605005>.

(1986) pedagogical content knowledge constructs with an additional important factor of technology in the model, as educational technology has become necessary, particularly during the COVID-19 pandemic (Gao and Zhang, 2020; Mohamad Nasri et al., 2020). In order to apply technology effectively in the educational context, required knowledge will need to extend beyond just an awareness of functionality (Galanti et al., 2020). Despite the importance of TPACK, more empirical research is necessary, as most pertinent studies on teachers' TPACK are not subject-specific (Akyuz, 2018). In the field of tourism and hospitality education, exploration of teachers' TPACK remains limited. Wang's (2019) study shed light on this issue and adopted TPACK, verifying that the framework was suitable to measure the curriculum design of tourism and hospitality programs. The results of his research urged teachers of tourism and hospitality programs to apply TPACK to enhance their teaching of the subject matters. Pahrudin et al. (2021) also suggested that TPACK would be able to predict one's use of information, communication, and technology which confirmed the fact that TPACK can be used as a solid research framework. However, most previous studies of teachers' TPACK were conducted prior to the pandemic and hence lacked a consideration of knowledge about learners and contextual factors during this specific time (Angeli and Valanides, 2009; Saad et al., 2012; Hsu and Chen, 2019).

Since its advent, the limitations of TPACK have been discovered with the expeditious development of technology and other models that have been developed to fit in various contexts (Hsu and Chen, 2019). For example, in the context of mobile-learning, teachers' ICT knowledge is of great importance and the framework of ICT-TPACK was developed by Angeli and Valanides (2009). Similarly, Saad et al. (2012) proposed another framework, TPACK-XL, which extends the elements of ICT-TPACK and includes another vital issue of teacher education courses such as knowledge about learners and context. Since then, a more holistic picture about the competence with which teachers nowadays are supposed to be equipped under various conditions has attracted scholars' attention to address the advice of Hamida et al. (2016). An attempt to cover all the knowledge that teachers are expected to have harnessed led to the development of TPACK.

TLPACK was developed by Hsu and Chen (2019) on the foundation of TPACK, ICT-TPACK, TPACK-XL, or their connotations. Five major constructs comprise the framework of TLPACK, namely technology knowledge, learner knowledge, pedagogy knowledge, academic discipline content knowledge, and context knowledge. The TLPACK also comprises the respective interactions between any of these five constructs. It differentiates itself from others by emphasizing teachers' knowledge about the learners and learning context. Teachers should have sufficient knowledge about learners, particularly in the digital age, as the majority of today's students tend to be technologically savvy due to the affordances and functionality of ICT (Ali, 2018). This requirement has been exacerbated during the COVID-19 pandemic as not all students in various countries have the same level of digital literacy (Adedoyin and

Soykan, 2020). Many have been found to be insufficiently equipped with appropriate digital competence for online education (Dhawan, 2020). Lei and So's (2020) research further highlighted the difference between teachers' and students' perceptions toward online education. Therefore, understanding learners' characteristics and learning styles would be of great help to teachers while designing instructional activities and reconsidering the appropriateness of their pedagogy, which would impact learning effectiveness (Andrews and Tynan, 2015), particularly with the activities occur online (Benedetti, 2015). In addition, it is obvious that complete learning cannot be separated from the context (Bell et al., 2013) because every teaching situation has its own uniqueness. Therefore, teachers must be able to select suitable teaching strategies in accordance with the context to create and provide the best learning environment in order to assist learners to effectively learn the content (Klenner, 2015). The abovementioned problems have been addressed by Tseng et al. (2019). They discovered that, in the online education context, many teachers had problems related to understanding learners' prior knowledge and attracting their attention during online instruction; hence, the variable of context was included in this research framework. Thus, this present study uses the constructs of TLPACK rather than TPACK. Details about the constructs of TLPACK are as follows:

- Technology knowledge (TK): teachers' level of literacy in technology, which includes their ability to acquire information about the applicability of technologies and, more importantly, how to operate and integrate technology into teaching activities.
- Learners' knowledge (knowledge about learners) (LK): teachers' ability to identify and understand different learners' characteristics and make lesson plans (including teaching methods and instructional activities) accordingly.
- Pedagogy knowledge (PK): teachers' ability to plan, design, and administer classroom management skills to not only optimise their teaching practice but also deliver the target contents to learners effectively.
- Academic discipline content knowledge (AK): teachers' mastery of the domain knowledge of the contents they teach.
- Context knowledge (CK): teachers' ability to make any environment ideal for students' learning, including their ability to make necessary adjustments to the teaching environment in compliance with administrative regulations.

The five constructs of TLPACK and how they interact with each other are presented in Figure 1.

According to the above-mentioned literature, it is clear that during the course of the COVID-19 pandemic, the relevant educational strategies adopted by different countries have differed because of the varying levels of their epidemic situations. Education is transformed in terms of not only the use of technology, but also the teaching context, pedagogy, and the

adaptability of teachers and students. All these will lead to new challenges ahead; however, due to the urgency of this situation, pertinent research is still insufficient. In order to understand the performance of teachers in different countries during the COVID-19 pandemic and provide cross-country comparisons and references, this study selected five countries for investigation and formulated the following research hypotheses:

RH1: Teachers of tourism and hospitality programs have significantly different levels of TPACK during the COVID-19 pandemic.

RH2: Tourism and hospitality teachers' TPACK are significantly different across five countries during the COVID-19 pandemic.

Methodology

Research method and participants

This research adopts a comparative research method, which involves describing, identifying, analyzing, and explaining similarities and/or differences of a phenomenon in various domains or disciplines (e.g., socio-cultural and political; von Schnurbein et al., 2018). This method was employed because 'comparative research can show us ways that others have found out of dilemmas similar to our own—and their solutions may be borrowed and adapted to local conditions' (Esser, 2013, p. 113). The benefits of such a comparison might be that a better solution in delivering subject matters online can be generated through

learning and understanding on their own TPACK and their counterparts in other countries.

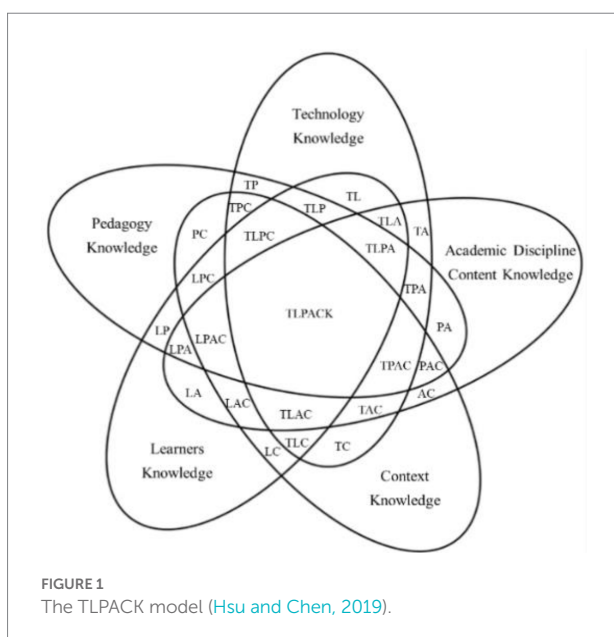
The research was designed and compiled in Taiwan; the questionnaire was then distributed with the help of doctoral students from Indonesia, Philippines, Taiwan, Thailand, and Vietnam who had come to study in Taiwan. Due to the difficulty of collecting cross-national data and the limited number of teachers in the University of Hospitality and Tourism, the sampling method adopted in this study was purposive sampling. In order to keep sampling technique of this present study scientifically rigorous, participants had to meet the following three conditions for inclusion in the study: (1) be engaged in full-time teaching in the hospitality and tourism department of colleges or universities in his or her countries; (2) cooperate with local government policies to actually carry out remote teaching implementation or drills during the COVID-19 pandemic; and (3) participate in this survey voluntarily and with informed consent. After doing online searching on the number of current teachers of hospitality and tourism programs in these five countries, a total of 223 invitation emails were sent out to in-service teachers before the onset of formal survey and 193 replied with their consents. Among these respondents, 9 of them were partial out because of they did not fit in the abovementioned three conditions. In the end, 184 teachers were the target samples of formal online survey.

The survey was conducted over 3 weeks, from September 28, 2020 to October 19, 2020 and Google Forms were used to distribute online questionnaires. Respondents had to fill in each question completely and submit it independently before it could be used as the preliminary sample of this research. After collecting the questionnaires from various countries, the data were cleaned up and the invalid questionnaires that were over-repetitively answered were deleted. The validity rate was 96.1%. In the final sample, the total number of all valid responses was 173, comprising responses from teachers of hospitality and tourism programs in Indonesia ($n=24$), Philippines ($n=41$), Taiwan ($n=37$), Thailand ($n=35$), and Vietnam ($n=36$).

Measurements and data analysis

The TPACK scale compiled by Hsu and Chen (2019) was adapted and used as the survey tool after its reliability and validity were examined. In preparing the scale, the researchers first compiled the questionnaire in English and then invited native speakers to translate it to the national languages of the participating countries. The translated questionnaires were retranslated and confirmed by students studying abroad in the target countries to ensure that the scales were semantically accurate and uniform. In terms of text, participants in Indonesia, Philippines, Taiwan, Thailand, and Vietnam used Bahasa Indonesia, English, Traditional Chinese, Thai, and Vietnamese, respectively, to fill in the questionnaires.

Measurements of teachers' TPACK were conducted through self-report surveys. Participants provided responses to



all the question items on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree, see [Appendix](#) for details). The theoretical dimension indicators of TLPACK were revised according to the results of the Bartlett's test of sphericity, the Kayser-Meyer-Olkin test, and exploratory factor analysis, covering a total of five dimensions and 35 indicators. The factor load of each indicator was above 0.35, and the total explained variation of the whole scale reached 60.43%. The reliability and validity of the TLPACK indicators were examined and the results are shown in [Table 2](#).

After the reliability and validity were assured, the research hypotheses had to be examined. Frequentist statistics such as one-way and two-way analysis of variance (ANOVA) were performed to answer the research questions. The results were cross-examined with Bayesian statistics and the level of significance was set at 0.05. Both the frequentist and Bayesian statistics were performed using SPSS 25.

Results

The first research question – ‘What is the TLPACK of tourism and hospitality teachers from Indonesia, Philippines, Taiwan, Thailand, and Vietnam during the COVID-19 pandemic?’ – was answered using the mean scores and standard deviations of two variables – knowledge of learners and context – of TLPACK teachers from these countries. Detailed information is presented in [Table 3](#).

The information conveyed in [Table 3](#) indicates that RH 1 is partially supported, revealing that among these five countries, data from Philippines, Taiwan, and Thailand were significant. All these countries shared some similarities in the ranking of TLPACK; namely, the lowest was learners' knowledge. Despite the fact that each country has various systems of teacher training/support programs or curriculum designs for teachers of tourism and hospitality programs, similar situations were discovered by these findings. One thing common among the tourism and hospitality teachers of these five countries is that they all ranked academic knowledge as the highest among these five variables except

Vietnamese teachers who considered their knowledge on pedagogy to be the highest. As for what teachers considered they lacked the most, all of them agreed on learners' knowledge. Context knowledge was ranked second lowest by all except Indonesian teachers who deemed that their pedagogical knowledge was the second lowest.

Such a finding indicates that teachers of tourism and hospitality programs in these countries face a similar challenge when required to impart online education, which is their limited understanding of their students. Present-day college students are considered digital natives ([Prensky, 2001](#)) as they have been raised with technology and have better digital competence than do those of previous generations ([Thompson, 2013](#)). There are some remarkable features of digital natives that differentiate them from other generations ([Akçayır et al., 2016](#)) including the way they learn things ([Bennett et al., 2008](#)). Therefore, teachers should acquire pertinent knowledge on these learners to successfully implement their lesson plans. Additionally, the pandemic has negatively impacted students' psychological stress, causing anxiety, loneliness, burnout, and helplessness, which have hindered their focus on studies ([Baticulon et al., 2021](#)); therefore, teachers' knowledge about learners is now more important than ever before.

The second research question – ‘Do teachers of tourism and hospitality programs from these five countries have significantly different TLPACK?’ – was answered using ANOVA. The results revealed that participants of different nationalities showed significant differences in their TLPACK ($F_{TK}=2.49, p<0.05, F_{LK}=3.29, p<0.05, F_{PK}=3.10, p<0.05, F_{AK}=6.24, p<0.01, F_{CK}=4.47, p<0.01$) and hence RH2 was accepted. Post-hoc Tukey's honest significance test found that Indonesian teachers' learners' knowledge was significantly higher than that of teachers in Taiwan, and Filipino teachers' pedagogical knowledge was significantly higher than that of Taiwanese teachers. Furthermore, teachers in Indonesia and Philippines had higher scores in academic discipline content knowledge than did their Vietnamese counterparts. As for context knowledge, teachers in Indonesia and Philippines had significantly higher scores than those of teachers in Taiwan. Detailed information is presented in [Table 4](#).

We further cross-examined the results of frequentist statistics with Bayesian statistics; the results of Bayesian analysis on teachers' technological ($BF_T=0.01$), learners' ($BF_L=0.05$), pedagogical ($BF_P=0.04$), and context ($BF_C=0.45$) knowledge were in line with the results of ANOVA. Specifically, the probability of occurrence of the null and the alternate hypothesis is similar. However, in terms of academic discipline content knowledge, the results of Bayesian and frequentist analyses are contradictory. ANOVA reported significant differences among teachers' content knowledge in these five countries but Bayes factor indicated that the probability of the null hypothesis is about 10 times higher than that of the alternate hypothesis ($BF_A=10.22$), which implied that no significant difference should be revealed. In order to solve this issue, a two-way ANOVA was administered to reveal whether the underlying reason for

TABLE 2 The test results of the reliability and validity of the TLPACK indicators.

	TK	LK	PK	AK	CK
Number of indicators	9	7	4	10	5
Cronbach's alpha	0.91	0.93	0.85	0.92	0.87
Composite reliability	0.91	0.93	0.85	0.92	0.87
Average variance extracted	0.54	0.64	0.60	0.57	0.57
Maximum shared variance	0.40	0.54	0.54	0.44	0.40

TABLE 3 Mean scores and standard deviations of TLPACK teachers from different countries.

	Indonesia <i>n</i> = 24		Philippines <i>n</i> = 41		Taiwan <i>n</i> = 37		Thailand <i>n</i> = 35		Vietnam <i>n</i> = 36	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Technology knowledge	4.30	0.62	4.20	0.59	4.11	0.63	3.89	0.53	3.89	0.86
Learners' knowledge	4.16	0.65	3.89	0.88	3.44	1.06	3.85	0.57	3.71	0.68
Pedagogy knowledge	4.27	0.70	4.29	0.57	3.80	0.79	4.11	0.60	4.04	0.72
Academic discipline content knowledge	4.43	0.62	4.50	0.46	4.15	0.48	4.17	0.50	3.91	0.75
Context knowledge	4.33	0.58	4.13	0.82	3.64	0.70	3.86	0.67	3.83	0.68
<i>F</i>	0.57		4.38***		5.87***		2.43*		0.95	

* $p < 0.05$, *** $p < 0.001$.

TABLE 4 Results of ANOVA and Bayesian statistics of TLPACK teachers from different countries.

TLPACK	<i>F</i>	<i>Post hoc</i>	Bayesian factor
Technology knowledge	2.49*	No significant difference found	0.01 (H1 > H0)
Learners' knowledge	3.29*	Indonesia > Philippines	0.05 (H1 > H0)
Pedagogy knowledge	3.10*	Philippines > Taiwan	0.04 (H1 > H0)
Academic discipline content knowledge	6.24***	Indonesia, Philippines > Vietnam	10.22 (H0 > H1)
Context knowledge	4.47**	Indonesia, Philippines > Vietnam	0.45 (H1 > H0)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

A Bayesian factor between 0.01 and 0.03 represents very strong evidence for H1; between 0.03 and 0.10 represents strong evidence for H1; between 0.33 and 1.00 represents anecdotal evidence for H1; between 10 and 30 represents strong evidence for H0 (Jeffreys, 1961; Lee and Wagenmakers, 2013). H1 stands for the alternative hypothesis whereas H0 stands for the null hypothesis.

differences in academic discipline content knowledge were caused by the interaction of country and gender. The two-way ANOVA ($F_A = 3.11$, $p < 0.05$, $\eta^2 = 0.07$) indicated that differences in academic discipline content knowledge are caused by the interaction of nationality and gender. Detailed information is presented in Table 5.

In terms of the critical situation of online tourism and hospitality education in these five Asian countries, teachers' TLPACK was found to be significantly different across borders, as revealed by the results of the ANOVA. Before the pandemic, conventional education was imparted at schools in Indonesia (Yulianti, 2015), which the COVID-19 pandemic changed in no time. Teachers in Indonesia worried about their competence in technology and their classroom management skills in virtual environments (Aristovnik et al., 2020). Nevertheless, the results of this study reported that tourism and hospitality teachers in Indonesia had greater technology knowledge than did their counterparts from the other four countries. This result was supported by Bayesian statistics. Similar outcomes were also observed with regard to learners' and pedagogy knowledge,

wherein significant results of frequentist statistics corresponded with Bayesian statistics. However, the results of academic discipline content knowledge differed, as frequentist ANOVA reported a significant difference while Bayesian statistics indicated no such significant difference. ANOVA reported that teachers in Indonesia and Philippines scored higher than did their Vietnamese peers. A two-way ANOVA was performed to identify a sound explanation. Results revealed that the interaction of nationality and gender may be the reason, as these are two salient social categories that often interact to influence human behaviors (Kumar et al., 2021). In the current research context, online teaching in Vietnamese universities during the COVID-19 period was found to be affected by the interaction of gender, which was significantly lower in comparison to the teachers' self-assessment in Indonesia and Philippines with regard to academic discipline content knowledge. Future research should, thus, take gender into account to extend our current understanding on this perspective.

Discussions, implications, and limitations

COVID-19 has changed our lifestyles drastically, which has forced tourism stakeholders to reconsider several aspects of their existence and functioning (Sigala, 2020), including tourism and hospitality education. As the 'new normal' becomes the norm (Davison, 2020), technology-driven practices have begun to play a leading role in not only work (Carroll and Conboy, 2020) but also educational praxis. In the post-pandemic context, online learning arrangements will likely leave a lasting trace and accelerate the online learning undertaken by higher education institutes (Daniel, 2020). COVID-19 has elucidated the vulnerability of the current educational practices and, hence, a more flexible and resilient system should be developed in the future (Ali, 2020). The post-COVID landscape of higher education (tourism and hospitality education included) will rely greatly on online and distance learning. However, many issues still need to be resolved regarding the implementation of online education; for example,

TABLE 5 Results of the two-way ANOVA of academic discipline content knowledge with variables of country and gender.

	df	SS	MS	F
Intercept	1	2782.99	2782.99	9093.98***
Country	4	9.57	2.39	7.82***
Gender	1	0.04	0.04	0.14
Country*	4	3.80	0.95	3.11*
Gender				
Error	163	49.88	0.31	
Corrected Total	172	61.68		

* $p < 0.05$, *** $p < 0.001$.

because the evaluation and assessment of online education are not always adequate, developing an appropriate mechanism to monitor the quality of online education seems critical (Vlachopoulos, 2020). With respect to teachers' readiness, their knowledge on how to successfully impart online education has attracted extensive attention in the academic community. Jin and Harp (2020) argued that when educational technology training programs are implemented, it would be wise to understand teachers' prior knowledge on technology and their TPACK confidence to nurture their TPACK knowledge because course design alone will not foster the development of teachers' TPACK. Moreover, TPACK, ICT-TPCK, and TPACK-XL all shed light on the various competencies that present-day teachers should possess. TLPACK is the holistic framework acknowledged to cover another two important dimensions, learners' knowledge and context knowledge, given the fact that these two have drastically different influences during the COVID-19 pandemic.

As TLPACK is a newly developed concept, only one empirical study (Chen and Hsu, 2021) has been conducted based on it. This particular study indicated that teachers' TLPACK were significantly different before and amid the COVID. Furthermore, this study unveiled the relationship between Teachers' learner knowledge (i.e., knowledge about the learners) and pedagogy knowledge was the strongest, which were not in line with the findings of this research. Possible reason may be the cultural issue as reported in the aforementioned section on two-way ANOVA.

The results of this study have the following implications. Regarding its practical implications, this study reveals that teachers of tourism and hospitality programs in these countries all believed that they lack learners' knowledge the most; in other words, online hospitality and tourism education during the COVID-19 pandemic highlighted the fact that it is necessary to provide teachers of tourism and hospitality programs with training on understanding digital-native learners. Unlike teachers at k-12 levels, most teachers in higher education institute did not receive pertinent trainings on understanding learners in their post-graduate or doctoral studies; hence, it is natural that they did not feel they equipped with sufficient knowledge about their students, particularly

these college students were Tech-savvy Generation Z (Persada et al., 2021) or even younger who are different from their teachers in many aspects such as they ways they rely on technology in and out of the classroom (Hicks, 2011). A call to gain understandings on these students because of their special nature has been made to educational institutions (Giray, 2022) and the new normal of post-pandemic education will possibly orient toward 'a personalized (virtually), open, continuous, and flexible education model' (Sigala, 2021, p. 921–922) which fits learners with more diverse learning styles better.

As all the courses were moved to the virtual environment because of the pandemic, the teachers also believed that their knowledge about this unprecedented learning context was foreign to them; therefore, information about how to effectively deliver the target content through online avenues will be necessary for these teachers. Higher education institutes around the world are combating COVID-19 by means of online education; however, teachers in different countries have various levels of TLPACK. Thus, educators and educational administrators should collaborate globally and develop a standard pedagogical practice for online education. Scholars from technologically advanced countries can take the responsibility of offering online training programs through Coursera or other massive open online course platforms for teachers in need, based on the most updated and recently researched TLPACK results. By doing this, it will be easier to help teachers in different countries to effectively impart online education. As for academic implications, this study is the first empirical study to explore teachers' TLPACK in the online hospitality and tourism education in five most populated South Asian countries, revealing that significant differences do exist in terms of their TLPACK. Furthermore, different results of frequentist statistics and Bayesian statistics led to the findings regarding the interaction of nationality and gender. Further studies may shed light on this issue in greater detail.

The major limitations of this study are three fold: First, because it was conducted in October 2020, approximately 6 months had passed since the start of online teaching in response to COVID-19 across the world. Hence, the results may not be timely in response to the pandemic. Second, Taiwan was one of the few countries where online education was not urgently required when this research was conducted. As such, it is plausible that the learners', pedagogy, and context knowledge of online teaching by tourism and hospitality teachers in Taiwan during the COVID-19 pandemic are significantly lower than that of their peers in other Southeast Asian countries. Third, because of the fact that limited connections to help the research team to acquire data from teachers of other countries, this survey focused on tourism and hospitality teachers at the post-secondary level in five Southeast Asian countries; hence, the number of participants was limited, which may hinder the generalizability of the findings. Future research may include

participants from more diverse cultural backgrounds to cross examine the results of this present research.

Conclusion

COVID-19 has changed our daily life routines in several spheres, including tourism and hospitality education. Online education has replaced traditional face-to-face education in order to prevent the further spread of the virus. Under such an unprecedented circumstance, tourism and hospitality teachers' related knowledge about the implementation of online education became a focus for us. This study adopted TLPACK as the research instrument used to survey teachers of tourism and hospitality programs at the higher education level in five south Asian countries. The results reveal that all the participants considered that their learners' knowledge was the lowest within the online education context. After performing an ANOVA to compare tourism and hospitality teachers in these five countries, teachers from Indonesia were found to have the highest TLPACK among all participants, particularly in learners' knowledge, academic discipline content knowledge, and context knowledge. However, the results of frequentist and Bayesian statistics are contradictory in terms of academic discipline content knowledge. A two-way ANOVA revealed that this may be due to the interaction of nationality and gender.

To sum up, this study highlighted that it takes time and experience to adapt to the emergency online teaching requirements caused by situations like the COVID-19 pandemic, which are difficult to predict. The following are the recommendations: (1) various teaching situations should be included in teacher training programs in order to ensure that teachers know how to effectively respond to different emergencies; (2) for emergencies, adequate support and education training should be provided to incumbent teachers to reduce the adaptation period; (3) because online education will be affected by the social context, it is important to be prepared.

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Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

Y-JC organized the conception of this manuscript and finalized the text. LH supervised the writing and statistical analysis. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2022.911182/full#supplementary-material>

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