

## Teaching and learning with mobile technologies under COVID-19 pandemic: crisis or opportunity

---

Paul Lai Chuen Lam

Centre for Learning Enhancement and Research,  
The Chinese University of Hong Kong, Hong Kong  
Email: paul.lam@cuhk.edu.hk

Hilary K.Y. Ng\*

School of Education and Languages,  
Hong Kong Metropolitan University, Hong Kong  
Email: hilaryngky@gmail.com  
\*Corresponding author

**Abstract:** As an emergency response to continuing education amidst the recent COVID-19 pandemic outbreak, institutions turned to a new form of practice – synchronised online virtual teaching with mobile technologies. In this paper, we share our experience at a university level. Students (N = 1,996 students in Study 1 and N = 413 students in Study 2) completed a survey on their perception, the learning process, and the challenges they encountered when learning with a mobile device in the online virtual learning medium. Our findings suggested students show improvement in learning in the synchronised online virtual teaching with mobile technologies across time. Thus, this form of teaching model holds the promise of becoming the model for future teaching and learning practices. Hence, we hope to pave the way for research and learning opportunity to advance our understanding of the new education model with mobile technologies, especially under uncontrollable circumstances.

**Keywords:** COVID-19 pandemic; higher education; synchronised online virtual teaching; perceptions; challenges.

**Reference** to this paper should be made as follows: Lam, P.L.C. and Ng, H.K.Y. (2023) 'Teaching and learning with mobile technologies under COVID-19 pandemic: crisis or opportunity', *Int. J. Mobile Learning and Organisation*, Vol. 17, Nos. 1/2, pp.198–213.

**Biographical notes:** Paul Lai Chuen Lam is an Associate Professor at the Centre for Learning Enhancement and Research, The Chinese University of Hong Kong. He has extensive interest and experience in teaching and learning principles, case-based teaching and learning, web-assisted teaching and learning, and evaluation of eLearning and mLearning. He also has experience in designing educational tools. uReply (<http://web.ureply.mobi>) is a classroom student response system developed under his supervision.

Hilary K.Y. Ng is an Assistant Professor at the Hong Kong Metropolitan University (formerly known as The Open University of Hong Kong). She is continuously developing herself with expertise across social and cross-cultural psychology, educational science, educational technology, and positive education. As a multi-disciplinary scholar, her recent work has been published in numerous SSCI- and SCOPUS-indexed journals.

This paper is a revised and expanded version of a paper entitled ‘Online teaching and assessment: what we have learnt from a university-wide study in Hong Kong’, presented at eLearning Forum Asia 2020, The Chinese University of Hong Kong, 7–8 December 2020.

---

## **1 Introduction**

The COVID-19 pandemic had erupted in most countries and has reached a one-million worldwide death toll in 2020 (WHO, 2020). To cope with the deadly outbreak, governments across the globe have responded with lockdowns or forged a temporary vacuum of social activities. By way of illustration, Hong Kong has enacted restrictions on group gatherings and dining-in since 29th March 2020, limiting the number of people to gather as a group to four. In a bid to resume service and social life, many organisations are searching for crisis-response solutions to grapple with this new normal of social distancing, mostly by shifting from physical workplaces to online platforms via mobile technologies to work remotely.

A similar shift toward virtualisation is witnessed in the higher education sector, which enables teaching and learning under social distancing. To minimise social contact, teaching activities are not carried out in the ordinary physical space but via distance learning and online systems with mobile technologies, such as the cloud conferencing software – zoom. Under social distancing, many students stay home and access learning resources at their own pace. For instance, Massive Online Open Courses (MOOCs) are seeing exponential growth, facilitating learning from video lectures and peer-evaluated assessments (Impey, 2020). Learning management systems, such as Blackboard and Panopto, are also frequently accessed by teachers and students to disseminate learning materials and conduct assessments (Alkhaldi and Abualkishik, 2019). From a practical point of view, students’ performances in online learning conditions are modestly better than those receiving face-to-face instruction, as supported by a meta-analysis targeting 45 studies from K-12 to higher education. The hybrid of technology and education with mobile technologies has gained continuous attention in both practice and research (Lam et al., 2020; Ng et al., 2021; Qashou, 2021). It offers much to explore (Means et al., 2013) and perhaps becomes one of the solutions under this pandemic.

The higher education institutions in Hong Kong have generally utilised mobile technologies to resume the disrupted teaching schedule under COVID-19. Getting on the bandwagon of synchronised virtual online teaching with mobile technologies, most lectures and tutorials have been shifted to a video-conferencing setting with mobile technologies where real-time feedback can be made. With an expanded virtual classroom capacity to house students, more possibilities are offered to students to sit in other courses, granting them a higher degree of freedom to experience and experiment (Kaye and Barrett, 2018). The cloud conferencing software – zoom – in mobile technologies offers features including ‘breakout rooms’ and ‘polls’ that can be used to simulate group discussions, replicating the question-and-answer session in a face-to-face teaching and learning setting (Andresen, 2009).

Teaching aside, physical barriers are also resolved by mobile technologies. For local students living near and far from campuses, they can now cut down the time for traffic and utilise it for the best alternative uses. Teachers can arrange their teaching schedules

and enjoy greater flexibility in hosting and inviting guest speakers from all walks of life. As the pandemic transcends local territories, international students who have gone back to their home countries might face difficulties attending real-time lessons due to different time zones. To cater to students from different time zones, cloud recording with mobile technologies and lecture notes with voiceover has been offered to respond to the discrepancy. It is possible that a mixed-mode of instruction would be implemented in the future to reap the benefits from both on-and-offline learnings (Porter et al., 2016). In other words, the synchronised online virtual teaching which relies on a mobile learning environment may become the future teaching and learning model and hence warrants further investigation on its effectiveness. Thus, the present research is exploratory in nature.

## **2 The present research**

While COVID-19 might be eliminated as a pandemic in the foreseeable future, the opportunities and challenges posed by it continuously impact our way of living and learning. In the long run, it is imperative for education institutions and learners to identify and assess the upcoming trend of synchronised online virtual learning with mobile device. This paper intends to empirically evaluate this teaching and learning practice. We have chosen to investigate at The Chinese University of Hong Kong, one of the eight government-funded universities in Hong Kong. Specifically, the perception from students in adopting synchronised online virtual teaching is collected. In addition, this research also collects students' open-ended feedback related to the problems of synchronised online virtual teaching model. All in all, we hope to advance our understanding of the new education model and widen the possibility of including this model for future teaching and learning practice.

### *2.1 Research background*

The 2020 Chinese Lunar New Year Holiday ended with an immediate outbreak of COVID-19 in Hong Kong. All face-to-face classes in the higher education institutions were abruptly suspended as a consequence. Some higher education institutions put on lockdown with teaching and administration staff working remotely, and the originally two-week holiday ending in early February was extended to varying lengths, depending on the universities' risk assessments.

The Chinese University of Hong Kong, after a careful assessment of the situation, postponed the commencement of the second semester for two weeks and made a concerted effort to resume normal teaching with mobile technologies. After careful consideration of students' health and the quality of education, the university tried the best to resume classes as soon as possible, mainly by facilitating the shift from traditional face-to-face learning to synchronised online virtual learning with mobile technologies. Numerous teaching staff and students had expressed concerns about different potential challenges to this innovative teaching and learning practice, including the choices of software, the strategies of conducting learning with technology, and the tools for fair assessments. In view of this, special arrangements and training sessions were organised before the official class resumption. Specifically, various departments from six different faculties of the university had separately approached the special eLearning consultation

service to seek advice on related issues, including to enhance teaching and learning effectiveness in terms of classroom interaction, students' interest, and their engagement, to collect experience on the strategy to conduct peer evaluation, as well as the support of hardware and the content of the software, such as educational videos. In addition to this, a series of four e-Teaching and e-Learning courses were conducted to facilitate teachers to convert their traditional face-to-face teaching practices into the synchronised online virtual learning practices with mobile technologies. The usefulness of these workshops could be reflected by the number of participants, with at least 51 participants joined. Hence, both staff and students had been informed and trained to adopt a full-fledged online experience so as to familiarise themselves with a virtual learning context in the months to come.

When the semester finally resumed on 17th February 2020, all classes were shifted to a mode of synchronised online virtual learning with mobile technologies, adopting zoom, a real-time conferencing application in mobile technologies, and often coupled with the learning management systems, such as Blackboard and Panopto. Some popular interactive applications, namely, uReply and Kahoot!, were also utilised to elicit discussion and feedback anonymously or otherwise. For example, the functions of uReply, including the multiple question sessions with multiple question types, were chosen to supplement the built-in poll function of Zoom to enrich students' learning experience. Beyond this, a new module named 'attendance' was developed in uReply to help the teachers record students' attendance during the pandemic.

In addition to facilitating teachers to convert their teaching practice, there were certain key departments assisting an entire shift from traditional settings to online settings continuously during the semester. For instance, online learning guidelines were distributed to both staff and students via mass mail in advance. To cater to different teaching styles and needs, testing sessions and tutorials were arranged for lecturers and teaching staff to utilise the online teaching practice. The Centre for Learning Enhancement And Research (CLEAR) and the Information Technology System Centre (ITSC) jointly offered helping hands to support on-site support in resolving technical problems. A special community of eLearning was also set up with a liaison person from each department and school to gather the resources and support for teachers.

On top of these continuous measures, there were also special arrangements in guiding teachers on conducting their first remote assessment. Specifically, information sessions were organised jointly by the CLEAR and the ITSC to explore possible solutions for the new eAssessment. The total number of active users after the session was nearly doubled the estimated number of participants. Apart from these information sessions, there was a series of four courses targeting on related issues, including the e-Assessment, different options of online assessment such as proctored online exam and non-proctored open-book exam, as well as guidelines of online assessments. Also, the series covered different technical issues that teachers may encounter when designing online assessments.

### **3 Study 1**

To understand whether and how students embraced the shift to synchronised online virtual learning with mobile technologies, the university distributed questionnaires to ask their perceptions of the new teaching mode. In a bid to identify possible problems

encountered by different stakeholders, it is hoped that eliciting early feedback can assist the university to complement anything not fully articulated or considered in the teaching arrangement.

### 3.1 Method and participants

The first questionnaire was distributed in the first week of the synchronised online virtual learning with mobile technologies (17th February to 22nd February). Students received questionnaires targeted on their learning experience through e-mail. Altogether, 1,996 students responded in this first round. The questionnaires evaluated the perceptions (mainly by the closed-ended questions) and the challenges of synchronised online virtual learning with mobile technologies (mainly by the open-ended questions).

### 3.2 Measures

- *Perceived learning effectiveness* was measured by a single item “Do you think Zoom has enabled you to learn effectively?” Respondents were asked to response on *yes*, *no*, or *no view*.
- *Satisfaction of learning* was tapped by a single item “Indicate your overall level of satisfaction with the use of Zoom in online learning” with a 5-point Likert scale from 1 (highly unsatisfied) to 5 (highly satisfied).
- *Connection speed* was measured by a single item “How would you describe your experience of the speed of the Zoom platform” with a 5-point Likert scale from 1 (*Very Laggy*) to 5 (*Very Smooth*).
- *Functions of the learning platform* was tapped by three items on “Did the teacher in any of your lessons use the ‘breakout room’ function to group participants for group work?”, “Did the teachers in any of these lessons use the ‘Chat’ function, i.e. you sent text messages to the teacher and your peer during the lesson?”, and “Did you use the function ‘Raise hand’ to initiate a question or a comment?” that focused on three different functions of the learning platform
  - 1 breakout room
  - 2 chat
  - 3 raise hand.

Responses were rated on yes and no.

- *Attention and participation* was tapped by a single-item “Comparing to traditional classes, do you think your level of attention and participation increased in the virtual lessons?” with yes, no, and no view.
- *Problems encountered* was included to invite students to “list some problems/difficulties you have had in learning online using zoom” with open-ended responses to yield a more in-depth understanding.
- *Positive aspects encountered* was included as an open-response question to invite students to freely “list some good aspects of learning online using zoom”.

## 4 Results

### 4.1 The perception towards the synchronised online virtual learning

There were almost half of the students (43.20%) disagreed and 34.2% agreed that learning in the synchronised online virtual medium can be effective. Another factor that we studied is the satisfaction of learning of the synchronised online virtual learning with mobile technologies, showing a mean of 3.09 ( $SD = 1.08$ ). The final factor is on students' attention and participation, in which most of the students disagree that they were more attentive in the virtual lessons ( $N = 1,002$ ; 59.8%), only 23.9% of students agreed that they were more attentive than face-to-face lessons ( $N = 401$ ).

### 4.2 The learning process

Another two factors were studied to understand the learning process of the synchronised online virtual learning with mobile technologies. The first factor is the connection speed of the learning platform. The mean of the connection speed is 3.73 ( $SD = 0.82$ ). The second factor is the usage of the functions in the learning platform. The most common feature that students used is the chat function ( $N = 1,576$ ; 93.6%), then the breakout room ( $N = 1,007$ ; 59.0%), and finally the raise hands function ( $N = 573$ ; 34.1%).

### 4.3 The challenges of synchronised online virtual learning

In addition, we specifically included open-ended questions to understand the challenges encountered by the students. In general, students often faced difficulties related to

- 1 technology
- 2 hardware
- 3 the change of learning environment
- 4 attention span
- 5 teachers-and-students interaction
- 6 learning resources.

We present them here in detail one by one.

#### 1 Technology

Technical difficulties are one of the common concerns expressed by the respondents. Students reported that the network connection was unstable, and the log-in to the system was not always successful. Once they become more familiar with the learning technology, these technical difficulties could be overcome. Apart from these common difficulties experienced, there were some difficulties that some students uniquely encountered. For instance, some students complained that the lecture time was wasted due to technical issues such as teachers' unfamiliarity with the platform or failing to connect with teachers play video in Zoom. In fact, technical difficulties have also been a major challenge for teachers (Nickolić et al., 2019). Once they

become more familiar with the learning technology, these technical difficulties could be overcome.

## 2 Hardware

Hardware is another concern. Although the basic setup for synchronised online virtual learning only requires a laptop or a mobile phone, students may still need upgrading their equipment for a better learning experience, which they may not be able to afford. For example, a pair of earphones with a built-in microphone system is necessary to conduct discussions and presentations like traditional face-to-face learning environments. Buying the extra hardware puts a financial burden on the students. Besides, the internet connection was also a problem for online learning in other countries (e.g., Muthuprasad et al., 2021).

## 3 Learning environment

Contrary to the on-campus teaching mode, synchronised online virtual learning with mobile technologies enables learning outside the classroom. However, students expressed their concern about the suitability of their living environment to be a venue for learning. For instance, when students did not have their private rooms and shared their room with their parents or siblings, other family members might barge in or disturb their lessons. Noise pollution is also distracting, with construction sites nearby as a common source of disturbing noises. The learning environment might be a common problem for learning outside the classroom (Zhao et al., 2021).

## 4 Attention span

Students' attention is key to the success of teaching and learning practice (Prince, 2004). Students reported that their level of attention decreased compared with learning in a regular classroom setting.

## 5 Learning resources

In view of the new learning mode, students preferred to have the online lessons recorded so that they can review them at their own pace. This is also in line of the literature of the flipped classroom approach (Gannod et al., 2008; Lam et al., 2020; Mason et al., 2013; Ng and Lam, 2020; Ng et al., 2021). Students also suggested that more support could be provided from the teaching staff and departments, including accessible e-resources from the library and supplementary lecture notes. The insufficiency of learning resources was no longer reported by the students as their concern in the second round.

## 6 Teachers-and-students interaction

The synchronised online virtual learning with mobile technologies reduced genuine interactions between teachers and students in the traditional face-to-face teaching medium. Students reported fewer opportunities to interact with teachers as well as with each other as non-verbal cues were reduced in the learning platform, such as body language and facial expressions. Students also complained about a reduction in interactive in-class activities and in engagements among classmates as they could not talk to other students. They also reported that they could not ask teachers questions individually during breaks or after the lesson. Hence, some of the teaching and learning activities in the traditional face-to-face teaching medium seem not yet

possible in synchronised online virtual learning with mobile technologies. Students could not find appropriate means to raise the reduced in-class interaction.

## 7 Assessment

Student respondents also reported their worries about their assessment. They reported that presentations and group discussions were more difficult in the synchronised online virtual learning setting. Their performance would be largely affected by the network connection as well as their learning environment (Alruwais et al., 2018), and that the fairness of the assessment cannot be guaranteed in the online setting. As the final assessment is closer in the second round, students also reported their concerns about the final assessment, especially on academic honesty and privacy in the online learning platform.

In short, these challenges could be summed up as three main aspects: technical challenges including technology and hardware; challenges on learning environment including learning environment and learning resources; and pedagogical challenges including teachers-and-students interaction and assessment.

### *4.4 The good aspects of synchronised online virtual learning*

While there are no lack of debates about the barriers and limitations of synchronised online virtual learning with mobile technologies, feedback from the respondents also hinted at some opportunities and advantages of the new learning mode. Apart from the challenges or problems encountered, we have also invited students to freely list the good aspects of synchronised online virtual learning with mobile technologies.

Most of the students pointed out the convenience and flexibility of using in the virtual medium. They can learn at their own pace and in a self-perceived comfortable location, not necessarily confined to a lecture hall or classroom setting. For instance, some students may prefer to have lessons at home, in cafés or libraries. As long as they have an internet connection, they can learn wherever they find comfortable. It is also believed that attendance and punctuality are improved in the online context. When the time and cost of transportation are minimised, students can access their virtual classrooms at their fingertips via smart devices. This learning model enables students to have a higher degree of control over their learning schedule. With recording applications or built-in features, students can review the lectures without the fear of missing out in class. They can pause, fast forward, or slow down to jot notes according to their grasp of knowledge. This benefit is quite similar to the qualitative study in other countries (e.g., Dwidienawat et al., 2020).

## 5 Study 2

After gathering the above feedback in Study 1, the university had continued and included additional support for teachers and students to overcome the challenges. For example, the on-site support was continued to offer immediate technical assistance. The tutorial sessions on how to teach and learn under pandemic with guidance were continued. In addition, the university reopened several lecture rooms for teachers and students to facilitate online teaching and learning activities with mobile technologies to take place.



The library arranged additional support to convert the physical books into electronics. As the final examination was coming, the university granted the faculties permission to decide whether they would arrange special measures related to the grading and assessment, such as enabling students to choose pass-and-fail options or allowing students to drop the course at a time later than the conventional ones, or other arrangements in monitoring the examinations. This additional study was intended to further investigate students' learning effectiveness.

### 5.1 Method and participants

Another questionnaire was distributed (4th May to 24th June) through e-mail to further evaluate students' perception of the synchronised online virtual learning with mobile technologies. There are 413 students responded.

### 5.2 Measures

The measures that filled in for the students in this additional study are equivalent to Study 1. To be specific, we have also evaluated the perceived learning effectiveness, the attention and participation, the satisfaction of learning for the perception of synchronised online virtual learning with mobile technologies. The connection speed for the learning process of synchronised online virtual learning with mobile technologies. The wording for the satisfaction was slightly modified, "*indicate your overall level of satisfaction with the use of zoom in online learning*" but with same 5-point Likert scale in Study 1.

## 6 Results

### 6.1 The perception of synchronised online virtual learning

As in Study 1, the perception of synchronised online virtual learning with mobile technologies was measured by two factors. Students reported an average satisfaction of 3.14 ( $SD = 1.06$ ) and 38% considered learning in zoom as effective. Comparing to Study 1, the overall satisfaction score was higher in the second round (mean = 3.13) than in the first round (mean = 3.09), and yet the results from the independent T-test showed that this improvement has not reached statistically significant,  $t(2061) = -.08$ ,  $p = .43$ , see Table 1.

Likewise, the percentage of students disagree on the learning effectiveness of synchronised online virtual learning with mobile technologies is slightly higher in Study 1 (43.2%) than Study 2 (42.67%). In contrast, those who agree on the learning effectiveness of synchronised online virtual learning with mobile technologies is lower in Study 1 (34.21%) than Study 2 (38.05%), see Table 2. A Mann-Whitney U test was followed and revealed these improvements had not reached statistical significance,  $p = .102$ .

There are also more students agreed that learning in Zoom enhanced their attention and participation in the second round (25.3%;  $N = 99$ ) than the first round (23.9%;  $N = 401$ ), see Table 2. A Mann-Whitney U test was followed and revealed these improvements had not reached statistical significance,  $p = .156$ .

In sum, these results indicated that the results in Study 2 were generally has been improved, although not statistically significant. Perhaps, it showed that students are more adopted to learning in the synchronised online virtual medium after a whole semester and the support from the university is useful.

## 6.2 The learning process of synchronised online virtual learning

The mean for the connection speed is 3.70. It is largely similar to the mean level of Study 1 (mean = 3.73). The independent T-test followed and revealed this difference was not significant,  $t(2275) = .81$ ,  $p = .42$ , see Table 1. Thus, there are no significant improvements or detriment in view of the connection speed of the learning platform.

**Table 1** Independent sample T-Test for the satisfaction of synchronised online virtual learning and the connection speed across time

	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>F</i>	<i>t</i>	<i>p</i>	<i>Mean difference</i>
<i>Variables</i>							
<i>Satisfaction</i>							
Time 1	1,673	3.09	1.08	0.60	-0.78	0.43	-0.05
Time 2	390	3.14	1.06				
<i>Connection speed</i>							
Time 1	1,879	3.73	0.87	1.57	0.81	0.42	0.39
Time 2	398	3.7	0.82				

**Table 2** The percentage distribution of the attention and effectiveness of online virtual learning across time

		<i>n</i>	<i>Valid percentage</i>			<i>n</i>	<i>Valid percentage</i>
<i>Variables</i>							
<i>Attention</i>							
Time 1	Yes	401	23.90%	Time 2	Yes	99	25.30%
	No	1,002	59.80%		No	243	62.10%
	No view	273	16.30%		No view	49	12.50%
<i>Effectiveness</i>							
Time 1	Yes	572	34.20%	Time 2	Yes	148	38.00%
	No	722	43.20%		No	165	42.40%
	No view	377	22.60%		No view	76	19.50%

## 7 General discussion

In response to continuing education amidst the recent COVID-19 pandemic, the present research explored and evaluated the teaching and learning experience. The present evaluation shared our experience to face the pandemic at a university level. Specifically, we first described how our university responded to the threat. Second, we evaluated the

effectiveness of synchronised online virtual learning by collecting close-ended feedback from students in different faculties across different time points. Third, we also obtained the open-ended feedback on the different aspects of synchronised online virtual teaching with mobile technologies.

The present evaluation holds promise to benefit a wider audience. Most of the existing evaluation focused on the course level, answering how a course reacted to facilitate students' learning (e.g., Jaberzadeh and Mansouri, 2021; Njoki, 2020), and how teachers (Xu et al., 2021) or students in a course (Rodríguez-Rodríguez et al., 2020) responded to the crisis. In contrast, the present research attempted to conduct evaluation at the university level and recruited students from different academic disciplines. We also described how different departments in our university jointly responded to this threat, such as the provision of teaching trainings from time to time. The smooth cooperation from different departments and staff seems to be one of the keys to respond to the sudden change of external circumstances and to continue to offer quality education to students in higher education.

Our findings on the students' perceptions of synchronised online virtual learning with mobile technology are also noteworthy. The sudden change is expected to pose a threat to the learning experience. Students' responses on their perception towards the synchronised online virtual learning and its associated learning process were in line with the concern expressed at the very beginning. Specifically, students considered learning in the synchronised online virtual medium with mobile technologies was less effective and attentive than learning in the face-to-face medium. They also participated less in the learning activities of the synchronised online virtual medium using mobile technology, even though the average of their satisfaction was moderate with fair connection speed. With additional support from the university, students' perception of their learning experience and process showed an improvement towards the end of the semester. It is noteworthy that the mean of the overall satisfaction was improved, indicating that students were more satisfied with this new learning practices. Besides, the self-perceived learning effectiveness and attention have also slightly increased. Yet, these improvements had not reached statistically significant that may be due to the short time lag in between. All in all, these results suggested that students more adjusted to learning in the synchronised online virtual medium with mobile technologies.

While future research could continue to explore the underlying reasons for the improvement, the present research can provide some suggestions from the students' open-ended responses. In addition to students' perceptions, we have specifically invited students to provide open-ended responses on their challenges encountered during the changing of the learning environment and learning process. The findings also presented various challenges on the students' side, including but not limited to technical difficulties with mobile technologies, limitations on the learning environment, and pedagogical challenges that call for enhancement of interactions and efficiency. The school had then adopted measures targeted these difficulties.

The technical difficulties can be considered personal problems that fall short of having the required skills, devices, and infrastructures to conduct learning fully with mobile technologies. It does not incur advanced technological breakthroughs that may not occur in a short time. These problems remain on the digital divide, referring to the disparities in the access, usage, and outcomes of information and communication technology, in which the education practice has been heavily influenced (Lythreathis et al., 2021). The digital divide has been found to impact the psychological distress during the

COVID-19 pandemic induced emergency online learning in other countries (e.g., Saha et al., 2021). Thus, this is a societal and cross-cultural challenge that intensifies inequalities within society and requires immediate solution before the emergence of mobile learning. Yet, solving this problem is not as difficult as expected at the university level. The university can offer device borrowing service and support to use technologies to its students. These solutions are effective and only require a short period for the arrangement.

The second difficulty is the constraints of the learning environment. The synchronised online virtual learning with mobile devices presents itself as more flexible than the traditional mode in terms of location and time. When learning in the fully virtual medium, students still require a quiet environment with minimal disturbance to conduct mobile learning. However, the provision of these public spaces has been complicated, especially in Hong Kong. The banning of diners from insider restaurants had quickly been reversed within 24 hours (SCMP, 2020). Hong Kong residents have only 2.7 square metres per person that is particularly small (BBC, 2020). Thus, staying at home or in public spaces to study is not feasible. Thus, the university had reopened several lecture rooms for students and teachers to conduct mobile learning in the middle of the semester and before Study 2.

Last but not least, the changing of face-to-face learning to synchronised online virtual learning with mobile devices had minimised the personal interaction and contact among students-and-students and students-and-teachers. This is purposive in dealing with the pandemic, but a sudden change in the pedagogy fostered a sense of loneliness to students (Telyani et al., 2021). This can partially be settled by encouraging the teachers to use the functions of the learning platform to mimic the face-to-face learning activities. In addition to this, students can also be trained to encourage them to actively participate in synchronised online virtual learning with mobile technologies.

Apart from the insight gained from students' open-ended responses, we also speculated two other reasons. First, the sudden change of educational practices may demand students a period of adjustment and fit in learning with the full use of mobile technologies. Given an adequate time for adaptation, students could perform equally well, or even better, in a mobile learning environment as in the face-to-face setting. This is supported by the phenomenon observed by the cross-cultural psychologists when studying acculturation. They noted a U-shaped curve as the common pattern of adjustment to acculturation. In the beginning, people would have very positive feelings about the novel and exotic experience in the host culture, but these experiences would turn to be tiring and difficult over time. After passing through this stage, they begin to fit in and become more enjoying their experience. More interestingly, this U-shaped curve is observed not only among people who move to a new country permanently but also among sojourners who return to their home country after a temporary stay in another culture (Heine, 2020). It is also possible that students need time to adjust to the changes in the learning environment and the full use of mobile technologies in learning. Beyond this, the temporal change in students' perception of synchronised online virtual learning with mobile technologies is worthy for investigation.

Second, it is also possible that the measures the university had adopted were effective. As mentioned, the university had spent a lot of effort in helping to sustain the educational practices during the social distancing. It has continued monitoring students' and teachers' needs in educational practice during the pandemic. Then, the respective departments worked closely to arrange and provide the support that targeted to address

the identified needs, such as reopening lecture rooms to deal with the spatial problem. These measures may be effective in facilitating students to adjust to the changing learning environment and fit in learning with the full use of mobile technologies.

Despite these challenges, new opportunities followed to support the synchronised online virtual learning as a strategy to complement, if not substitute, the traditional practice under the health crisis. As mentioned by the students' responses about the positive aspects, synchronised online virtual learning presents itself as more flexible than the traditional mode in terms of location. It saves the time and cost of traffic for all stakeholders and holds the promise of learning *anywhere*. In fact, this characteristic has been found to be a factor encouraging students to adopt mobile learning (Qashou, 2021). This is important because mobile learning enables students to complete their learning activities and assess the learning materials without temporal or spatial restrictions, making learning easier and more flexible (Qashou, 2021). Such an instructional model could contribute to the recent movement of student-centred learning, opening the possibility of differentiated learning and other forms of teaching pedagogies (Keebler and Huffman, 2020; Lam et al., 2021) and practice (Dwidienawati et al., 2020; Kaye and Barrett, 2018; Ng and Lam, 2020; Ng et al., 2021). Having explored the possibilities brought by the new learning mode, it is arguable that synchronised online virtual learning may be considered a sufficiently good alternative to face-to-face teaching and even hold the promise to become the future model of education, or at least in times of necessity, such as under the pandemic.

## 8 Conclusions

Described by the World Health Organization as a contemporary threat to humanity, it is still unknown how long the pandemic persists, not to mention the outlook after the pandemic (WHO, 2020). In the face of uncertainty, this research illustrated a university-wide measure on the real-life responses – synchronised online virtual learning – to the crisis and obtained open-and close-ended feedback from students on this new practice. Their feedback on how they perceive this new practice is important to understand what they feel about synchronised online virtual learning, whether synchronised online virtual learning can be sustained in the future, as well as the advantages and disadvantages of mobile learning. All in all, we have collected closed-ended responses in their perception towards the synchronised online virtual learning and the associated learning process. These responses were collected across two time-points such that statistical tests can be conducted for comparisons. We have also provided the opportunity for them to provide open-ended feedback on the good and negative aspects of this learning experience.

Nonetheless, several challenges and obstacles are still to be overcome with effort and empirical evidence to deliver quality education to students in this new learning practice. For instance, future research could incorporate more well-established scales for investigation. Due to the exploratory nature with immediate evaluation, the present research relied on several single-item measures to obtain students' feedback from diverse perspectives. Although it is impactful that the improvements were found in different measures in the present research, most of the enhancements are not statistically significant. Future research could consider testing the differences in temporal change with different time lags or a longer time span. While the feedback collected from students

established the foundation on students' subjective perception about synchronised online virtual learning with mobile technologies, the digital footprints during this period can provide further insight. Future research could adopt a learning analytics approach in triangulating the findings in this research. All this empirical evidence could directly maximise the learning effectiveness and efficiency of the new learning mode. It is hoped that the new learning mode can thrive to benefit and shed lights on the practical implementation of future mobile learning.

## References

- Alkhalidi, A. and Abualkishik, A. (2019) 'The mobile blackboard system in higher education: discovering benefits and challenges facing students', *International Journal of Advanced and Applied Sciences*, Vol. 6, No. 6, pp.6–14.
- Alruwais, N., Wills, G. and Wald, M. (2018) 'Advantages and challenges of using e-assessment', *International Journal of Information and Education Technology*, Vol. 8, No. 1, pp.34–37, <http://doi.org/10.18178/ijiet.2018.8.1.1008>.
- Andresen, M.A. (2009) 'Asynchronous discussion forums: success factors, outcomes, assessments, and limitations', *Educational Technology and Society*, Vol. 12, No. 1, pp.249–258.
- BBC (2020) *Hong Kong's Public Space Problem*, 2 September [online] <https://www.bbc.com/worklife/article/20200831-hong-kong-public-space-problem-social-distance> (accessed 21 July 2021).
- Dwidienawati, D., Abdinagoro, S.B., Tjahjana, D. and Gandasari, D. (2020) 'E-learning implementation during the COVID-19 outbreak: the perspective of students and lecturers', *Journal of Social Sciences*, Vol. 48, No. 4, pp.191–196.
- Gannod, G., Burge, J. and Helmic, M. (2008) 'Using the inverted classroom to teach software engineering', *ICSE '08: Proceedings of the 30th International Conference on Software Engineering*, pp.777–786, Association for Computer Machinery, <https://doi.org/10.1145/1368088.1368198>.
- Heine, S. (2020) *Cultural Psychology*, 4th ed., W.W. Norton, New York, NY.
- Impey, C. (2020) 'Massive online open courses see exponential growth during COVID-19 pandemic', *The Conversation* [online] <http://theconversation.com/massive-online-open-courses-see-exponential-growth-during-covid-19-pandemic-141859> (accessed 18 July 2021).
- Jaberzadeh, S. and Mansouri, F. (2021) 'Short-term research projects in cognitive neuroscience for undergraduate students: a contingency plan to maintain quality teaching during COVID-19 pandemic', *Advances in Physiology Education*, Vol. 45, No. 2, pp.376–383, <https://doi.org/10.1152/advan.00012.2021>.
- Kaye, H. and Barrett, J. (2018) 'Making online teams work', in Baxter, J., Callaghan, G. and McAvoy, J. (Eds.): *Creativity and Critique in Online Learning*, Palgrave Macmillan, Cham., [https://doi.org/10.1007/978-3-319-78298-0\\_4](https://doi.org/10.1007/978-3-319-78298-0_4).
- Keebler, D.W. and Huffman, J. (2020) 'Effective eLearning and transformative pedagogical strategies: STEM programs', *International Journal of Online Pedagogy and Course Design*, Vol. 10, No. 2, pp.61–70, <https://doi.org/10.4018/IJOPCD.2020040105>.
- Lam, P., Ng, H.K.Y., Lau, C.K.M. and Tse, A.H.H. (2020) 'Flip or not? Evaluating the effectiveness of the flipped classroom in Hong Kong higher education', *Journal on Excellence in College Teaching*, Vol. 31, No. 4, pp.89–107.
- Lam, P.L.C., Ng, H.K.Y., Tse, A.H.H., Lu, M. and Wong, B.Y.W. (2021) 'eLearning technology and the advancement of practical constructivist pedagogies: illustrations from classroom observations', *Education and Information Technologies*, Vol. 26, pp.89–101, <https://doi.org/10.1007/s10639-020-10245-w>.

- Lythreathis, S., Singh, S. and El-Kassar, A. (2021) 'The digital divide: a review and future research agenda', *Technological Forecasting and Social Change*, Article No. 121359, <https://doi.org/10.1016/j.techfore.2021.121359>.
- Mason, G., Shuman, T. and Cook, K. (2013) 'Comparing the effectiveness of an inverted classroom to a traditional classroom in an upper-division engineering course', *IEEE Transactions on Education*, Vol. 56, No. 4, pp.430–435, <https://doi.org/10.1109/TE.2013.2249066>.
- Means, B., Toyama, Y., Murphy, R. and Bakia, M. (2013) 'The effectiveness of online and blended learning: a meta-analysis of the empirical literature', *Teachers College Record*, Vol. 115, No. 3, p.1.
- Muthuprasad, T., Aiswarya, S., Aditya, K.S. and Jha, G.K. (2021) 'Students' perception and preference for online education in India during COVID-19 pandemic', *Social Sciences & Humanities Open*, Vol. 3, No. 1, p.100101.
- Ng, H.K.Y. and Lam, P.L.C. (2020) 'How the number of lessons flipped influence the overall learning effectiveness and the perceptions of flipped learning experiences?', *Interactive Learning Environment*, <https://doi.org/10.1080/10494820.2020.1826984>.
- Ng, H.K.Y., Lam, P.L.C., Chan, K., Leung, H. and Lai, S. (2021) 'Flipping the classroom: will the changes of teachers influence learning outcomes?', *Proceedings to ICEEL 2020: 2020 The 4th International Conference on Education and E-Learning*, pp.42–45, ACM. <https://doi.org/10.1145/3439147.3439156>.
- Nickolić, V., Petković, D., Denić, N., Milovančević, M. and Gavrilović, S. (2019) 'Appraisal and review of e-learning and ICT systems in teaching process', *Physica A: Statistical Mechanics and its Applications*, Vol. 513, pp.456–464, <https://doi.org/10.1016/j.physa.2018.09.003>.
- Njoki, P. (2020) 'Remote teaching of general chemistry for nonscience majors during COVID-19', *Journal of Chemical Education*, Vol. 97, No. 9, pp.3158–3162, <https://doi.org/10.1021/acs.jchemed.0c00864>.
- Porter, W.W., Graham, C.R., Bodily, R.G. and Sandberg, D.S. (2016) 'A qualitative analysis of institutional drivers and barriers to blended learning adoption in higher education', *The Internet and Higher Education*, Vol. 28, pp.17–27, <https://doi.org/10.1016/j.iheduc.2015.08.003>.
- Prince, M. (2004) 'Does active learning work? A review of the research', *Journal of Engineering Education*, Vol. 93, pp.223–231, <https://doi.org/10.1002/j.2168-9830.2004.tb00809.x>.
- Qashou, A. (2021) 'Influencing factors in M-learning adoption in higher education', *Education and Information Technologies*, Vol. 26, pp.1755–1785, <https://doi.org/10.1007/s10639-020-10323-z>.
- Rodríguez-Rodríguez, E., Sánchez-Paniagua, M., Sanz-Landaluze, J. and Moreno-Guzmán, M. (2020) 'Analytical chemistry teaching adaptation in the COVID-19 period: Experiences and students' opinion', *Journal of Chemical Education*, Vol. 97, No. 9, pp.2556–2564, <https://doi.org/10.1021/acs.jchemed.0c00923>.
- Saha, A., Dutta, A. and Sifat, R.I. (2021) 'The mental impact of digital divide due to COVID-19 pandemic induced emergency online learning at undergraduate level: evidence from undergraduate students from Dhaka City', *Journal of Affective Disorders*, Vol. 294, pp.170–179, <https://doi.org/10.1016/j.jad.2021.07.045>.
- SCMP (2020) *Hong Kong Reverses Covid-19 Ban on Dining in at Restaurants after Public Backlash*, 30 July [online] <https://www.scmp.com/yp/discover/news/hong-kong/article/3095291/hong-kong-reverses-covid-19-ban-dining-restaurants-after> (accessed 18 July 2021).
- Telyani, A., Farmanesh, P. and Zargar, P. (2021) 'The impact of covid-19 instigated changes on loneliness of teachers and motivation–engagement of students: a psychological analysis of education sector', *Frontiers in Psychology*, Vol. 12, p.4353, <http://doi.org/10.3389/fpsyg.2021.765180>.
- WHO (2020) *Coronavirus Disease (COVID-19) Pandemic*, World Health Organization [online] <https://www.who.int/emergencies/diseases/novel-coronavirus-2019> (accessed 17 July 2021).

- Xu, Q., Chen, S., Wang, J. and Suhadolc, S. (2021) 'Characteristics and effectiveness of teacher feedback on online business English oral presentations', *The Asia-Pacific Education Researcher*, Vol. 30, pp.631–641, <https://doi.org/10.1007/s40299-021-00595-5>.
- Zhao, L., Hwang, W.Y. and Shih, T.K. (2021) 'Investigation of the physical learning environment of distance learning under COVID-19 and its influence on students' health and learning satisfaction', *International Journal of Distance Education Technologies*, Vol. 19, No. 2, pp.61–82.