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Exploring teachers' technology acceptance during COVID-19 pandemic: A systematic review (2020-2022)

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ABSTRACT

The emergence of novel coronavirus disease 2019 (COVID-19) caused teachers shifting from conventional mode to emergency remote teaching with technology use. Nevertheless, review of technology acceptance level of teachers towards technology is limited, despite its significance in sustaining education during the pandemic. This study aimed to explore teachers' technology acceptance level and factors affecting their intentions of accepting technology in the COVID-19 pandemic. With the adherence of preferred reporting items for systematic review and meta-analyses (PRISMA) 2020 statement and list of inclusion and exclusion criteria, 22 articles which were published from 2020 to present and related to the research focus had been identified from Scopus and Web of Science databases. The findings depicted that most teachers hold high acceptance level towards using technology to deliver lessons during the COVID-19. There were five key factors affecting teachers' intentions in accepting technology, namely: i) Perceived usefulness; ii) Perceived ease-of-use; iii) Attitude; iv) Social influence; and v) Facilitating conditions. This study has provided insight to stakeholders on teachers' technology acceptance during the pandemic. Future studies are recommended to conduct systematic reviews on technology acceptance from students' perspective by identifying published papers from more databases such as ERIC and Google Scholar.

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1. INTRODUCTION

Technology has been developing rapidly over time until it becomes an indivisible component in our daily life, including teaching and learning as well. In the 21st century, integration of technology in the classroom has become prevalent to enhance teachers' content delivery as well as pupils' understanding of the content. This is aligned with the fourth goal of sustainable development goals (SDG4) initiated by The United Nations Educational, Scientific and Cultural Organization (UNESCO). According to Rosa [1], the fourth goal of sustainable development goals concerns "universal coverage of quality education from pre-school through at least secondary education, and then on to more advanced skills training." This vision could become a reality with the facilitation of salient new technologies in the current era of globalization as previous researcher [1] mentioned that technology plays a vital part in providing opportunities and possibilities to warrant everyone receives comprehensive and unbiased quality education and opportunities for lifelong learning which corresponds to the aim of SDG4.

The epidemic of novel coronavirus disease 2019 (COVID-19) had been emerged from the province of Wuhan in China in 2019 before emerging in other parts of the world rapidly. It became worse as a pandemic in the beginning of 2020 resulted in a swift and drastic educational system disruption at a global context. One of the initiatives to reduce the dispersal of COVID-19 among students had prompted the wide-spread closure of educational institutions [2]. Consequently, almost all countries worldwide that were plagued with COVID-19 had to change from the conventional teaching mode to a fully online teaching mode instantly. In other words, technology had become the teachers' forced choice regardless their technology competency and acceptance level to ensure the continuance of students' learning during the pandemic.

After almost two years, most countries had shifted from pandemic to a more manage-able endemic mode, and various studies on the adoption of technology during the pandemic were conducted by researchers in educational field. Nevertheless, systematic reviews on teachers' technology acceptance are lacking, thereby leaving a gap. Therefore, teachers' acceptance towards technology during COVID-19 pandemic is worth investigating to predict the future educational trends and identify their intentions to accept and integrate technology in their post-COVID-19 teaching and learning sessions for sustainable education in alignment with SDG4 [3]. This study was intended to explore teachers' technology acceptance level and factors affecting them towards accepting use of technology for emergency remote teaching.

2. LITERATURE REVIEW

2.1. Emergency remote teaching

The existence of COVID-19 virus had shifted face-to-face to emergency remote teaching mode. However, it differs from the normal online teaching which exists prior to the COVID-19 pandemic. Wen and Tan [4] further elaborated on this in which such transition serves a different purpose compared to the existing online teaching, in which the emergency remote teaching tends to be served as a provisional alteration of instructional delivery mode because of inevitable circumstances such as emergency and crisis [5]. It is different with usual online teaching mode such as blended learning and flipped classroom approach which is well-planned and meaningfully contrast to deal with certain crisis.

In conjunction with approximately 200 country-wide educational institutions' closure which impacted approximately 1.5 billion learners due to COVID-19 pandemic [6], teachers transformed their traditional to distanced-learning environments by employing emergency remote teaching with the adoption of technological tools as an effort to provide a harmless and comprehensive learning environment for all learners as aspired by UNICEF [6]. However, the COVID-19 had uncovered a gap which is teachers might not be ready for teaching online without adequate training and time for preparation [7].

2.2. Educational technology

Technology is not a novel element in the education field. The first film for instructional use was published in 1910 [8]. In this 21st century, education 4.0 which involves convergence of humans and technology is introduced in conjunction with industrial revolution 4.0 to create new opportunities creatively and innovatively [9]. Thus, educational technology is crucial in enhancing students' learning by utilizing tools which can assist them to obtain knowledge, improve their verbal skills and develop their abilities in solving problems as well [10].

During the COVID-19 pandemic, educational technology was heavily relied by teachers to deliver content knowledge to learners and communicate with them as well. Teachers utilized a variety of websites and applications including social media applications, learning management systems (LMS), as well as game-based learning tools to sustain pupils' motivation and engagement in learning despite the change of learning locality due to the school closure. Nonetheless, it was because teachers had no other choice other than adopting educational technology, regardless their information technology (IT) competency level and experience in handling online learning tools.

2.3. Technology acceptance

It is significant to explore how teachers interpret and accept and adopt technology in their workforce. Technology acceptance means to what extent a user is willing to adopt technology for accomplishing those jobs which it is devised for support [11]. Despite the provision of sufficient facilitating resources and infrastructures, the query arises of how teachers conduct engaging lessons with the use of educational technology. There were a few models which are commonly used to elucidate teachers' acceptance of technological environment in educational settings, they are: i) Technology acceptance model (TAM); ii) Unified theory of acceptance and use of technology (UTAUT); and iii) Theory of planned behavior (TPB).

TAM was developed by Davis [12] in 1985 based on the theory of reasoned action. This model is still considered as one of the most popular technology acceptance models at present. In the finalized version of TAM, there are two mediating variables that explain the association between external variables, behavior intention and usage behavior of technology users namely perceived usefulness (PU) and perceived ease of use (PEU) [13] as illustrated in Figure 1.

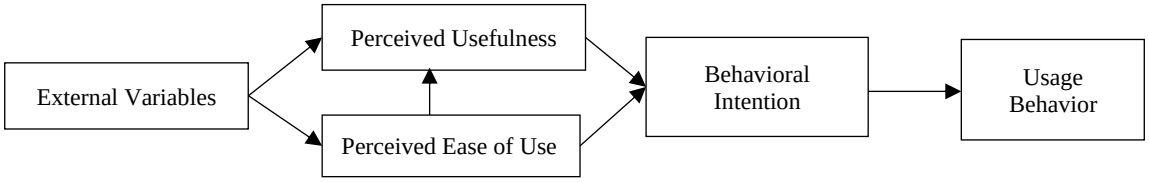

Figure 1. Technological acceptance model [12]

To put in other words, users of a particular technological tool will portray a favorable attitude towards technology if they perceive it beneficial for them and easy to use. TAM was further extended and elaborated by previous researchers [14], [15] to form TAM 2 and TAM 3 respectively, it is noticeable that TAM 1 model is still widely adopted by educational researchers to study users' technology acceptance because of its simplicity and understandability. UTAUT model was devised by Venkatesh *et al.* [16] in 2003 to introduce eight main constructs that explain the users' technology acceptance and usage intention as shown in Figure 2.

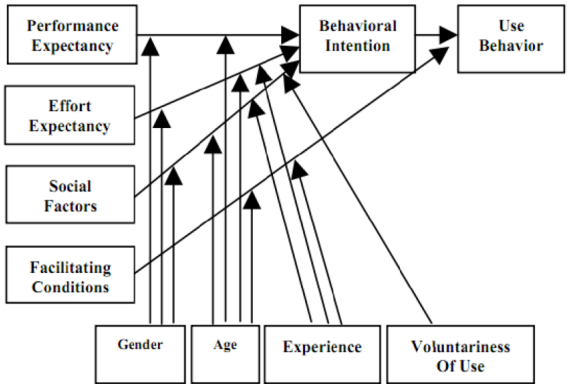

Figure 2. Unified theory of acceptance and use of technology model [16]

Based on Figure 2, among the eight constructs, there are four key determinants: i) Performance expectancy (PE); ii) Effort expectancy (EE); iii) Social influence (SI); and iv) Facilitating conditions (FC) which impact technology users' behavioral intention and behavior directly, and four intermediate individual variation variables (gender, age, experience, voluntariness of use) that moderate the mentioned key determinants in accepting technology. UTAUT was extended to UTAUT 2 by dropping voluntariness of use as a moderating variable and inserting new constructs (hedonic motivation, price value, habit) into the model [17].

TPB is one of the social-psychological theories which was founded by Ajzen [18] is extensively used in numerous fields, but it is also applicable in explaining technology users' behavior for educational purposes. Page *et al.* [19] elaborated that TPB describes human's process of behavioral decision-making to identify and predict their behavior, advocating that an individual's will may successfully control human behaviors. TPB proposed three factors that affect users' behavioral intentions as shown in Figure 3.

Based on the theories and models, it is concluded that there are two common characteristics that are shown in TAM, UTAUT, and TPB models. Firstly, the behavioral intention and attitude of a user of technology will bring impact towards his or her behavior or actual use of technology. Furthermore, the acceptance of a user in adopting technology is affected by various factors. They could be either external or internal factors which can drive the user's acceptance or rejection towards technology. Nonetheless, the

research gap exists as recent systematic reviews on teachers' technology acceptance is lacking, especially for emergency remote teaching context. Hence, this study was meant to analyze and review all current studies on teachers' technology acceptance in the COVID-19 to explore the key factors affecting teachers in adopting and accepting technology for emergency remote teaching purposes.

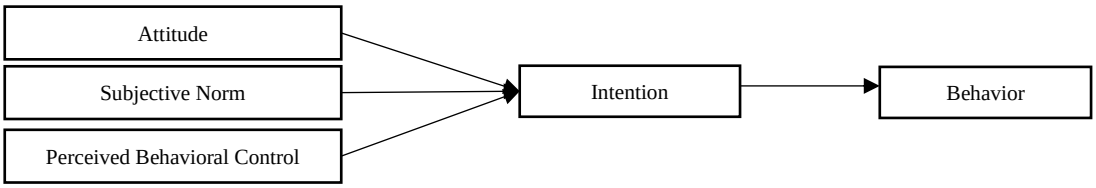

Figure 3. Theory of planned behavior [18]

3. RESEARCH METHOD

This systematic review adhered to preferred reporting items for systematic reviews and meta-analyses (PRISMA) 2020 statement that includes new reporting outline which enable researchers in identifying, selecting, appraising, and synthesizing studies in a more effective manner [19]. PRISMA is widely adopted for systematic review use due to its inclusiveness and compliance to other studies [20]. This study adopted the latest PRISMA statement which consists of three main processes, namely identification, screening, and inclusion as illustrated in Figure 4.

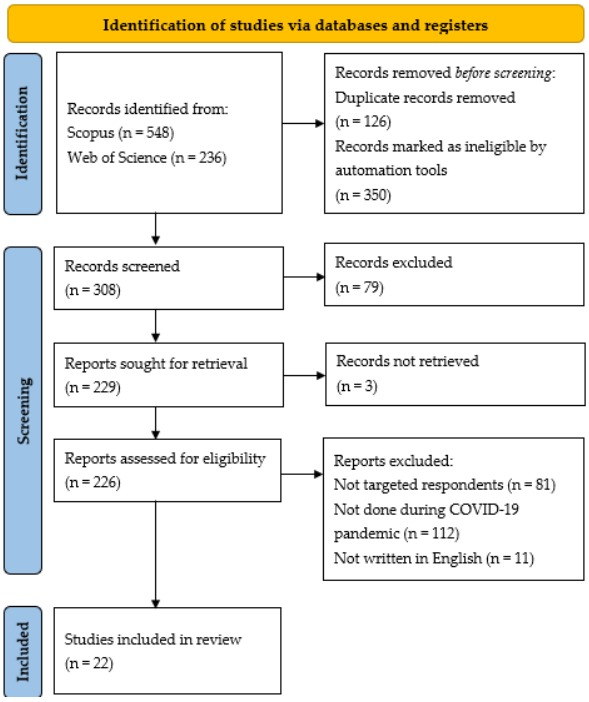

Figure 4. PRISMA 2020 statement [19]

3.1. Identification

The identification process involves identifying articles through database searching as well as deduplication. There were two databases namely Web of Science (WoS) and Scopus chosen as both databases are perceived as the two major and most wide-ranging sources of publication metadata and impact indicators [21]. The potential keywords related to the study were meticulously listed and search strings were formed to make sure an inclusive literature search. Table 1 tabulates the search strings for the initial database searches.

There was a total of 794 articles identified from both databases. Deduplication was done after identifying the articles by eliminating the duplicate articles which were found in both databases. Additionally, automation tools were also used in the identification process to exclude the articles which were irrelevant to the education field and not conducted during the COVID-19 pandemic (before 2020). As a result, 126 duplicate articles and 350 articles which were marked as ineligible by automation tools were then removed, resulting in 308 articles were eligible for the consecutive process.

Table 1. Search strings used in this study

Database	Search string
Scopus	TITLE-ABS-KEY ((“teachers” OR “teacher” OR “educators” OR “educator”) and (“technology acceptance*” OR “acceptance of technology*”))
Web of science	TS=((“teachers” OR “teacher” OR “educators” OR “educator”) and (“technology acceptance*” OR “acceptance of technology*”))

3.2. Screening

Screening process was done to the 308 remaining articles according to their titles, abstracts, and keywords with the notion that the selected articles shall concern about teachers’ technological acceptance level during COVID-19 pandemic. The outcome of the screening process was that 79 articles which were irrelevant to this study were excluded. On the other hand, 229 articles were sought for retrieval and three articles were failed to retrieve. Hence, 226 articles were meticulously screened with the reference of a list of inclusion and exclusion criteria as presented in Table 2. The screening result depicted that there were 204 articles excluded due to their targeted respondents were not teachers and pre-service teachers (n=81), the studies were not done in the COVID-19 pandemic (n=112), and the articles were not written in English (n=11).

Table 2. Inclusion and exclusion criteria for articles screening in this study

Criterion	Inclusion	Exclusion
Perception	Teachers, pre-service teachers	Students, parents, and staffs
Type of article	Journal articles	Other than journal articles
Language	English language	Other than English language
Publication year	After 2020	Before 2020
Research design	Quantitative, Mixed method	Qualitative
Use of technology acceptance theory	At least one theory used in the study	No theory used in the study

3.3. Included

There were 22 included articles. They were included for this study closely related to the technological acceptance of teachers in the COVID-19 epidemic as tabulated in Table 3. Based on table, the aims of the selected studies revolved around identifying teachers’ technological acceptance level and factors affecting their acceptance and actual use of technology for emergency remote teaching.

3.4. Data analysis procedure

This systematic review was aimed to get a closer view on how teachers accept technology during the outbreak and the key factors affecting their acceptance and adoption of technology for emergency remote teaching. To address the mentioned research aim, this systematic review attempted to answer the research questions: i) What is the technology acceptance level of teachers for emergency remote teaching during the COVID-19 pandemic?; ii) What are the key factors that affect teachers’ behavioral intentions to accept technology for emergency remote teaching during the COVID-19 pandemic? All selected articles were interpretively analyzed in accordance with the research questions. The findings of the selected articles were critically synthesized in the subsequent section.

Table 3. Summary of the selected studies

Study	Database	Purpose of the study	Theory	Method	Samples
[22]	Scopus	To explore EFL teachers' information and communications technology (ICT) literacy and acceptance and the correlations between them	TAM, TPACK	Mixed method (descriptive analysis, directed content analysis)	186 high school EFL teachers in China
[23]	Scopus	To identify factors affecting Social Media Use in TEFL during the COVID-19 pandemic	TAM	Quantitative (SEM)	287 EFL faculty members from 10 Indonesian universities
[24]	Scopus, WoS	To investigate factors influenced Chinese EFL teachers' non-volitional online teaching intentions	TAM	Quantitative (SEM)	158 Chinese EFL teachers in China
[25]	Scopus, WoS	To examine the influence of factors on teacher' continuance intention to adopt various digital technologies in teaching practices	TAM	Quantitative (SEM)	23 undergraduate and postgraduate teachers in India
[26]	Scopus, WoS	To identify factors affecting of pre-service teachers' intentions in using technology for teaching ESL	UTAUT, TPACK	Quantitative (SEM)	257 ESL pre-service teachers in Malaysia
[27]	Scopus, WoS	To investigate pre-service teachers' accessibility, acceptability, and readiness for mobile learning technology and the relationships between M-learning acceptance and readiness	UTAUT	Quantitative (SEM)	429 pre-service teachers from public and private universities in Pakistan
[28]	Scopus, WoS	To examine factors, affect teachers' intentions to use mobile applications	TAM, Flow Theory, TPB	Quantitative (SEM)	1203 pre-service and in-service Science teachers in Turkey
[29]	Scopus	To examine the factors affecting Iranian EFL teachers' use of mobile devices	UTAUT, TPACK	Quantitative (SEM)	160 EFL teachers from private language institutes in Isfahan
[30]	Scopus, WoS	To explore the intentions of Turkey's pre-service mathematics teachers in adopting technology for teaching in future	TAM	Quantitative (SEM)	530 pre-service Mathematics teachers from universities in Turkey
[31]	Scopus	To study the behavior intention of Malaysian teachers' in using IR4.0 technology	UTAUT	Quantitative (SEM)	62 primary school teachers in Malaysia
[32]	Scopus, WoS	To identify how the factors influence student teachers' intentions in using technology	TAM and TPACK	Quantitative (SEM)	232 student teachers from the University of Tartu
[33]	Scopus, WoS	To investigate the relationship between factors which affect upper secondary school teachers to integrate technology for teaching	TAM	Quantitative (Pearson's correlation, least squared regression)	178 upper secondary school teachers in Italy
[34]	Scopus, WoS	To study the relationship between factors among educators and learners towards adopting virtual learning for learning during the global pandemic lockdown	TAM	Quantitative (Regression of partial least squares)	543 secondary schools and tertiary institutions students and teachers
[35]	Scopus, WoS	To investigate how technostress as a boundary condition influences teachers' intention to accept and use portable technology	TAM	Quantitative (SEM)	367 teachers in K-12 settings in Palestine
[36]	Scopus, WoS	To explore teachers' attitudes and factors that affect their acceptance and behavioral intentions to use Google Classroom as LMS	TAM	Quantitative (PLS-SEM)	54 university teachers (27 Nigerians and 27 Bangladeshis)
[37]	WoS	To investigate factors influencing university teachers' use of mobile technology-enhanced teaching platform during COVID-19 epidemic	TAM, UTAUT, TPB	Quantitative (SEM)	214 university teachers in China
[38]	Scopus, WoS	To investigate teachers' acceptance toward cloud-based learning technology	TAM	Quantitative (SEM)	75 primary school teachers in Indonesia
[39]	Scopus	To explore the impact of pre-service teachers' computer self-efficacy on their computer use	TAM	Quantitative (PLS-SEM)	332 pre-service teachers in South Africa
[40]	Scopus, WoS	To investigate the perceptions of university teachers on their intention of adopting online platforms at post-COVID-19 settings	TAM	Mixed-method (PLS-SEM, in-depth interviews)	242 teachers from various institutes in India
[41]	Scopus, WoS	To compare experienced and inexperienced teachers' acceptance towards LMS	UTAUT	Quantitative (Independent samples t-test, Pearson's correlation, stepwise regression analyses)	127 experienced and 69 inexperienced K-12 teachers in Finland
[42]	Scopus, WoS	To explore the application of the UTAUT and use of technology towards ESL lecturers' intention to use flipped learning	UTAUT	Quantitative (SEM)	206 ESL lecturers from four different universities in Malaysia
[43]	Scopus	To investigate the teachers' perceptions and tendency to apply VLE as teaching tool	TAM	Quantitative (Descriptive analysis, Pearson's correlation, multiple regression analyses)	178 teachers in southern state of Malaysia

4. RESULTS AND DISCUSSION

4.1. Teachers' technology acceptance level for emergency remote teaching during COVID-19

In response to the first research question, teachers' acceptance level in adopting technology during the outbreak in all selected studies had been identified and the findings were tabulated in Table 4. According to Table 4, there are 13 articles which did not investigate teachers' technology acceptance level during the COVID-19 pandemic because their research focus was to solely explore the relationship between factors that bring an impact to teachers in adopting technology for emergency remote teaching which will be discussed in the next research question. For the remaining articles, it is noticed that there are seven studies found that teachers have high level of acceptance towards integrating technology in emergency remote teaching during the pandemic. However, the findings of two studies reported that teachers moderately accepted the implementation of technology for online teaching.

Table 4. Analysis of findings on teachers' technology acceptance level for emergency remote teaching during the COVID-19 pandemic

Study	Teachers' technology acceptance level for emergency remote teaching during the COVID-19 pandemic			
	High	Moderate	Low	Not mentioned
[22]	✓			
[23]				✓
[24]				✓
[25]				✓
[26]				✓
[27]	✓			
[28]				✓
[29]				✓
[30]	✓			
[31]				✓
[32]				✓
[33]				✓
[34]	✓			
[35]	✓			
[36]		✓		
[37]				✓
[38]				✓
[39]				✓
[40]	✓			
[41]	✓			
[42]				✓
[43]		✓		

According to the findings shown in Table 4, excluding the 13 articles which did not mention about their technology acceptance level, it is assumed that most teachers are optimistic in accepting technology for emergency remote teaching during the COVID-19 pandemic [22], [27], [30], [34], [35], [40], [41]. This finding also exists in other related studies which presented that most teachers have embraced the fact that technology becomes one of their ways to continue their students' learning during the outbreak [44]. To explain this scenario, it is possible that teachers were trained to integrate technology for educational purposes [30] and they had sufficient knowledge on how to adopt technology to deliver teaching [22], [27], resulting in their positive acceptance towards technology use for emergency remote teaching. The studies showed that teachers perceive technology has a facilitating effect in delivering the content knowledge to learners effectively during the pandemic [22], [23], [25], [27], [28], [34], [35], [37], [40], and they were comfortable and confident using online platforms to deliver lessons during the closure of educational institutions [22], [40]. This is supported by Zamora-Antuñano *et al*. [45] which found that teachers managed to implement technology for emergency remote teaching because they received adequate training to confront the outbreak.

Apart from that, they expressed that they are willing to acquire more ICT knowledge [22] and they portrayed their intentions to apply technology after the barrier of pandemic is ceased later [40]. It is undeniable that the disruption of COVID-19 outbreak could be considered as one step forward to a new educational paradigm as teachers were driven to pick up the ICT skills to conduct teaching and learning sessions online, and most probably teachers realize that using technology in teaching and learning persistently may influence students' motivation, participation and learning in a positive manner [46].

In contrast, previous studies [36], [43] showed that teachers portrayed a moderate level of technology acceptance as they were not ready to conquer the challenges of emergency remote teaching yet. Akar [47] further elaborated that teachers' belief and readiness would determine the teachers' technology acceptance level. Also, teachers in the developing countries might hold negative perceptions towards technology due to inadequate facilities and training [48], [49]. Therefore, policymakers and administrators should provide sufficient resources and training to the teachers so that they would acknowledge the advantages of integrating technology to provide quality education compared to conventional method [50].

Interestingly, there were studies which compared teachers' technology acceptance level for emergency remote teaching between pre-service and in-service teachers [28], inexperienced and experienced teachers [41] as well as male and female teachers [40]. The findings revealed that teachers' technology acceptance level did not differ from their experience, but discrepancy occurred based on their gender. In terms of gender, the findings of Bajaj *et al*. [40] showed that the mean value of male teachers is higher than female teachers. In other words, male teachers are more inclined to adopt technology for educational purposes after the pandemic compared to female teachers. This finding contradicts to the study done by [51] which identified no significant difference between technological acceptance level based on gender.

On the other hand, Dindar *et al*. [41] discovered that even though both inexperienced (adopted technology due to the outbreak) and experienced (adopted technology before outbreak) teachers were compelled to adopt technology to deliver lessons, they exhibited similar levels of technology acceptance. Also, the results of research [28] also depicted that both pre-service and in-service teachers hold positive perceptions towards technology as it was effortless and enhanced their efficiency. This result contradicts with the previous studies which proposed that teachers with a shorter length of service tend to hold a higher level of technology acceptance [52].

4.2. Key factors affecting teachers' behavioral intentions to accept technology for emergency remote teaching during the COVID-19 pandemic

To answer the second research question, all factors that had a significant relationship with teachers' behavioral intentions towards educational technology for emergency remote teaching during the COVID-19 pandemic in the articles were identified. The cut-off value for indicating statistical significance is 0.05, indicating that the probability that the finding is a true finding is more than 95% as suggested by Andrade [5]. Table 5 illustrates the factors which have a significant relationship with teachers' behavioral intentions to accept technology for emergency remote teaching during the COVID-19 pandemic.

Table 5. Findings on factors affecting teachers' behavioral intentions to accept technology for emergency remote teaching during the COVID-19 pandemic

Study	Factors								
	TAM			UTAUT				TPB	
	PU	PEU	ATT**	PE	EE	SI	FC	SN	PBC
[22]									
[23]	/								
[24]	/		/						
[25]		/					/		
[26]									
[27]				/	/	/			
[28]	/		/					/	/
[29]				/		/			
[30]			/				/	/	
[31]						/	/		
[32]		/	/						
[33]	/	/							
[34]			/						
[35]	/		/						
[36]		/							
[37]	/								
[38]						/			
[39]	Teachers' behavioral intention was not examined								
[40]	/		/						
[41]				/	/		/		
[42]						/			
[43]	/	/							

*Note: perceived usefulness (PU), perceived ease of use (PEU), attitude (ATT), performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating conditions (FC), subjective norm (SN), perceived behavioral control (PBC), technological pedagogical content knowledge (TPACK)
**The attitude components from both TAM and TPB are merged

The amount of each factor from the identified studies were then summed up. Noticing that some of the components underlie in TAM, UTAUT and TPB theories coincide with one another, the factors from each model which are interrelated with each other were combined with the reference of [53] and then tabulated in Table 6. Based on Tables 5 and 6, teachers' perceived usefulness and performance expectancy is the most important determinant of teachers' technology acceptance which were found in 11 studies. Moreover, teachers' perceived ease of use and effort expectancy, attitude to-wards use of technology as well as social influence and subjective norm are the other key factors which may manipulate teachers' technology acceptance during the pandemic. Furthermore, there are five studies which discovered that facilitating conditions and perceived behavioral control may impact teachers' behavioral intentions to apply it in the lessons during the outbreak.

Table 6. Analysis of findings on factors affecting teachers' behavioral intentions to accept technology for emergency remote teaching during the COVID-19 pandemic

Rank	Factor	Theory	Number of studies
1	Perceived usefulness (PU)	TAM	11
	Performance expectancy (PE)	UTAUT	
2	Perceived ease of use (PEU)	TAM	7
	Effort expectancy (EE)	UTAUT	
	Attitude towards use (ATT)	TAM, TPB	7
	Social influence (SI)	UTAUT	7
	Subjective norm (SN)	TPB	
3	Facilitating conditions (FC)	UTAUT	5
	Perceived behavioral control (PBC)	TPB	
4	Technological pedagogical content knowledge (TPACK)	Others	3
	Self-efficacy	Others	3
5	Quality of services	Others	1
	Personal innovativeness	Others	1
	Perceived enjoyment	Others	1
	Concentration	Others	1
	Growth mindset	Others	1
	Help seeking	Others	1
	Perceived risk	Others	1
	Gender	Others	1
	Satisfaction	Others	1
	Readiness	Others	1

Note: Technology acceptance model (TAM), Unified theory of acceptance and use of technology (UTAUT), Theory of planned behavior (TPB)

There are five key factors that impact teachers' behavioral intentions to accept technology for emergency remote teaching during the COVID-19 pandemic, namely perceived usefulness or performance expectancy, perceived ease of use or effort expectancy, attitude toward use, social influence or subjective norm and facilitating conditions or perceived behavioral control. Among all the factors stated, PU [23], [24], [28], [33], [35], [37], [40], [43] or PE [27], [29], [41] is considered the most influential factor of teachers' intentions in accepting technology during the outbreak. In other words, teachers concern the most about how useful the technology is in enhancing their performance [54]. Studies have shown that if teachers consider technology is useful for their teaching, it will positively affect their intentions in accepting and using technology. However, there were studies [25], [38], [55] which explained a different perspective on its effect towards teachers' technology acceptance. PU and PE might not be able to influence users in accepting technology as they use it due to reasons related to obligatory such as the COVID-19 outbreak, resulting in teachers merely adopted technology without realizing its advantages in teaching and learning [56].

Another factor which has the tendency in impacting teachers' intentions to accept using technology is PEU or EE which is associated with to what extent a technology user use technology effortlessly. The findings depicted that the teachers are more likely to accept using technology for educational purposes if they find it easy to use [25], [27], [32], [33], [36], [41], [43], resulting in the increase of teachers' positive perceptions on the benefits of educational technology for both learners and teachers as well [57]. This is aligned with the study which outlined the role of PEU and EE in influencing teachers in accepting technology [58]–[60]. It is supported by studies which proved that individuals with high PEU towards technology would develop their positive attitudes and behavioral intention towards technology acceptance [61], [62].

Moreover, there were seven studies [24], [28], [30], [32], [34], [35], [40] which demonstrated that teachers' attitude towards technology use may directly affect their behavioral intention of technology acceptance as portrayed in both TAM and TPB [63]. This indicates that the stronger the teachers' positive

attitude, the higher their intention to accept technology for emergency remote teaching in the COVID-19 pandemic. This statement was supported by [64] who believed that the attitude of teachers toward technology acceptance and their beliefs about "good" pedagogical practices determine whether and how they use technology [65], [66].

The social factors such as SI [27], [29], [31], [38], [42] and SN [28], [30] are proven to be prominent in affecting teachers' wills to accept the adoption of technology for emergency remote teaching during the outbreak. Both SI and SN are relevant in contexts of technology acceptance for determining an individual's behavior intention and adoption of technology from a social perspective [67]. This finding added more contextual evidence that teachers' intentions of non-volitional technology use for emergency remote teaching are more likely to be engaged by the people surrounding them especially colleagues, peers, or family members. This is agreed by Chen *et al*. [68] who perceived that the support of others such as fellow teachers and researchers could raise teachers' capability in accepting technology and applying it in their classroom. The study of Baydas and Yilmaz [69] further asserted that teachers intended to have a strong level of behavioral intention to accept and use technology for teaching if they were positively influenced by others.

Furthermore, FC [25], [30], [31], [41] and PBC [28] were identified as one of the factors affecting teachers' behavioral intentions to accept technology for emergency remote teaching during the COVID-19 pandemic. Both FC and PBC are interrelated and discussed together as they are subjected to shift teachers' intentions for technology acceptance based on the availability and perceived significance of skills, resources, and opportunities [70]. To be specific, teachers were more likely to accept the use of technology for emergency remote teaching if they assumed that they were given adequate resources, trainings and assistance in the COVID-19. In contrast, poor facilitating conditions tend to become teachers' barriers to accept and integrate technology into teaching effectively [30]. This statement had been proven in [36] which identified that various technology challenges impacted Nigerian teachers in conducting online teaching, resulting in demonstration of a lower level of technology acceptance compared to Bangladeshi teachers due to lack of support, devices, and resources.

5. CONCLUSION

This systematic literature review has critically reviewed papers related to teachers' technology acceptance in the COVID-19 pandemic to identify teachers' level of technology acceptance for emergency remote teaching in the outbreak as well as factors affecting their intentions to accept technology as well. There was a number of 22 articles which were identified with the adherence to the preferred reporting items for systematic review recommendations and meta-analyses PRISMA protocol to review published studies in both Scopus and WoS databases. The findings showed that most studies reported a high level of technology acceptance level among teachers for emergency remote teaching during the COVID-19 pandemic.

Nevertheless, the findings of this study shall be interpreted with cautions and several limitations should be borne in mind. First and foremost, considering the comprehensiveness of the database content, this systematic review only adopted Scopus and WoS databases to identify the articles related to the research focus. There might be more relevant articles available in other databases such as ERIC and Google Scholar. Future research may expand this study by identifying more related articles on teachers' technology acceptance during the COVID-19 pandemic from other databases. Furthermore, this review only focused on technology acceptance from the teachers' perspective. However, students who are the ones who received the knowledge via emergency remote teaching conducted by teachers. Their perceptions such as engagement, effectiveness, and motivation towards online learning in the pandemic are worth studying so that a clearer picture on the technology acceptance from both teachers and students' perspectives could be obtained.

This systematic literature review contributes significantly to provide an insight on teachers' level of acceptance towards using technology for emergency remote teaching in conjunction with the COVID-19, benefitting the educational policymakers and administrators in identifying teachers' readiness to adopt technology for teaching and learning and designing policies and instructional strategies for post-COVID-19 situations. Besides, this study managed to provide essential contributions to the literature by synthesizing factors that influence teachers' intentions in accepting technology for non-volitional use. Stakeholders should take these factors into account to ascertain that all teachers' needs are fulfilled and the constraints that interfere their technology acceptance are overcome well. As the use of technology in educational context is expected to be the current educational trends, it is anticipated that teachers are ready to accept the integration of technology in either their physical or virtual classroom as an effort in providing quality and sustainable education in alignment with the sustainable development goals.

REFERENCES

[1] W. Rosa, "Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all," in *A New Era in Global Health: Nursing and the United Nations 2030 Agenda for Sustainable Development*, New York: Springer Publishing, 2017, pp. 283–300.

[2] P. Sahu, "Closure of universities due to coronavirus disease 2019 (COVID-19): Impact on education and mental health of students and academic staff," *Cureus*, vol. 12, no. 4, 2020, doi: 10.7759/cureus.7541.

[3] A. Sung, K. Leong, and S. Cunningham, "Emerging technologies in education for sustainable development," in *Partnerships for the Goals. Encyclopedia of the UN Sustainable Development Goals*, Switzerland: Springer Cham, 2020, doi: 10.1007/978-3-319-71067-9_61-1.

[4] K. Y. K. Wen and K. H. Tan, "ESL teachers' intention in adopting online educational technologies during covid-19 pandemic," *Journal of Education and e-Learning Research*, vol. 7, no. 4, pp. 387–394, 2020, doi: 10.20448/journal.509.2020.74.387.394.

[5] C. Andrade, "The P value and statistical significance: Misunderstandings, explanations, challenges, and alternatives," *Indian Journal of Psychological Medicine*, vol. 41, no. 3, pp. 210–215, 2019, doi: 10.4103/IJPSYM.IJPSYM_193_19.

[6] T. Ferguson, D. Iliško, C. Roofe, and S. Hill, *SDG4 - Quality education: Inclusivity, equity and lifelong learning for all (Concise guides to the United Nations sustainable development goals*. Bingley: Emerald Publishing Limited, 2019.

[7] T. E. Shim and S. Y. Lee, "College students' experience of emergency remote teaching due to COVID-19," *Children and Youth Services Review*, vol. 119, p. 105578, 2020, doi: 10.1016/j.childyouth.2020.105578.

[8] R. A. Reiser, "A history of instructional design and technology: Part I: A history of instructional media," *Educational Technology Research and Development*, vol. 49, no. 1, pp. 53–64, 2001, doi: 10.1007/BF02504506.

[9] D. Lase, "Education and industrial revolution 4.0," *Jurnal Handayani*, vol. 10, no. 1, pp. 48–62, 2019, doi: 10.24114/jh.v10i1.14138.

[10] Y.-P. Cheng, C.-H. Huang, and L. C. Hsu, "Research trends in educational technology," *International Journal of Technology and Human Interaction*, vol. 18, no. 1, pp. 1–14, 2022, doi: 10.4018/ijthi.293191.

[11] T. Teo, "Technology acceptance research in education," in *Technology Acceptance in Education*, Rotterdam: SensePublishers, 2011, pp. 1–5, doi: 10.1007/978-94-6091-487-4_1.

[12] F. D. Davis, "A technology acceptance model for empirically testing new end-user information systems: Theory and results," Ph.D. Dissertation, Sloan School of Management, Massachusetts Institute of Technology, 1985.

[13] A. Gaddi, C. Prashantha, and K. Shivashankar, "A review of technology acceptance model (TAM)-origin, development & future directions," *International Journal for Research in Engineering Application & Management (IJREAM)*, vol. 6, no. 12, pp. 107–111, 2021.

[14] V. Venkatesh and F. D. Davis, "Theoretical extension of the Technology Acceptance Model: Four longitudinal field studies," *Management Science*, vol. 46, no. 2, pp. 186–204, 2000, doi: 10.1287/mnsc.46.2.186.11926.

[15] V. Venkatesh and H. Bala, "Technology acceptance model 3 and a research agenda on interventions," *Decision Sciences*, vol. 39, no. 2, pp. 273–315, 2008, doi: 10.1111/j.1540-5915.2008.00192.x.

[16] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "User acceptance of information technology: Toward a unified view," *MIS Quarterly: Management Information Systems*, vol. 27, no. 3, pp. 425–478, 2003, doi: 10.2307/30036540.

[17] V. Venkatesh, J. Y. L. Thong, and X. Xu, "Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology," *MIS Quarterly: Management Information Systems*, vol. 36, no. 1, pp. 157–178, 2012, doi: 10.2307/41410412.

[18] I. Ajzen, "From intentions to actions: A theory of planned behavior," in *Action Control: From Cognition to Behavior*, Berlin, Heidelberg: Springer Berlin Heidelberg, 1985, pp. 11–39, doi: 10.1007/978-3-642-69746-3_2.

[19] M. J. Page *et al.*, "The PRISMA 2020 statement: an updated guideline for reporting systematic reviews," *Systematic Reviews*, vol. 10, no. 1, p. 89, 2021, doi: 10.1186/s13643-021-01626-4.

[20] K. R. M. Rafiq, H. Hashim, and M. M. Yunus, "Sustaining education with mobile learning for English for specific purposes (ESP): A systematic review (2012–2021)," *Sustainability (Switzerland)*, vol. 13, no. 17, p. 9768, 2021, doi: 10.3390/su13179768.

[21] R. Pranckutė, "Web of science (WoS) and Scopus: The titans of bibliographic information in today's academic world," *Publications*, vol. 9, no. 1, p. 12, 2021, doi: 10.3390/publications9010012.

[22] B. Li, "Ready for online? Exploring EFL teachers' ICT acceptance and ICT Literacy during COVID-19 in Mainland China," *Journal of Educational Computing Research*, vol. 60, no. 1, pp. 196–219, 2022, doi: 10.1177/07356331211028934.

[23] A. Mukminin *et al.*, "Analyzing social media use in TEFL via the technology acceptance model in Indonesian higher education during the COVID-19 pandemic," *Teaching English with Technology*, vol. 22, no. 1, pp. 3–22, 2022.

[24] F. Huang, T. Teo, and J. Guo, "Understanding English teachers' non-volitional use of online teaching: A Chinese study," *System*, vol. 101, p. 102574, 2021, doi: 10.1016/j.system.2021.102574.

[25] S. Sharma and J. R. Saini, "On the role of teachers' acceptance, continuance intention and self-efficacy in the use of digital technologies in teaching practices," *Journal of Further and Higher Education*, vol. 46, no. 6, pp. 721–736, 2022, doi: 10.1080/0309877X.2021.1998395.

[26] L. L. Wah and H. Hashim, "Determining pre-service teachers' intention of using technology for teaching English as a second language (ESL)," *Sustainability (Switzerland)*, vol. 13, no. 14, p. 7568, 2021, doi: 10.3390/su13147568.

[27] M. Z. Asghar, E. Barberà, and I. Younas, "Mobile learning technology readiness and acceptance among pre-service teachers in Pakistan during the COVID-19 pandemic," *Knowledge Management and E-Learning*, vol. 13, no. 1, pp. 83–101, 2021, doi: 10.34105/j.kmel.2021.13.005.

[28] H. Ateş and J. Garzón, "Drivers of teachers' intentions to use mobile applications to teach science," *Education and Information Technologies*, vol. 27, no. 2, pp. 2521–2542, 2022, doi: 10.1007/s10639-021-10671-4.

[29] B. Mohammad-Salehi, M. Vaez-Dalili, and H. H. Tabrizi, "Investigating factors that influence EFL teachers' adoption of Web 2.0 technologies: Evidence from applying the UTAUT and TPACK," *Teaching English as a Second Language Electronic Journal (TESL-EJ)*, vol. 25, no. 1, 2021, [Online]. Available: https://tesl-ej.org/pdf/ej97/a21.pdf.

[30] M. D. Gurer, "Examining technology acceptance of pre-service mathematics teachers in Turkey: A structural equation modeling approach," *Education and Information Technologies*, vol. 26, no. 4, pp. 4709–4729, 2021, doi: 10.1007/s10639-021-10493-4.

[31] H. A. Jalil, M. Rajakumar, and Z. Zaremohzzabieh, "Teachers' Acceptance of Technologies for 4IR Adoption: Implementation of the UTAUT Model," *International Journal of Learning, Teaching and Educational Research*, vol. 21, no. 1, pp. 18–32, 2022, doi: 10.26803/ijlter.21.1.2.

[32] P. Luik and M. Taimalu, "Predicting the intention to use technology in education among student teachers: A path analysis," *Education Sciences*, vol. 11, no. 9, p. 564, 2021, doi: 10.3390/educsci11090564.

[33] L. Menabò, A. Sansavini, A. Brighi, G. Skrzypiec, and A. Guarini, "Promoting the integration of technology in teaching: An analysis of the factors that increase the intention to use technologies among Italian teachers," *Journal of Computer Assisted Learning*, vol. 37, no. 6, pp. 1566–1577, 2021, doi: 10.1111/jcal.12554.
[34] N. James, O. R. Vincent, N. O. Akande, and A. S. Makinde, "COVID-19: Why virtual learning becomes a pedagogical acceptance model in Africa," *International Journal of Emerging Technologies in Learning*, vol. 17, no. 1, pp. 206–223, 2022, doi: 10.3991/ijet.v17i01.23567.
[35] Z. N. Khlaif, M. Sanmugam, and A. Ayyoub, "Correction to: Impact of Technostress on Continuance Intentions to Use Mobile Technology," *Asia-Pacific Education Researcher*, 2022, doi: 10.1007/s40299-022-00646-5.
[36] M. K. Saidu and M. A. Al Mamun, "Exploring the factors affecting behavioural intention to use google classroom: university teachers' perspectives in Bangladesh and Nigeria," *TechTrends*, vol. 66, no. 4, pp. 681–696, 2022, doi: 10.1007/s11528-022-00704-1.
[37] K. Y. Tang, C. H. Hsiao, Y. F. Tu, G. J. Hwang, and Y. Wang, "Factors influencing university teachers' use of a mobile technology-enhanced teaching (MTT) platform," *Educational Technology Research and Development*, vol. 69, no. 5, pp. 2705–2728, 2021, doi: 10.1007/s11423-021-10032-5.
[38] I. Q. Utami, I. Fahmiyah, R. A. Ningrum, M. N. Fakhruzzaman, A. I. Pratama, and Y. M. Triangga, "Teacher's acceptance toward cloud-based learning technology in COVID-19 pandemic era," *Journal of Computers in Education*, vol. 9, no. 4, pp. 571–586, 2022, doi: 10.1007/s40692-021-00214-8.
[39] A. Chibisa, M. G. Tshabalala, and M. C. Maphalala, "Pre-service teachers' computer self-efficacy and the use of computers," *International Journal of Learning, Teaching and Educational Research*, vol. 20, no. 11, pp. 325–345, 2021, doi: 10.26803/ijlter.20.11.18.
[40] P. Bajaj, A. Khan, M. I. Tabash, and S. Anagreh, "Teachers' intention to continue the use of online teaching tools post COVID-19," *Cogent Education*, vol. 8, no. 1, 2021, doi: 10.1080/2331186X.2021.2002130.
[41] M. Dindar, A. Suorsa, J. Hermes, P. Karppinen, and P. Näykki, "Comparing technology acceptance of K-12 teachers with and without prior experience of learning management systems: A COVID-19 pandemic study," *Journal of Computer Assisted Learning*, vol. 37, no. 6, pp. 1553–1565, 2021, doi: 10.1111/jcal.12552.
[42] S. F. Abd Rahman, M. Md Yunus, and H. Hashim, "Applying UTAUT in predicting ESL lecturers intention to use flipped learning," *Sustainability (Switzerland)*, vol. 13, no. 15, p. 8571, 2021, doi: 10.3390/su13158571.
[43] A. H. A. Rashid, N. A. Shukor, Z. Tasir, and K. S. Na, "Teachers' perceptions and readiness toward the implementation of virtual learning environment," *International Journal of Evaluation and Research in Education (IJERE)*, vol. 10, no. 1, pp. 209–214, 2021, doi: 10.11591/ijere.v10i1.21014.
[44] B. A. Lukas and M. M. Yunus, "ESL teachers' challenges in implementing e-learning during COVID-19," *International Journal of Learning, Teaching and Educational Research*, vol. 20, no. 2, pp. 330–348, 2021, doi: 10.26803/IJLTER.20.2.18.
[45] M. A. Zamora-Antuñano, J. Rodríguez-Reséndiz, M. A. Cruz-Pérez, H. Rodríguez Reséndíz, W. J. Paredes-García, and J. A. G. Díaz, "Teachers' perception in selecting virtual learning platforms: A case of Mexican higher education during the COVID-19 Crisis," *Sustainability*, vol. 14, no. 1, p. 195, 2021, doi: 10.3390/su14010195.
[46] R. A. Salas-Rueda, R. Castañeda-Martínez, A. L. Eslava-Cervantes, and C. Alvarado-Zamorano, "Teachers' perception about MOOCs and ICT during the COVID-19 pandemic," *Contemporary Educational Technology*, vol. 14, no. 1, p. ep343, 2022, doi: 10.30935/cedtech/11479.
[47] S. G. Mazman Akar, "Does it matter being innovative: Teachers' technology acceptance," *Education and Information Technologies*, vol. 24, no. 6, pp. 3415–3432, Nov. 2019, doi: 10.1007/s10639-019-09933-z.
[48] A. J. Kola and A. A. Opeyemi, "Mitigating the impact of COVID-19 on the teaching and learning of science in the Nigerian higher education," *International Journal of Research and Innovation in Social Science (IJRISS)*, vol. IV, no. VI, pp. 334–337, 2020.
[49] I. Udosen and P. Adie, "Google classroom for distance learners by national teachers' institute: A case study of Calabar study centre," *International Journal of Computer Science and Information Technology Research*, vol. 7, no. 1, pp. 46–55, 2019.
[50] K. Kulikowski, S. Przytuła, and Ł. Sułkowski, "E-learning? Never again! On the unintended consequences of COVID-19 forced e-learning on academic teacher motivational job characteristics," *Higher Education Quarterly*, vol. 76, no. 1, pp. 174–189, 2022, doi: 10.1111/hequ.12314.
[51] T. Teo, X. Fan, and J. Du, "Technology acceptance among pre-service teachers: Does gender matter?" *Australasian Journal of Educational Technology*, vol. 31, no. 3, pp. 235–251, 2015, doi: 10.14742/ajet.1672.
[52] T. Teo, "Unpacking teachers' acceptance of technology: Tests of measurement invariance and latent mean differences," *Computers and Education*, vol. 75, pp. 127–135, 2014, doi: 10.1016/j.compedu.2014.01.014.
[53] Y.-L. Wu, Y.-H. Tao, and P.-C. Yang, "The use of unified theory of acceptance and use of technology to confer the behavioral model of 3G mobile telecommunication users," *Journal of Statistics and Management Systems*, vol. 11, no. 5, pp. 919–949, 2008, doi: 10.1080/09720510.2008.10701351.
[54] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "User acceptance of computer technology: A comparison of two theoretical models," *Management Science*, vol. 35, no. 8, pp. 982–1003, 1989, doi: 10.1287/mnsc.35.8.982.
[55] S. Y. Park, M. W. Nam, and S. B. Cha, "University students' behavioral intention to use mobile learning: Evaluating the technology acceptance model," *British Journal of Educational Technology*, vol. 43, no. 4, pp. 592–605, 2012, doi: 10.1111/j.1467-8535.2011.01229.x.
[56] S. H. Kim, "A study on adoption factors of Korean smartphone users: A focus on TAM (Technology Acceptance Model) and UTAUT (Unified Theory of Acceptance and Use of Technology)," *Advanced Science and Technology Letters*, vol. 57, pp. 27-30, Aug 2014, doi: 10.14257/ASTL.2014.57.07.
[57] T. Teo, C. B. Lee, C. S. Chai, and S. L. Wong, "Assessing the intention to use technology among pre-service teachers in Singapore and Malaysia: A multigroup invariance analysis of the technology acceptance model (TAM)," *Computers and Education*, vol. 53, no. 3, pp. 1000–1009, 2009, doi: 10.1016/j.compedu.2009.05.017.
[58] J. Kim and K. S. S. Lee, "Conceptual model to predict Filipino teachers' adoption of ICT-based instruction in class: using the UTAUT model," *Asia Pacific Journal of Education*, pp. 1–15, 2020, doi: 10.1080/02188791.2020.1776213.
[59] V. Venkatesh, J. Y. L. Thong, and X. Xu, "Unified theory of acceptance and use of technology: A synthesis and the road ahead," *Journal of the Association for Information Systems*, vol. 17, no. 5, pp. 328–376, 2016, doi: 10.17705/1jais.00428.
[60] Y. K. Dwivedi, N. P. Rana, A. Jeyaraj, M. Clement, and M. D. Williams, "Re-examining the unified theory of acceptance and use of technology (UTAUT): towards a revised theoretical model," *Information Systems Frontiers*, vol. 21, no. 3, pp. 719–734, 2019, doi: 10.1007/s10796-017-9774-y.
[61] D. Kwok and S. Yang, "Evaluating the intention to use ICT collaborative tools in a social constructivist environment," *International Journal of Educational Technology in Higher Education*, vol. 14, no. 1, 2017, doi: 10.1186/s41239-017-0070-1.

[62] M. S. Abdullah and M. Toycan, "Analysis of the factors for the successful e-learning services adoption from education providers' and students' perspectives: A case study of private universities in Northern Iraq," *Eurasia Journal of Mathematics, Science and Technology Education*, vol. 14, no. 3, pp. 1097–1109, 2018, doi: 10.12973/ejmste/81554.
[63] T. Teo, F. Huang, and C. K. W. Hoi, "Explicating the influences that explain intention to use technology among English teachers in China," *Interactive Learning Environments*, vol. 26, no. 4, pp. 460–475, 2018, doi: 10.1080/10494820.2017.1341940.
[64] F. Wijnen, J. Walma van der Molen, and J. Voogt, "Primary school teachers' attitudes toward technology use and stimulating higher-order thinking in students: a review of the literature," *Journal of Research on Technology in Education*, pp. 1–23, 2021, doi: 10.1080/15391523.2021.1991864.
[65] M. A. Bowman, V. W. Vongkulluksn, Z. Jiang, and K. Xie, "Teachers' exposure to professional development and the quality of their instructional technology use: The mediating role of teachers' value and ability beliefs," *Journal of Research on Technology in Education*, vol. 54, no. 2, pp. 188–204, 2022, doi: 10.1080/15391523.2020.1830895.
[66] A. T. Ottenbreit-Leftwich, T. J. Kopcha, and P. A. Ertmer, "Information and communication technology dispositional factors and relationship to information and communication technology practices," in *Second Handbook of Information Technology in Primary and Secondary Education*, Cham: Springer, 2018, pp. 309–333, doi: 10.1007/978-3-319-71054-9_27.
[67] J. C. Roca and M. Gagné, "Understanding e-learning continuance intention in the workplace: A self-determination theory perspective," *Computers in Human Behavior*, vol. 24, no. 4, pp. 1585–1604, 2008, doi: 10.1016/j.chb.2007.06.001.
[68] F. H. Chen, C. K. Looi, and W. Chen, "Integrating technology in the classroom: A visual conceptualization of teachers' knowledge, goals and beliefs," *Journal of Computer Assisted Learning*, vol. 25, no. 5, pp. 470–488, 2009, doi: 10.1111/j.1365-2729.2009.00323.x.
[69] O. Baydas and R. M. Yilmaz, "A model for pre-service teachers' intention to use interactive white boards in their future lessons," *Journal of Higher Education and Science*, vol. 7, no. 1, p. 59, 2017, doi: 10.5961/jhes.2017.184.
[70] K. M. White *et al.*, "Using a theory of planned behaviour framework to explore hand hygiene beliefs at the '5 critical moments' among Australian hospital-based nurses 59," *BMC Health Services Research*, vol. 15, no. 1, p. 59, 2015, doi: 10.1186/s12913-015-0718-2.

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