

Principals' Perceptions of Online Teaching and Learning in School After the Outbreak of the Pandemic

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ABSTRACT

The current study aims to analyse school leaders' understanding and expectation of, and support for, online teaching and learning during and after the outbreak of the COVID-19 pandemic. Based on the theory of reasoned action (TRA) framework, the authors designed a questionnaire and collected 319 responses from school principals about their views on online teaching and learning. Structural equation modelling revealed that principals' understanding was significantly associated with their expectations and support. Together with a thematic analysis, this study indicated that school principals understood online teaching and learning. The most expected item was students' ownership and access to a suitable device for online learning. Principals were willing to support students' self-regulated learning through online teaching. They appealed for more support for the infrastructure needed to ensure teachers' and students' privacy and security in online teaching and learning. They had suggestions for teacher development to tackle learner diversity in the online mode.

KEYWORDS

Online Teaching and Learning, Perception, Primary and Secondary Schools, Principals, Theory of Reasoned Action

INTRODUCTION

The initial outbreak of the COVID-19 pandemic prompted many educational institutions to shift to online teaching and learning overnight. Over the past two years, Hong Kong primary and secondary schools were forced to suspend classes, at the beginning, and switch between fully online teaching and learning and resumption of half-day face-to-face classes plus half-day either synchronous or asynchronous online class, in accordance with the pandemic situation, posing a challenge for the education system. Although fully online teaching and learning have ended in some regions around the world, including Hong Kong, blended learning with online components is a hot topic of discussion. In the context of technological innovation, people need opportunities created by educational policies and practices to achieve lifelong learning and improve their employability throughout their lives (Dede & McGivney, 2021). This is the moment to seek to innovate in blended online teaching and learning and thus groom future-ready learners for lifelong learning, which is one of the goals of K-12 education.

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Although the school leaders are eager to make good use of information and communication technology (ICT) to improve student learning achievement and school performance (Wu et al., 2019), studies have revealed that a lack of understanding of technology-supported teaching and learning affects the quality of school principals' leadership (McGarr & Kearney, 2009). Capable school leadership greatly facilitates the effective use of technology across the curriculum (Roth & Price, 2016), an argument that is supported by Wu et al. (2019) and Hadjithoma-Garstka (2011). Leadership in quality online teaching and learning can be enhanced by understanding school leaders' perceptions and providing support accordingly (Schiller, 2003; Yuen et al., 2003). Law et al. (2016) argued that implementing technology effectively necessitates the building of school-wide capacity by providing professional opportunities to principals, middle management leaders, and technology support staff so that sound decisions can be made on technology development policies and implementation plans. Researchers pointed out that principal leadership influences the use of ICT; meanwhile, principals' perspectives on the usefulness of educational technologies and their support are essential and critical to the school's digital revolution (Karakose et al., 2021; Navaridas-Nalda et al., 2020). It is proved that principals' understanding of the school's needs and the strategies they employ for school improvement are the keys to success (Day et al., 2016).

After the pandemic, a blended mode of face-to-face and synchronous and asynchronous online learning has been widely adopted in Hong Kong education sector. Without school leaders' understanding and support, the large-scale online or blended teaching and learning cannot be smoothly employed and enhance teaching and learning through a new online norm. A few studies discussed the school leadership during the pandemic crisis to make sure the teaching and learning in their schools were implemented effectively and efficiently from the management and leadership points of view (DeMatthews, et al., 2021; Harris, 2020; Mutongoza et al., 2021). However, none of them dug into school leaders' perspectives on online education supported by technology. Turnbull et al. (2021) identified the challenges of online education in higher education sectors, including blended use of synchronous and asynchronous learning, access to technology, IT competence of teachers and students, and privacy and confidentiality. Some researchers probed the impact of technology and pedagogy on school education during a pandemic, but they did not investigate principals' understandings (Fiş Erümit, 2021; Starkey et al., 2021). Besides, many studies investigated faculties' and students' perceptions, practices, and evaluation on blended learning, but most of them were conducted in higher education sector rather than in K-12.

Therefore, in this study, the authors aimed to investigate primary and secondary school principals' perceptions towards online education, with the attempt to answer the following three questions:

1. How does principals' understanding of online teaching and learning influence their expectations, and, in turn, how do these expectations influence their support for online teaching and learning?
2. From the principals' perspective, what challenges and problems did they experience from online teaching and learning, and what future challenges do they expect?
3. How do principals expect online teaching and learning to affect education in the near future?

BACKGROUND

The Meaning of Online Teaching and Learning

With rapid advances in education technology, the definition of online learning is evolving, especially after the initial outbreak of the pandemic forced a shift to online teaching and learning overnight. Some years ago, Allen and Seaman (2005) defined an online course as one in which more than 80% of the content was delivered online, and a blended or hybrid course as one with 30% to 79% of the content delivered online, while the remaining proportion was delivered face to face. According to Hrastinski (2008), e-Learning or online learning basically has two types, namely synchronous and

asynchronous online learning facilitated by the Internet and related technologies. He defines that synchronous online learning refers to real-time learning normally powered by videoconferencing for live participation, while asynchronous online teaching allows learners to access course resources and interact with teachers and peers anytime anywhere. These definitions have been also accepted by some educators and researchers, with minor updates in accordance with technology advancement (Moorhouse & Wong, 2021; Yamagata-Lynch, 2014). However, educators still have different perceptions and understanding of the related concepts of online learning, e-Learning, and distance learning (Moore et al., 2011). In this study, which focuses on principals' perspectives in the primary and secondary school contexts, the authors adopted the term "online learning" to include all of the asynchronous and synchronous teaching and learning activities that are facilitated by the Internet and related platforms and applications.

In the academic years 2019/20 and 2020/21, Hong Kong schools had implemented online teaching and learning for almost one and a half year after the first outbreak and several waves of COVID-19 (Education Bureau [EDB], 2022). In February 2020, the EDB of Hong Kong issued a notice entitled *Suspending Classes Without Suspending Learning*, in which the authority urged schools to "make better use of online classrooms and coordinate real-time teaching" (EDB, 2020a, para. 5). In this document, the EDB mentioned synchronous online teaching and learning. Two months later, the EDB (2020b) clarified that synchronous online teaching is only one of the e-Learning strategies. The EDB further urged schools to make good use of both online and offline learning to enhance students' self-regulated learning by taking their needs and school-based situations into consideration. Therefore, this paper views Hong Kong school principals, the targets of the survey of the authors' study, as agreeing that online learning is facilitated by the Internet and information technologies and can be categorised as e-Learning, which involves both synchronous and asynchronous online learning.

The Goals of Online Teaching and Learning

The Organisation for Economic Cooperation and Development (2019) reiterated the importance of equipping people, including K-12 students and their teachers, with the knowledge to make good use of the Internet and to develop the related generic skills. These skills include, but are not limited to, the cognitive and problem-solving abilities needed to protect online privacy and security and thrive in the technology-rich environments that are created as the impact of digital technologies on people's daily lives, work, and lifelong learning. Researchers have argued that technological advances provide opportunities for reform and innovation in K-12 schools because they facilitate blended and fully online teaching and learning, where learners can engage in an authentic learning process (Greene & Hale, 2017). Studies have revealed that teaching and learning should emphasise active, constructive, interactive, and reflective learning to promote student-centred learning (Chi, 2009; Kong & Song, 2015). Kong and Song (2015) designed a reflective engagement framework that aimed to support learners in attaining intellectual, personal, and social growth by using a personalised learning hub facilitated by a bring your own device (BYOD) scheme to participate in online teaching and learning activities in technology-rich environments.

Shifting From Face-to-Face Teaching to Blended Online Learning

Many studies have been conducted to probe the impact on teaching and learning of the pandemic-induced move to an online mode. However, most of the studies have focused on teachers' and students' perceptions (Moorhouse & Wong, 2021; Müller et al., 2021; Oliveira et al., 2021). Few have explored school principals' opinions about online teaching and learning or focused on the K-12 sector (Martin et al., 2021). Further, some scholars have warned that online learning is different from emergency remote teaching (Adedoyin & Soykan, 2020; Hodges et al., 2020). Adedoyin and Soykan (2020) argued that, with the correct blending of on- and offline instructional activities, online teaching and learning can be more sustainable. Because the K-12 sector will have more opportunities and occasions to adopt online teaching and learning, in both fully online and blended modes, there is an increasing

need to make teachers online-ready and design and deliver effective teaching by reviewing the best practices of online teaching blended with face-to-face instruction. In particular, Hong Kong schools had experienced and implemented several class modes, ranging from school lockdown, fully online, half-day face-to-face, and the supplementation of asynchronous online learning, in the past two and a half year with the first outbreak and five waves of COVID -19 (Cheung et al., 2022; EDB, 2022).

Infrastructure and Platform of Online Teaching and Learning

Schools set up the infrastructure required to implement online teaching and learning and play a vital role in ensuring their quality. Research has indicated that the way by which schools integrate their technology, rather than students' social-economic status, affects students' use of the technological tools for learning at home (González-Betancor et al., 2021). By interviewing teachers and students, Oliveira et al. (2021) revealed that both teachers and students had enjoyed positive experiences in using online platforms for teaching and learning, whereas their experiences were mostly negative when they tried to select and adopt suitable platforms by themselves. As a result, the researchers argued that efforts should be made to identify and select appropriate and standardised platforms for institutional-wide deployment, with adequate teacher training aiming at enhancing the online and blended learning experience and mitigating the technology gaps (An et al., 2021; Oliveira et al., 2021). It is therefore vital for school leaders to identify and set up suitable infrastructure and platforms to facilitate online teaching and learning.

Privacy and Cyber Security in Online Teaching and Learning

Many studies have pointed out that privacy issues and personal information security are ethical and social concerns that arise from online learning and e-Learning (Ashman et al., 2014; Panigrahi et al., 2018). In a survey of K-12 and higher education teachers, Chou and Chou (2021) found that teachers' technostress was associated with their concerns about privacy and their ability to deliver effective instruction while teaching online. In other words, teachers felt more stressed when they felt that their privacy was threatened while teaching online. Therefore, the researchers urged the educational authorities to provide guidance and training to protect the privacy of teachers' and students' data. Since school principals are the decision-makers when infrastructure is installed, their perceptions of privacy issues and cybersecurity for both students and teachers warrant investigation.

Study Framework: Theory of Reasoned Action

In this study, the authors mainly aimed to investigate school leaders' perceptions of and behaviour in implementing online teaching and learning. Specifically, the researchers attempted to comprehend their understanding and expectations of and support for the implementation of online teaching and learning in their schools. The authors suggest that school leaders' understanding, expectations, and support follow the attitude-intention-behaviour mechanism posited by the theory of reasoned action (TRA), which was developed for investigating individuals' volitional behaviour (Hale et al., 2002). The authors believe that the three components, namely understanding, expectation, and support, are present in Fishbein and Ajzen's (1975) conceptualisations of attitude, intention, and behaviour, respectively. According to the TRA, behavioural intention is the earliest predictor of volitional behaviour, and one's behavioural intention is the result of one's attitude towards carrying out the behaviour (Fishbein & Ajzen, 1975). The TRA has been widely adopted and tested in empirical studies in recent decades, and its increasing robustness means it has been used in different attitude-behaviour research contexts (Hackman & Knowlden, 2014; Sheppard et al., 1988). For example, in an early meta-analysis of consumer behavioural studies, Sheppard et al. (1988) found the TRA to have strong predictive utility even when investigating situations that were beyond the boundary conditions of the original model. In education, Burak et al. (2013) also found that the TRA could be used by teachers as a mechanism to improve students' attitudes and intentions, helping students to behave better in school. Kong and Wang (2021), too, deployed the TRA to probe primary school principals' views of programming and

found that, when principals understood programming, they expected that they would promote it and increased their support for teaching it.

In this study, the researchers first conceptualised school leaders' and educators' understanding as their self-constructed beliefs about and existing knowledge of implementing online teaching and learning. This conceptualisation was likely to represent their attitudes towards implementing online teaching and learning in their schools. Second, the researchers conceptualised school leaders' and educators' expectations as the way that they believed online teaching and learning should be practiced and their strong view of what should be achieved by a successful implementation. In the TRA, this conceptualisation aligns with the definition of intention, which represents one's motives in performing clearly planned behaviours (Sheppard et al., 1988). Finally, the researchers conceptualised school leaders' and educators' support as their actual supportive behaviour in implementing online teaching and learning in their schools, including actions such as offering platforms and tools to teachers and students. The authors argue that their supportive behaviour can be mapped to the conceptualisation of behaviour in the TRA, which is the result of attitude and intention. Previous research probed the relationship between understanding, expectation, and action: Acree et al. (2017) found that principals' increased understanding strengthened their dedication in promoting blended learning and thus would promote blended learning at their schools. Besides, they observed that when school leaders had much understanding of blended learning, they were willing to promote online teaching and learning, encouraging teachers to receive training, and the use of online tools. Further, the more the school leaders understand blended learning, the more they intend to do planning and support teachers for utilizing learning tools and online learning resources. Some research argued that the advancement of technologies facilitated teachers' exploration and use of innovative pedagogies to engage their students (Bouilheres et al., 2020). Jerry and Yunus (2021) pointed out that blended learning can improve students' motivation, engage them in the online activities, and promote self-regulated learning under the assistance of technology.

In light of the above, the researchers decided to use TRA as the theoretical framework of this study and develop the questionnaires. Most importantly, by using the TRA framework to present the interplay between school leaders' and educators' understanding, expectations, and support, the researchers aimed to deliver suggestions for improving the planning of online teaching and learning in local schools.

METHODOLOGY

Sample

In June 2021, the authors invited the principals of 584 primary schools and 495 secondary schools to fill in a survey on principals' perception of online teaching and learning in school education. They recorded a total of 319 responses from the 1,079 primary and secondary schools in Hong Kong, which made up the study sample. The response rate was 29.6%. The composition of the sample closely reflected the school population in Hong Kong, based on both the type of funding and school level, and thus the researchers considered the study sample as sufficiently reliable. Table 1 illustrates the demographics of the survey respondents and their schools.

Procedure and Questionnaire

Based on the theoretical framework of the TRA, the researchers developed a questionnaire covering principals' views of online teaching and learning at the school level. The questionnaire consisted of 21 items and one open-ended question. Appendix A shows the final English version of the questionnaire and its 21 items. Prior to the study, the authors sought and obtained ethical approval from the ethics committee of their affiliated university.

Table 1. Demographic information of the school principals

Demographics	Frequency (N = 319)	Percentage (%)	Demographics	Frequency (N = 319)	Percentage (%)
Gender			Education Level		
Male	161	50.5%	Doctoral	22	6.9%
Female	152	47.6%	Master	231	72.4%
Missing	6	1.9%	Bachelor	59	18.5%
			Missing	7	2.2%
Age (years)			Awareness of Online Teaching		
31–40	11	3.4%	Yes	295	92.5%
41–50	120	37.6%	No	12	3.8%
51–60	181	56.7%	Missing	12	3.8%
> 60	1	0.3%	School Level		
Missing	6	1.9%	Primary	163	51.10%
			Secondary	156	48.90%

The researchers created the questionnaire using an online survey tool with versions in Chinese and English, and sent it to 1,075 primary and secondary schools of Hong Kong based on the school list the researchers retrieved from the EDB of Hong Kong. The authors and two research support colleagues reviewed and finalised the survey tool of both Chinese and English versions for dissemination. Besides, the authors consulted one expert in providing online teaching and learning trainings to in-service teachers on the design of the questionnaire. They faxed a hard copy of the questionnaire, in both Chinese and English versions, to 580 primary schools and 495 secondary schools. The principals could choose to complete whichever version of the survey they preferred. Finally, the researchers received 319 responses from principals and vice principals, of which they returned 134 using the online form and 185 by fax.

Data Analysis

The researchers conducted a Cronbach’s alpha reliability test to measure the reliability of the survey. According to the test results (Table 3), the reliability of the questionnaire was robust (Cronbach’s $\alpha = .935$). Its 21-item scale examined three dimensions of the principals’ perception of online teaching and learning in school: 1) Understanding of online teaching and learning (six items); 2) expectations of online teaching and learning (nine items); 3) support for online teaching and learning in school education (six items). The authors measured it using a 5-point Likert scale, ranging from 1, “strongly disagree,” to 5, “strongly agree.” In this study, the reliability of the scale was satisfactory (understanding: Cronbach’s $\alpha = .853$; expectations: Cronbach’s $\alpha = .829$; support: Cronbach’s $\alpha = .899$) (Table 3).

The researchers conducted structural equation modelling (SEM) to explore the relationships between school principals’ understanding and expectations of and support for online teaching and learning. Based on the TRA study framework of the attitude-intention-behaviour mechanism (Hale et al., 2002), the authors proposed two hypotheses, drawing on Fishbein and Ajzen’s (1975) conceptualized presentation of attitude, intention, and behavior, namely, understanding, expectation, and support:

Hypothesis One: Principals’ understanding of online teaching and learning directly promotes their support.

Hypothesis Two: Principals' understanding of online teaching and learning indirectly promotes their support through the mediating role of expectation.

For the qualitative analysis, the authors conducted a thematic analysis to identify patterns of themes in school principals' concerns and suggestions about online teaching and learning in school education. They identified three themes, namely teaching and learning enhancement, challenges, and problems. Thematic analysis has been proven to be a useful and flexible method of qualitative research (Braun & Clarke, 2006). Xu and Zammit (2020) pointed out that thematic analysis can be applied in educational research to analyse qualitative data. To collect written feedback from the participants, the authors embedded one open-ended question in the survey questionnaire they sent to all primary and secondary school principals in Hong Kong. The question asked about the principals' concerns and suggestions regarding online teaching and learning in schools. The researchers received a total of 168 entries from the principals: 53 from primary schools and 115 from secondary schools. As some of the responses were in Chinese, two research support colleagues translated these entries into English and the authors reviewed them for further analysis.

Following the steps proposed by Braun and Clarke (2006), the authors conducted a thematic analysis. They assigned two research support staff members to 1) Read through the written responses to familiarise themselves with the data; 2) generate initial codes; 3) identify the themes and categorise the codes; 4) review the themes based on the research questions proposed; 5) define and name the themes. The team members conducted the coding separately. The authors reviewed and discussed all potential gaps and differences in the codes until they produced and finalised a list of codes. Finally, they identified three themes, namely teaching and learning enhancement, challenges, and problems. Table 2 shows the codes and corresponding themes and Appendix B provides the definitions of the codes.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 3 illustrates descriptive statistics for the means and standard deviations (SDs). The authors checked the data for normality as well. The skewness and kurtosis were within the range for retaining the assumption of normality.

Appendix A presents the descriptive statistics summarising the principals' responses to the questions. The overall rating is 4.05 (SD = 0.51). This means that the respondents generally agreed with the statements in the questionnaire.

Table 2. Codes and corresponding themes

Theme	Theme 1 – Teaching and Learning Enhancement	Theme 2 – Challenges	Theme 3 – Problems
Codes	Supplementary role of online teaching and learning (22). Trend and sustainability (16). Emergency online teaching and learning in the pandemic (10). Blended learning (9).	Teacher development (26). Resources (19). Home-school cooperation (12). Technological support (8). IT literacy (8). Learner diversity (8). Students' socioeconomic status (SES) (7).	Stakeholders' acceptance (18). Student attitude and attention (16). Teaching ineffectiveness (14). Whole-person education (12). Workload (11). Students' physical and mental health (8).
Counts	(57)	(88)	(79)

Table 3. Means and standard deviations and reliability of the survey (Cronbach's α)

Elements	Mean	SD	N	Cronbach's α
Age	3.55	0.570	313	
Gender	1.49	0.501	313	
Education level	1.88	0.496	312	
Awareness of online teaching	1.04	0.194	307	
Understanding	4.05	0.555	319	.853
Expectation	4.00	0.522	319	.829
Support	4.11	0.628	318	.899

Note: Gender (1 = male; 2 = female); Age (1 = 21–31; 2 = 31–40; 3 = 41–50; 4 = 51–60; 5 = 61 years or above); Education level (1 = bachelor's degree; 2 = master's degree; 3 = doctoral degree); Awareness of online teaching (1 = yes; 2 = no); Overall (understanding, expectation, and support).

Correlation Coefficients

The researchers calculated Pearson's correlation coefficients to measure the association between the variables. The results showed that the principals' understanding of online teaching and learning in schools was significantly associated with their expectations ($r = .706, p < .001$) and their support ($r = .725, p < .001$) for online teaching and learning, respectively. The researchers also found that the principals' expectations were significantly associated with their support ($r = .783, p < .001$) for online teaching and learning. Table 4 presents the Pearson's correlation coefficients.

Structural Equation Modelling

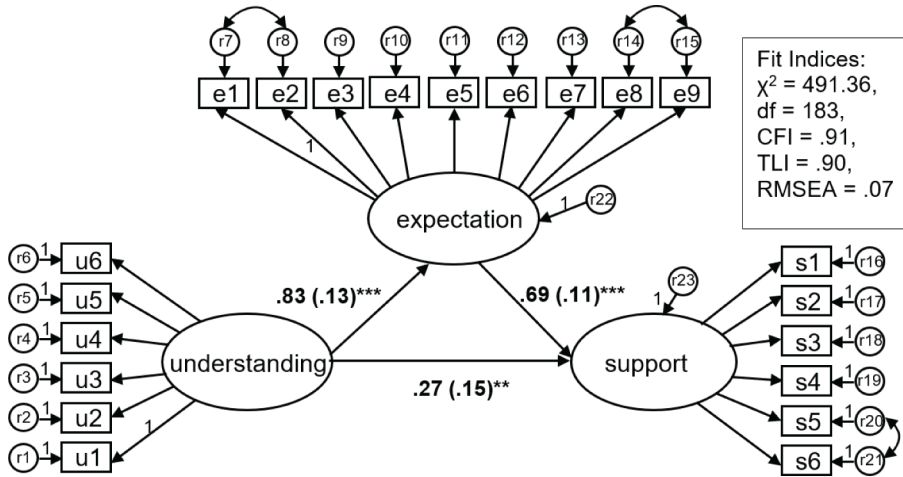
To answer the first research question, the researchers conducted SEM to explore the relationships between school principals' understanding and expectations of and support for online teaching (Figure). The SEM results showed an adequate model fit ($\chi^2 = 491.36, df = 183, comparative\ fit\ index\ [CFI] = .91, Tucker-Lewis\ index\ [TLI] = .90, root\ mean\ square\ error\ of\ approximation\ [RMSEA] = .073$) and significant paths from understanding to expectation ($\beta = .83, SE = 0.13, p < .001$), from expectation to support ($\beta = .69, SE = 0.11, p < .001$), and from understanding to support ($\beta = .27; SE = 0.15, p < .01$). To further examine the mediating relationship between understanding and support

Table 4. Pearson's correlation coefficients

	School Level	Age	Gender	Education Level	Awareness of Online Teaching	Understanding	Expectation	Support	Overall
School Level	1	.066	-.260**	.325**	-.098	.073	.049	.065	.069
Age		1	.073	-.076	.071	.036	.063	.075	.063
Gender			1	-.093	.077	.105	.041	.009	.056
Education Level				1	-.023	.191**	-.140*	.200***	-.195**
Knows Online Teaching					1	-.051	-.050	-.044	-.067
Understanding						1	.706***	.725***	.874***
Expectation							1	.783***	.931***
Support								1	.920***

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

Figure 1. Path coefficients and standard errors (in parentheses) of the structural equation model result



Note: u = understanding of online teaching and learning; e = programming expectation of online teaching and learning; s = support of online teaching and learning.

through expectation, the authors conducted bootstrapping with 2,000 resamples. The results revealed a significant mediating effect (0.57; 95% CI [.53, 1.13]), showing that principals' understanding of online teaching and learning may indeed influence their expectations, which, in turn, have an impact on their support.

Principals' Views of Online Teaching and Learning in School Education

The items on principals' understanding of online teaching and learning in schools showed that most were aware of the need to promote online teaching and learning in school education (mean = 4.37, SD = 0.72), although they did not have strong view on its ability to promote teachers' creativity in delivering their lessons (mean = 3.73, SD = 0.74). Meanwhile, the principals were unsure about whether it was good for students to learn online (mean = 3.79, SD = 0.78). They tended to agree that online teaching and learning could motivate students to develop self-regulated learning (mean = 3.92, SD = 0.81), which was in line with Müller et al.'s (2021) and Flack et al.'s (2021) studies. Further, the principals pointed out that the flexibility and benefits gained through online teaching and learning provides opportunities to enhance students' independent learning. In general, the principals agreed that they had understanding of online teaching and learning, although the results also indicated that the principals' educational level was associated with their level of understanding ($r = .191$, $p < .01$), expectations ($r = .140$, $p < .05$), and support ($r = .200$, $p < .01$).

In terms of the principals' expectations of online teaching and learning, most strongly agreed on the importance of students owning and having access to a proper device for online learning at home (mean = 4.54, SD = 0.65), which indicates support for the BYOD initiative. This was also echoed by Harris (2020) on the notion of mitigating the disparities in access to digital devices and the Internet facilitated by schools and in line with educators' appeal for minimizing the learning loss among disadvantaged students (Flack et al., 2021). Moreover, the principals noted the importance of the security and privacy issues online teaching and learning raised, and the need to keep the identities and data of teachers and students safe (mean = 4.67, SD = 0.52). However, they felt it would be difficult to address learner differences when working online (mean = 3.30, SD = 0.98). This was in line with Müller et al.'s findings (2021) that teachers face challenges online when trying to cater to diverse

student needs. The principals were also unsure whether schools should provide online learning after normal school hours (mean = 3.50, SD = 0.98).

Finally, the survey results showed that the principals, in general, tended to support the introduction and implementation of online teaching and learning in their schools. On the one hand, their support and encouragement for teachers who attended development courses on teaching effectively online was clear (mean = 4.45, SD = 0.64), and they also encouraged students to learn online (mean = 4.05, SD = 0.79). On the other hand, their responses indicated that not all schools were planning or setting up properly equipped classrooms to allow students to learn online together (mean = 3.90, SD = 0.87). Further, the schools' implementation status varied in terms of planning and establishing platforms and tools such as video conferencing, assignment collection and distribution, assessment, and other online activities (mean = 3.99, SD = 0.79).

The thematic analysis demonstrated the principals' agreement that the large-scale online teaching and learning employed after the first outbreak of COVID-19 pandemic and its several waves in Hong Kong has enhanced teaching and learning and created a new online norm. As the pandemic continues to progress, cross-border students who used to travel from their homes in mainland China to study in Hong Kong can no longer attend their schools in person. The principals agreed that online teaching and learning was unavoidable and would continue to play an important supplementary role in students' learning. Furthermore, some principals also expressed that, over the long term, a blended or hybrid mode of teaching and learning should be explored, sustained, and enhanced to best exploit the benefits of studying online.

The principals saw challenges ahead for online teaching and learning, exemplified by the lack of close communication and cooperation between families and schools. They argued that greater efforts were needed to ensure communication between the two parties and thus encourage in families a supportive attitude and positive view of learning at home. In addition, the sudden change in teaching methods had meant that some teachers had failed to implement effective online teaching and pedagogical practices. Therefore, the principals called for teachers to be provided with more development and training opportunities and equipped with adequate resources. Finally, students' IT literacy and their diverse learning needs needed to be addressed to ensure a smooth and effective learning experience. These findings have some similarities with previous research in terms of emphasizing the need to provide more training to teachers (Flack et al., 2021), but the priorities are not the same, compared with some developing countries (DeMatthews et al., 2021; Garcia & Revano, 2022). Hong Kong principals tend to seek for the solutions for effective and innovative pedagogies, while they seldom complained on the lack of IT infrastructure since the government had been invested in the past decade (EDB, 2015; EDB, 2021; Kong et al. 2014).

The principals were concerned that failure to properly overcome the above challenges in implementing online teaching and learning was likely to create problems or, indeed, has already created problems. These problems include stakeholders' unwillingness to accept online teaching and learning, students' low learning motivation, ineffectiveness in teaching, lack of whole-person development, a high workload for teachers, as well as problems with students' physical and mental health. These findings also align with previous studies, which concluded that learner motivation, self-regulatedness, and socialisation were the major themes that had emerged from online teaching and learning (Chiu et al., 2021; DeMatthews et al., 2021).

Some studies probed K-12 teachers' perceptions towards online teaching and learning after the outbreak of COVID-19 (Aliyyah et al., 2020; An et al., 2021; Cha & So, 2021; Chiu, 2021; Pressley, 2021). Similar with the principals being surveyed in this study, teachers around the world as frontline educators agreed that a blending of synchronous and asynchronous online teaching and learning can shape the future of education and improve the effectiveness (Aliyyah et al., 2020; An et al., 2021; Cha & So, 2021; Chiu, 2021; Pressley, 2021). Kundu and Bej (2021a) articulated that the secondary school teachers held positive views on the shift from face-to-face to online mode and they showed least worries on IT infrastructure. Teachers urged for professional development to enhance their

efficacy in planning and organising online teaching and learning activities by making use of existing technologies to engage students (Francom et al., 2021; Ma et al., 2021).

Although there is very little research investigating K-12 students' views on online learning, some researchers looked into their experience. Chiu (2021) argued that the students might be more engaged in cultivating digital competence and self-regulated learning if the online learning environments can facilitate autonomous learning. K-12 educators should also identify and address different needs of learners when delivering online mode by taking their age into consideration (Yan et al., 2021). Admittedly, lack of Internet access and electronic devices still hinders the online teaching and learning practices in some rural regions. Some researchers believed that students from marginal socioeconomic background may be left behind if there was not enough support provided by the schools and governments, and they pointed out that this gap can be mitigated with effective adoption of technologies and associated pedagogies (Francom et al., 2021; Kundu & Bej, 2021b; Van der Spoel et al., 2020). Besides, teachers believed that parents' support would help engage students in online learning (An et al., 2021; Francom et al., 2021). Foremost, school leaders and policy makers are encouraged to take care of teachers' and students' workload and well-being by providing adequate and timely support (Kim et al., 2022).

CONCLUSION

Online teaching and learning, as well as blended learning in technology-rich environments, will continue to develop into an integral component of school education in Hong Kong and other regions. The principals consented that the large-scale online teaching and learning implemented due to the face-to-face class suspension in view of the several waves of pandemic facilitated the transformation and enhancement of the new norm of a blend mode of synchronous and asynchronous online teaching and learning. The principals also pointed out that asynchronous online learning can provide appropriate supplementary learning support for students when they cannot study at schools for the afternoon sessions, which turns out to be effective for enhancing teaching and learning. Despite their positive opinions of online teaching and learning, the principals also expressed their concerns about the challenges to be overcome in online teaching and learning in school education in the coming years.

In the future, continued efforts are needed to ensure that teaching and learning are more effective. First, professional development schemes are greatly needed and will be welcomed by school management teams and in-service teachers. This is particularly true in terms of enhancing teachers' creative pedagogy, addressing learner differences in online environments, and making the best use of online teaching and learning to cultivate self-regulated and self-directed learning. Most of the principals pointed out that privacy and cyber security should be seriously considered when infrastructure is deployed for online teaching and learning. Awareness of user privacy and cyber security for both students and teachers must also be improved. Second, as the government has been investing in promoting and implementing BYOD schemes to make sure that every student has access to a device that is adequate for online learning, school-friendly schemes are needed to support local schools in speeding up the installation of high-speed Wi-Fi networks and identifying the appropriate devices for both students and teachers. For example, communities of practice among schools, principals, and teachers can be formed to enhance communications and peer support among educators by exchanging experiences in promoting BYOD, setting up hardware with good Internet connection, and paying attention to privacy and cyber security issues of users. Third, instead of focusing on the irreplaceability of face-to-face teaching and learning, schools must overcome challenges and exploit online teaching and learning to their full potential while they appropriately and effectively blend synchronous and asynchronous online learning. Fourth, the SEM of this study revealed that principals' understanding was significantly associated with their expectations and support. In this regard, there is an urgent need to provide opportunities for principals to have a better understanding

of online teaching and learning, such as ways to promote teachers' creativity in pedagogical delivery and strategies to stimulate self-regulated learning in blended learning.

This study has limitations. First, the study only collected feedback from principals. The single source of subjective data may lead to biased results. Future studies should involve responses from front-line teachers and students as the practitioners of online teaching and online learning, respectively. Second, although the study received feedback from about 30% principals of primary and secondary schools in Hong Kong, 70% of them did not reply. The views of online teaching and learning held by the nonrespondents cannot be ignored.

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CONFLICT OF INTEREST

The authors claimed no conflicts of interest.

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APPENDIX A

Table 5. Principals' understanding, expectation, and support for online teaching and learning in school education

Question Item (N = 319)	Mean	SD
Overall	4.05	0.51
Part I: Understanding	4.05	0.55
U1. It is necessary to promote online teaching and learning in school education.	4.37	0.72
U2. It is good for students to learn online.	3.79	0.78
U3. Learning online is important for students' futures.	4.18	0.70
U4. Online learning can motivate students to develop self-regulated learning.	3.92	0.81
U5. Online teaching can promote teachers' creativity in pedagogical delivery.	3.73	0.74
U6. Online platforms and tools can help teachers to deliver online teaching.	4.29	0.62
Part II: Expectation	4.00	0.52
E1. Schools should provide online teaching and learning in the formal curriculum.	3.56	0.94
E2. Online teaching and learning should be applied across various subjects as appropriate.	3.91	0.82
E3. Schools should provide online learning after normal school hours.	3.50	0.98
E4. Learner differences can be addressed through online teaching and learning.	3.30	0.98
E5. Online learning integrated in the flipped classroom learning approach can enhance students' self-learning abilities.	3.92	0.79
E6. Teacher development courses should be provided to facilitate effective online teaching and learning.	4.48	0.63
E7. Schools should adopt integrated platforms and tools for online teaching and learning.	4.18	0.65
E8. It is important for students to own/ have access to a proper device for online learning at home.	4.54	0.65
E9. With the rise of online teaching and learning, it is important to keep the identities and data of teachers and students securely.	4.67	0.52
Part III: Support	4.11	0.63
S1. I support the introduction of online teaching and learning in my school.	4.13	0.79
S2. I encourage teachers to make good use of online teaching and learning to teach their students.	4.14	0.73
S3. I encourage teachers to attend development courses for effective online teaching and learning.	4.45	0.64
S4. I encourage students to learn online.	4.05	0.79
S5. I am planning/implementing well-equipped classrooms for students to learn online together.	3.90	0.87
S6. I am planning/implementing platform and tools to facilitate online teaching and learnings, such as video conferencing for teaching and learning, assignment collection and distribution, assessment, and other online activities.	3.99	0.79

Note: A 5-point Likert scale is used, where 5 = "strongly agree" and 1 = "strongly disagree."

APPENDIX B**Table 6. Codes and definitions for thematic analysis**

No.	Codes	Code Definitions
1	Supplementary role of online teaching and learning	Online teaching and learning cannot replace face-to-face teaching and learning, as it serves a supplementary role in online teaching and learning.
2	Trend and sustainability	Online teaching and learning should be sustainable and become trends to promote quality teaching and learning.
3	Emergency online teaching and learning in the pandemic	Online teaching and learning during the pandemic are emergency measures due to suspension of face-to-face classes.
4	Blended learning	Blended learning is a blending of online and face-to-face learning.
5	Teacher development	Teacher development refers to teacher training and the professional development of online teaching and learning.
6	Resources	Resources refers to teachers' qualification/expertise, teaching strategies and materials, funding, equipment, and devices.
7	Home-school cooperation	Home-school cooperation refers to the quality of relations and communications to tackle the barriers to implementing online teaching and learning.
8	Technological support	Technological support refers to support related to technology.
9	IT literacy	IT literacy refers to students' skills in using IT and computers.
10	Learner diversity	Learner diversity refers to students' different learning needs.
11	Students' SES	Students' SES refers to students' and their families' economic access to resources and social position.
12	Stakeholders' acceptance	Stakeholders' acceptance refers to the perceived understanding of the importance of online teaching and learning and its potential benefits for teachers, students, and parents.
13	Student attitude and attention	Student attitude and attention refers to students' perceived attitudes towards online teaching and learning, and whether they stay focused during the process.
14	Teaching ineffectiveness	Teaching ineffectiveness refers to the unsatisfactory quality of online teaching process design and implementation.
15	Whole-person education	Whole-person education refers to the all-round education that fosters students' personal growth, social growth, and cognitive growth.
16	Workload	Workload refers to teachers' tight schedules, staff shortages, inadequate support, and online teaching development challenges.
17	Student physical and mental health	Student physical and mental health refers to the negative impacts on students' physical and mental health due to school closures and social distancing during the pandemic.

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