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Students' perceptions of the actual effectiveness of mobile learning during the Covid-19 pandemic

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1.1 Introduction

Since the onset of the COVID-19 pandemic, educational institutions globally have had to temporarily shut their doors, leading to a widespread halt of in-person classes and cancellation of exams. Most higher education institutions have opted to substitute traditional face-to-face learning with remote education through online platforms to lessen the impact on academics (Chu et al., 2021). Hong Kong has not been aloof from the situation; students can study from home remotely (Hong Kong Ideas Centre & Policy 21 Limited, 2020). Owing to technological advancements and the ubiquity of the internet, distance learning has made a substantial impression on the global education sector and is steadily gaining traction across the globe.

The widespread application of mobile learning in Hong Kong is evident. The Education Bureau has provided backing to educational institutions at all tiers by offering various types of funding and resources to facilitate the implementation of online learning (Hong Kong Legislative Council, 2020). For instance, the Education Bureau encouraged schools to use mobile devices to support students' learning at home through the Fourth Strategy on Information Technology in Education, enabling students to achieve "suspending classes without suspending learning" (HKEDB, 2016).

In light of this, even though the current generation of university students in Hong Kong had extensive experience with mobile learning before the pandemic, it does not necessarily mean they have easily adapted to using it as a distance learning strategy. According to various local scholars who conducted research on distance learning during the COVID-19 period, the majority of students had a more negative outlook toward learning amidst the pandemic, expressing low levels of satisfaction and encountering numerous challenges.

Although Hong Kong has entered the post COVID-19 era, mobile learning has already established new learning habits among institutions and students. While the Hong Kong government has gradually relaxed social distancing measures and schools have resumed face-to-face teaching, remote learning remains a valuable contingency plan in the case of future pandemics. Furthermore, mobile learning experienced rapid growth and it would be unwise to disregard its potential as a valuable education tool once the pandemic subsides, it is crucial to understand the views of Hong Kong students on the effectiveness of mobile learning during the pandemic. As such, it is vital to continue exploring the actual effectiveness and opinions of students towards mobile learning, and to integrate it into the education system as a valuable tool for future learning.

This research aims to explore the actual application status and effectiveness of mobile learning as a distance learning strategy, together with the students' perception towards the adoption of mobile learning based on their learning satisfaction, targeted the university students in Hong Kong, during the COVID-19 pandemic. This study will employ the Technology Acceptance Model (TAM) in numerous areas to gain a more concrete understanding of students' actual perceptions when using mobile learning, further promoting an investigation of effectiveness.

1.2 The significance of this research

This report can bring benefit to 2 parties. First of all, students must be the main beneficiaries. Through this research project, it can effectively point out the benefits gained, plus the difficulties faced by students through mobile learning during the epidemic. In the long run, it can improve the effectiveness of teaching and enable students to obtain higher-quality learning opportunities. Second, it can support the university and its teaching staff to more effectively handle course matters from an objective perspective, understand students' intuition, and then modify the current learning strategies for online courses. Effective learning strategies can reduce the administrative burden on both staff and universities (Woelert, 2023), while enhancing the school's reputation and better evaluation among students. Additionally, we may

consider the outcome of the report as a significant indicator of the students' perception to determine whether the mobile learning adopted in Covid-19 should be continued to implement as a type of conventional education method during the easing time of epidemic and even the time after the epidemic, based on the data and analysis results acquired in the study.

1.3 Research Purposes and Research Questions

This proposed study aims to examine the actual application status and effectiveness of mobile learning as a distance learning strategy, explore the relationship between students' learning satisfaction and learning performance, together with their perception of the effectiveness of the use of mobile learning during the COVID-19 pandemic. The study will answer the research questions below:

1) What are students' perceptions of adopting mobile learning as a distance learning strategy during the Covid-19 pandemic?
2) Can students benefit from the adoption of mobile learning for educational purposes during this COVID-19 pandemic?
3) What are the possible factors influencing the effectiveness of mobile learning from a students' perspective?

II. Literature Review

2.1 Mobile learning and its application in Hong Kong

Mobile Learning is described as learning that takes place when a learner uses mobile technology to learn at any time and in any location (Traxler, 2005). Mobile devices are used to conduct m-learning. Mobile devices, which range from smartphones to netbooks, are portable instruments for productivity, learning, and communication that support a larger range of activities thanks to software created specifically for mobiles (Johnson et al., 2010). Although it is related to online learning and distance learning, the obvious difference between them is the comprehensive learning and the use of handheld devices to learn.

Together with leveraging mobile technology, mobile learning integrates pedagogies from technology-supported learning and conventional classroom settings, changing the ideas of location and dialogue. With its distinctive, localized, and context-aware learning opportunities, this strategy effectively raises learner motivation and engagement (Katz & Aakhus, 2002). Additionally, extending educational possibilities to distant or inaccessible students, mobile learning supports both conventional and online learning strategies. Mobile learning encourages flexibility and customization, empowering students from all backgrounds as mobile devices continue to change the

educational environment. This adaptable learning environment closes the gap between traditional and digital education by enabling the seamless integration of formal and casual learning events. By embracing mobile learning, instructors and students can benefit from improved accessibility, teamwork, and knowledge application in the real world, ultimately fostering a more productive and interesting learning environment (Traxler, 2005).

Back to Hong Kong, many years ago, Hong Kong began research on "mobile learning" and its development, such as building up on-campus wireless networks and promoting a "bring your own device" (BYOD) culture in all schools. Practice in Hong Kong schools has produced more "mobile learning" approaches, enabling mobile learning to be applied to daily learning and teaching, and is also a vital component in driving the expansion of the Hong Kong mobile learning sector. The Hong Kong Education Bureau has also supplied several IT resources for pupils to study at home during the epidemic since the outbreak began. They believe that the hybrid type of instruction (i.e. face-to-face classrooms paired with mobile learning at home) may become the new mainstream (HKEDB, 2021).

Government initiatives are not the only reason for the expansion of mobile devices in education; the 21st century's broad embrace of technology additionally made an influence. Behind the walls of educational institutions, students of all ages own their own mobile devices. The majority of adults now own multiple mobile devices, which has led to an exponential expansion in their use. The age range of 18 to 29 is the largest population of mobile device users, and this is also the usual age of university students (Crompton & Burke, 2018).

As a result, the use of mobile devices is in line with current technological trends for modern Hong Kong university students who have been subjected to mobile learning throughout their primary and secondary education. These pupils have mastered the use of mobile devices for educational purposes, showing a natural propensity for this mode of learning.

2.2 Mobile learning during COVID-19

A number of preventive actions have been implemented to combat the pandemic and slow the virus's global spread. The closure of educational institutions is one such tactic (Batubara, 2021). Remote learning has become an unavoidable option during such situations in order to strike a balance between educating students and keeping social

distance. Higher education institutions and universities have embraced a variety of technologies to help with this process, including learning management systems (like Moodle, Blackboard), online meeting tools like Zoom and Google Meet, and other educational portals. Even so, the majority of online learning platforms failed to plan for or foresee the increase in the number of online learners, leaving them inadequate to cope with the sudden surge of users. There are well-known benefits and drawbacks to employing mobile learning in the classroom (Saikat et al., 2021). Although they have access to learning materials via a variety of channels, including desktops and laptops, most students prefer to use mobile devices as an alternative option when they are alone (Al-Emran, 2020).

Mobile Learning (ML) has been employed as a social educational platform at universities throughout the world (Alhumaid et al., 2021). Learners can improve their overall learning experience by introducing interactive ways to access content from remote locations as the usage of digital learning solutions grows with the proliferation of mobile devices. Students can use mobile devices to access online course management platforms like Moodle, which are often used in colleges. Additionally, students have been using a variety of social media platforms for learning during the

COVID-19 pandemic, such as Facebook, YouTube, Google+, and WhatsApp (Biswas, 2020).

2.3 Student Satisfaction

Satisfaction represents the emotional attitude of end users who interact directly with the application towards a particular computer application (Doll et al., 1998). Hence, Student Learning satisfaction is a feeling or attitude toward a learning activity driven by the student's enjoyment of the activity or the fulfillment of his or her wishes and needs during the learning process (Tough, 1982). Thus, learning satisfaction can be utilized to explain why students want to participate in learning activities and what they get out of it. Student satisfaction is also one of the main items to measure learning outcomes, and it is significantly determined by student, teacher, and technology elements. If these variables were positively accepted, student satisfaction rises; otherwise, student disappointment emerges. The student's attitude or satisfaction with information technology is mostly dictated by himself. A learner's positive attitude toward new technologies contributes to his overall happiness (Malik & Mubeen, 2009).

2.4 Learning effectiveness

The professional knowledge, skills, attitudes and behaviors that students accumulate after the course is completed through active participation in the teaching process, are known as "Learning Outcomes". The degree to which learning outcomes are attained is characterized as “Learning Effectiveness” (Blicker, 2005). The purpose of education is to learn. Hence, the fundamental criterion for evaluating mobile learning must be learning effectiveness. Learning Effectiveness denotes that students who complete an online program acquire an education that reflects the institution's distinctive quality. The goal is for online learning to be at least as effective as the institution's other delivery modes, particularly traditional face-to-face, classroom-based schooling. Interaction is another important factor affecting learning effectiveness (Moore, 2005). Learning effectiveness in asynchronous online learning has been tested using various design features such as cognitive, teaching, and social presence in the online learning community (Anderson et al., 2000). Through thought and inquiry, these design components aim to cultivate and facilitate higher order thinking skills (Garrison, 2003).

In this research, as the research targets were not limited to students in a specific major or program, one of the challenges in this study was how we assessed learning effectiveness or learning outcomes generally. Hence, the learning effectiveness examined in this study is based on students' subjective perceptions of their learning

rather than academic performance measured by grade point average or topic-specific test scores. This is because test results may be impacted by a variety of complicated factors, including the type of school attended, the subject matter covered, and the quality of the instructor, it might be challenging to compare the learning efficacy of students with various majors. As a result, this study compares the learning effectiveness of mobile learning from students in various institutions using subjective perceived learning self-scoring questions as part of the questionnaires, meanwhile, I will still collect the approximate academic result as a reference.

2.5 Technology Acceptance Model

The Technology Acceptance Model (TAM), which has been updated over time to account for additional contexts and circumstances, is a widely used theoretical framework for understanding and forecasting user uptake and acceptance of new technologies (Davis, 1989). The model highlighted perceived usefulness and perceived ease of use as the two primary criteria influencing technology acceptance. To anticipate the acceptance and usage of various technologies for learning, the Technological Acceptance Model (TAM) has been the most important and commonly used model (Kurnia et al., 2006). Over time, TAM have been advanced and elaborated by researchers, addressing their limitations, incorporating other theoretical models or

introducing new external variables, and applied to different settings, systems, tasks, and topics (Lee et al., 2003). In the right circumstances, the tactic can prevent an institution from investing in a technology that might be underutilized or not used to its fullest extent (Mugo et al., 2017).

Under TAM, it claims that these two elements have a direct impact on users' attitudes toward adopting technology as well as their behavioral intentions to do so, and some additional correlative factors were added to fit this study more closely. The following dimensions are included in the TAM for this study:

a. Perceived Usefulness (PU)

This refers to the degree to which users believe that using a particular technology will be effortless and easy to learn (Davis, 1989). In short, the degree to which students perceive that using mobile learning is hassle-free.

b. Perceived Ease of Use (PEOU)

This indicates the degree to which users believe that adopting a technology will enhance their job performance or provide some benefit. When users perceive a technology as

useful, they are more likely to adopt it (Davis, 1989). Simply put, the degree to which students believe that using mobile learning will improve their learning outcomes.

c. Attitude towards Mobile Learning (ATML)

This component measures how students feel about using mobile learning resources in general. It may take into account things like their level of enthusiasm, curiosity, and motivation to participate in mobile learning. The general impression that students have of using mobile learning as a distant learning approach during the COVID-19 epidemic, is whether they find it to be positive or bad.

d. Actual System Use (ASU)

This dimension measures how much actual mobile learning technologies are utilized by students in their regular learning activities. It gauges how frequently, how long, and how intensely people use something. This dimension, which goes beyond students' beliefs and attitudes to capture their actual activities, is crucial for assessing the real-world effects of mobile learning on their education. the extent to which mobile learning tools and platforms were actively used during the pandemic.

e. Learning Satisfaction (LS)

This factor measures how satisfied students are with their mobile learning tools-based learning experiences. Their satisfaction with the educational experience, the quality of the material, and their sense of accomplishment are a few examples. The degree to which students found adopting mobile learning throughout the pandemic to be generally satisfactory.

f. Perceived Learning Performance (PLP)

Students' perceptions of their learning outcomes and advancement made possible by mobile learning tools are referred to by this dimension. It can include aspects such as their perceived improvements in knowledge, skills, and understanding of the subject. The degree to which students believe their academic performance has improved due to using mobile learning during the pandemic.

III. Methodology

3.1 Research Design

TAM was initially utilized, as was noted in the previous sections, to comprehend how new technologies can be embraced and applied by the specific community. I am going to utilize it now to investigate how university students in Hong Kong used mobile learning in practice during the pandemic and how effective it was for them. The technological acceptance model employed in this report is as follows:

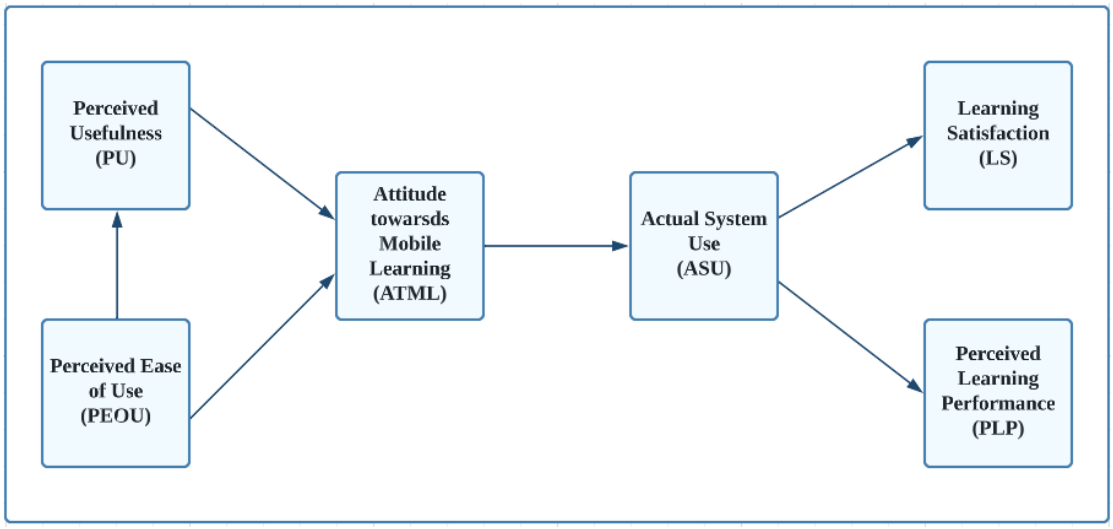

Figure 1.1 The revised technology acceptance model for the study

Development of Hypothesis

Is believed that a variety of factors could influence how students view mobile teaching strategies (Yau & Au, 2021). For the analysis in this study, the following hypotheses were developed, which may imply a relationship between each factor.

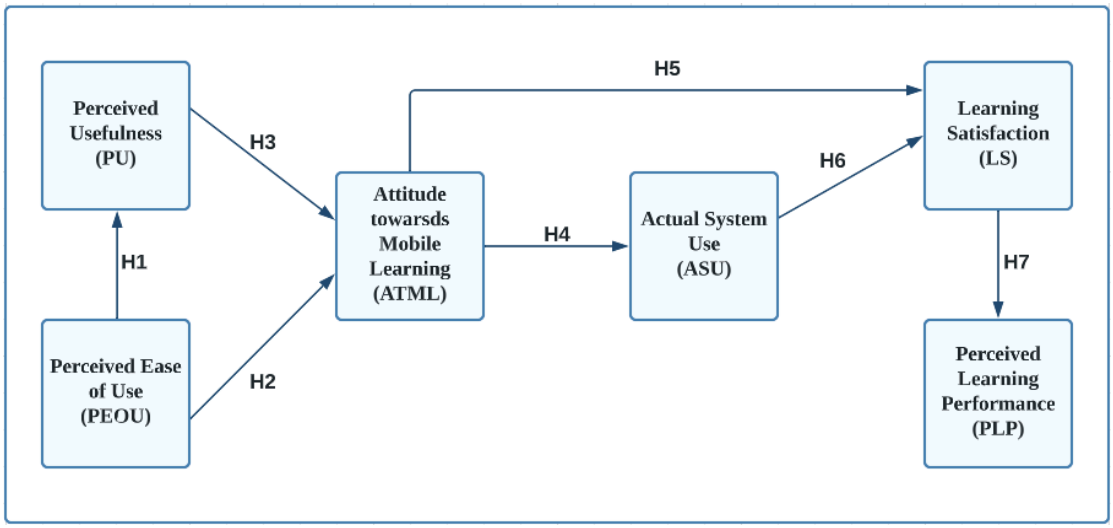

Figure 1.2 The relationship and hypothesis of TAM for the study

H1 (PEOU → PU): It posits that when users perceive a technology to be easy to use, they are more likely to find it useful. In the context of mobile learning, if students find mobile learning platforms easy to use, they may perceive these platforms as more useful for their learning needs.

H2 (PEOU → ATML): The hypothesis that PEOU influences ATML is based on the idea that if students perceive mobile learning platforms as easy to use, they may have a more positive attitude towards using them for learning purposes.

H3 (PU → ATML): This hypothesis is also rooted in the original TAM, which suggests that when users perceive a technology to be useful, they develop a positive attitude toward using it. In the context of mobile learning, if students perceive mobile learning platforms as useful, they may develop a positive attitude toward using them for learning.

H4 (ATML → ASU): In line with the TAM, this hypothesis posits that students who have a positive attitude towards mobile learning are more likely to use mobile learning platforms.

H5 (ATML → LS): This hypothesis is based on the idea that students who have a positive attitude towards mobile learning may be more satisfied with their mobile learning experience, as they may be more engaged and motivated to learn using mobile platforms.

H6 (ASU → LS): The relationship between ASU and LS is grounded in the notion that the more students use mobile learning platforms, the more satisfied they may be with their learning experience, as they are taking advantage of the tools and resources provided by these platforms.

H7 (LS → PLP): This hypothesis suggests that students who are satisfied with their mobile learning experience may perceive better learning performance, as satisfaction can be an indicator of engagement, understanding, and achievement in the learning process.

3.2 Research method

Since this report is aimed at the students' level to study their views on the effectiveness of mobile learning, in order to sufficiently obtain the data of students, mixed research

methods will be used in the study. The targeted population of this research is university students or graduates from Hong Kong local universities that have experienced mobile learning during Covid-19. A questionnaire will be developed to collect quantitative data while interviews will also be conducted to collect qualitative data. These methods are used to observe the students' degree of application of mobile learning in distance learning, and then measure their learning satisfaction, and finally record their perception of the effect of mobile learning. Meaning that the study was quantitative and qualitative in nature.

a. Quantitative research

There were 102 participants from local universities, and the questionnaire was randomly distributed through social media platforms. The complete survey is divided into four sections with a total of 27 questions, some of which include multiple items. The student's personal and demographic information is represented by nine questions in the first section. The second section contains six questions that represent student information about mobile technology and intuitive remarks about their experiences using it. There were eight questions in the third section of the survey that represented attitudes toward using mobile learning. The last section contains data on how well students performed academically during the pandemic. The second to fifth

parts of the questionnaire, which assess 30 items related to attitude, effectiveness, and the other four factors, employ a five-point Likert scale with Strongly Agree (SA) [5], Agree (A) [4], Neutral (N) [3], Disagree (D) [2], and Strongly Disagree (SD) [1]. Thirty items from each survey were combined to check the TAM model. This survey was developed by the authors of this study. Since these questions are scattered throughout the questionnaire's various sections and topics, Tables 1 to 6 list the questions that belong to each of the corresponding dimensions.

Dimension	Items
Perceived Ease of Use (PEOU)	Q12.6 Internet speed does not affect my learning during COVID-19.
	Q12.7 Screen size of my mobile does not affect my learning during Covid-19.
	Q12.8 I did not face any technical issue when I am using mobile devices for educational purpose.

Table 1 Items under the dimension of PEOU

Dimension	Items
Perceived Usefulness (PU)	Q12.1 Mobile learning makes it possible to complete assignments.
	Q12.2 Through mobile devices and relevant platform, it is easier for me to participate in class-related discussions during COVID-19.
	Q12.3 Mobile Learning offers rapid transfer of information to students.
	Q12.4 With the help of mobile learning, I can study whenever I want, anywhere.
	Q12.5 Mobile learning facilitates fast feedback.

Table 2 Items under the dimension of PU

Dimension	Items
Attitude towards Mobile Learning (ATML)	Q17.1 During COVID-19, utilizing a mobile device allows for flexible learning.
	Q17.2 With the use of mobile devices, I can access essential information regarding my studies more easily.
	Q17.3 During COVID-19, mobile learning is a great help for learning
	Q17.4 During COVID-19, mobile learning becomes a key method of delivering content.
	Q17.5 During COVID-19, mobile learning can reduce the study gap.
	Q17.6 During COVID-19, mobile learning helps to increase my motivation to learn.

Table 3 Items under the dimension of ATML

Dimension	Items
Actual System Usage (ASU)	Q9a Have you ever used mobile devices for educational purpose during the COVID-19 epidemic for your university studies?
	Q9b How often does you used mobile devices for educational purpose for educational purpose during the COVID-19 epidemic for your university studies?
	Q9c How much time do you usually spend on your mobile device in a day for educational purpose during the COVID-19 epidemic for your university studies?

Table 4 Questions under the dimension of ASU

Dimension	Items
Learning Satisfaction (LS)	Q13.1 With the adoption of Mobile learning during COVID-19, I am satisfied with the performance of lecturers.
	Q13.2 With the adoption of Mobile learning during COVID-19, I am satisfied with the course material.

	Q13.3 With the adoption of Mobile learning during COVID-19, I am satisfied with the course content.
	Q13.4 With the adoption of Mobile learning during COVID-19, I am satisfied with the learning platform.
	Q13.5 With the adoption of Mobile learning during COVID-19, I am satisfied with the learning outcome.
	Q13.6 With the adoption of Mobile learning during COVID-19, I am satisfied with the quality of the lesson.

Table 5 Items under the dimension of LS

Dimension	Items
Perceived Learning Performance (PLP)	Q23.1 I believe it improves my ability to learn.
	Q23.2 I believe it helps me learn knowledge more efficiently (e.g., I can achieve the same level of learning in less time).
	Q23.3 I believe I have improved my ability to communicate with my peers.
	Q23.4 I believe that I can work better as a team with my peers.
	Q23.5 I believe it stimulates my innovative abilities (e.g., I can think more imaginatively, flexibly, or uniquely).
	Q23.6 I believe my mindset has grown more independent (e.g., I can judge the truth of information and present arguments objectively).
	Q23.7 I believe my ability to solve problems is better (e.g., I can come up with more solutions).
	Q23.8 I believe my software operating skills were improved (e.g., I can use clerical software or video editing software).
	Q23.9 I believe my hardware operating skills were improved (e.g., use a digital camera etc).

Table 6 Items under the dimension of PLP

b. Qualitative research

More data will be collected through focus group interview. For the interview, 10 participants were invited to join the focus group interview. There were 2 groups of participants and each group will have 5 students, all the participants are current students from local university that experience mobile learning during COVID-19 epidemic. There are a total of 7 questions in the interview, and it lasted for around 1 hour based on the interaction between participants. The interview's objective is to gather more in-depth conversations and data. Students were interviewed to learn more about the benefits they have gained through the use of mobile learning during the epidemic, and some of the factors that have influenced them to gain these benefits. Through their interactions and exchanges, students' opinions and attitudes on this topic were recorded. It also inspired the students to express more subjective and realistic ideas when they hear the responses from other respondents.

Interview Questions	Corresponding Dimensions
1. How do you use mobile learning to help with your studies? What mobile learning applications or resources do you use?	ASU
2. What impact does mobile learning have on your studies? Is mobile learning more helpful for your studies?	PU, LS, PLP
3. Have you encountered any problems or challenges related to using mobile learning? If so, how did you address these issues? What can you learn/ Can you be benefit from overcoming those issues?	PEOU
4. What do you think are the advantages and disadvantages of mobile learning?	PU, ATML
5. Compared to face-to-face classroom learning, which learning method do you prefer?	ATML, LS

6. Do you think schools or teachers can better support students in using mobile learning during Covid-19/ post Covid-19 era (Now)? If so, what suggestions do you have?	LS
7. What impact do you think mobile learning will have on future learning and education? Will you continue to use mobile learning in the future?	/

Table 7 Interview questions under the different dimensions

3.3 Data Analysis

SPSS was used in the study for the subsequent stage of data analysis after the data had been gathered, especially for the quantitative research part.

a. Quantitative research

A combination of descriptive and inferential statistics will be used in the quantitative analysis of survey data to thoroughly examine the data acquired. The data will be condensed and summarized using descriptive statistics, which includes calculating frequencies and percentages. This makes it simple to spot patterns in the data. To evaluate the validity of the hypothesis and investigate the correlations between the variables, inferential statistics will be used. While correlation or regression studies will look at links between continuous variables, techniques like the Chi-square test will be used to look for associations between categorical variables, such as the relationship between satisfaction levels and gender.

b. Qualitative research

The interview subjects were generally straightforward and obvious in content because they were designed based on the questionnaire questions with the goal of acquiring a deeper understanding. As a result, summary and generalized analysis methods are utilized to evaluate focus group interview data in order to capture the significant points of the participants in a more direct and timely approach. Researchers will develop a greater understanding of the topic, leading to a well-rounded study of the data by spotting recurrent trends, common viewpoints, and original ideas.

IV. Results and Findings

4.1 Questionnaires

For this study, I randomly distributed 110 questionnaires to students from different universities in Hong Kong through social media. A total of 102 valid surveys were returned (excluding invalid or incomplete questionnaires), with 52 male respondents (51%), 47 female respondents (46.1%), and 3 people (2.9%) who preferred not to disclose their gender. There were 48 respondents (47.1%) aged between 18 and 21, 52 respondents (51.0%) aged between 22 and 25, and 2 respondents (1.9%) aged between 26 and 29. A total of 99 (97.1%) respondents indicated that they use the Internet every day, while 3 (2.9%) respondents use it at least once a week. The amount of time respondents used mobile devices in a day was also as follows: 1 person (1.0%) used them for less than 1 hour, 3 people (3.0%) used them for 1 to 2 hours, 40 people (39.2%) used them for 3 to 4 hours, 34 people (33.3%) used them for 5 to 6 hours, and 24 people (23.5%) used them for 7 hours or more. (For more details, see Figure 2.1-2.4, Additional personal background information can be found in the figure).

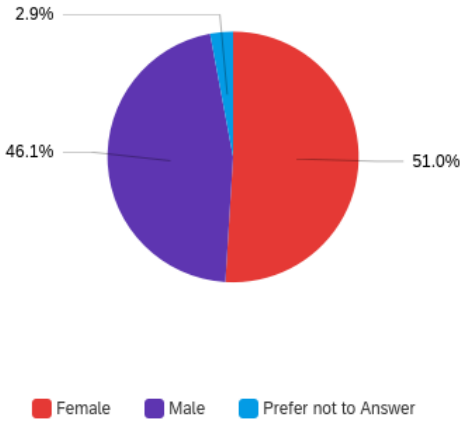

Figure 2.1 Gender of respondents

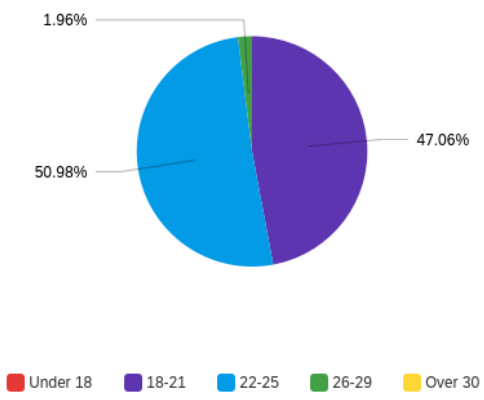

Figure 2.2 Age distribution of respondents

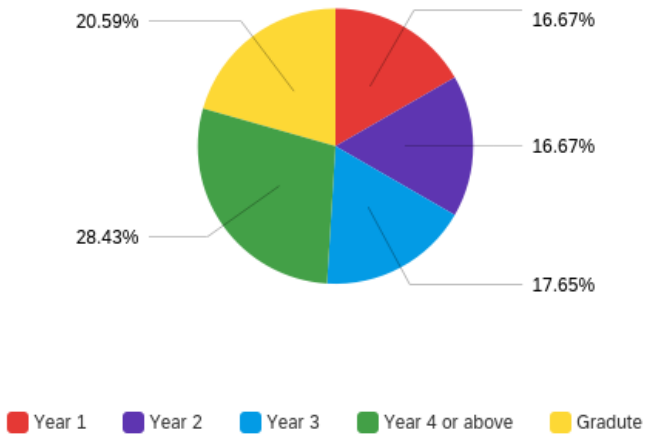

Figure 2.3 Year distribution of respondents

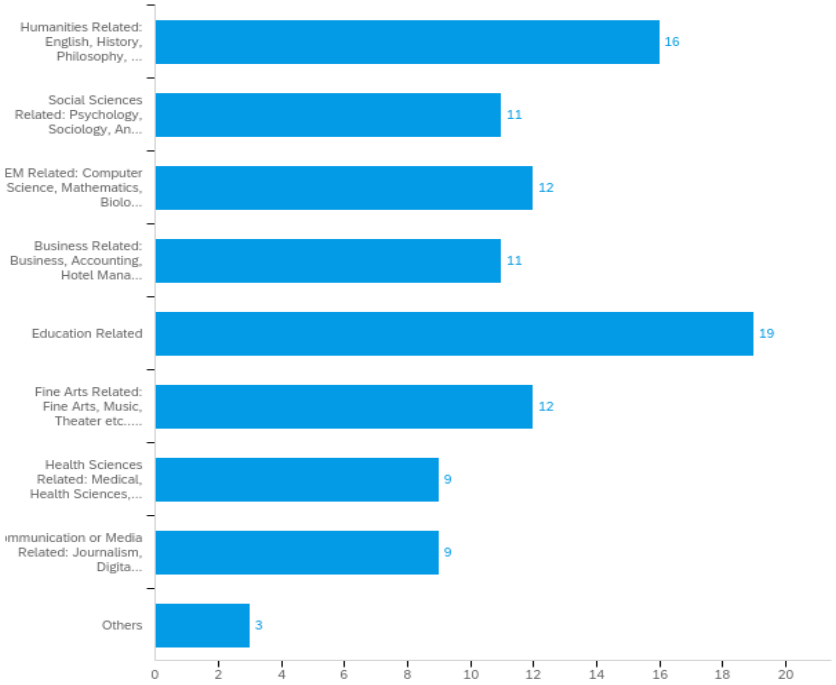

Figure 2.4 Major of the respondents

Data Validity and Reliability

To ensure the reliability of the questionnaire used in this study, I conducted a reliability analysis. Cronbach's alpha coefficient was used as the primary indicator to assess the internal consistency of the items within each scale. It is generally accepted that a Cronbach's alpha value of 0.7 or above indicates satisfactory reliability (Falk & Savalei, 2011). After analyzing the data collected from the respondents, we calculated the Cronbach's alpha values for each scale and found that these values were within the acceptable range (Table 8), suggesting that the questionnaire demonstrates good internal consistency.

	No. of related questions	Cronbach's alpha (α)
Perceived Ease of Use (PEOU)	3	0.851
Perceived Usefulness (PU)	5	0.716
Attitude towards Mobile Learning (ATML)	6	0.850
Learning Satisfaction (LS)	6	0.752
Perceived Learning Performance (PLP)	9	0.844

Table 8: The Cronbach's alpha value of different items

Pearson Correlation among Components

Pearson Correlation is used to assess the significance of all direct effects or assumptions in the structural model. The Pearson Correlation coefficient (r) ranges from -1 to +1.

Positive values indicate that as one variable increases, the other also increases, while negative values suggest the opposite. Coefficients close to +1 or -1 imply strong relationships between variables, while values near 0 indicate weak or no correlation. The Pearson Correlation coefficient is shown in Figure 3.

Correlations

		Comp_PEOU	Comp_PU	Comp_ATML	Comp_LS	Comp_PLP
Comp_PEOU	Pearson Correlation	1	.173	.132	.451**	.191
	Sig. (2-tailed)		.092	.200	<.001	.063
	N	96	96	96	96	95
Comp_PU	Pearson Correlation	.173	1	.465**	.381**	.425**
	Sig. (2-tailed)	.092		<.001	<.001	<.001
	N	96	96	96	96	95
Comp_ATML	Pearson Correlation	.132	.465**	1	.405**	.730**
	Sig. (2-tailed)	.200	<.001		<.001	<.001
	N	96	96	96	96	95
Comp_LS	Pearson Correlation	.451**	.381**	.405**	1	.479**
	Sig. (2-tailed)	<.001	<.001	<.001		<.001
	N	96	96	96	96	95
Comp_PLP	Pearson Correlation	.191	.425**	.730**	.479**	1
	Sig. (2-tailed)	.063	<.001	<.001	<.001	
	N	95	95	95	95	95

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 3 The Pearson Correlation coefficient between different factors

For the relationship between PEOU → PU (H1) ($r = 0.173$, $p = 0.092 > 0.001$), the hypothesis is rejected. For the relationship between PEOU → ATML (H2) ($r = 0.132$, $p = 0.2 > 0.001$), the hypothesis is rejected. For the relationship between PU → ATML (H3) ($r = 0.132$, $p < 0.001$), the hypothesis is supported. For the hypotheses, it is reported that H5 and H7 significantly influence ATML → LS ($r = 0.405$, $p < 0.001$) and LS → PLP ($r = 0.479$, $p < 0.001$). Therefore, the hypotheses are supported.

As ASU does not include sufficient questions for data analysis in the questionnaire part, instead only questions about the frequency of using mobile devices for educational purposes are included (as shown in figure 4.1 - 4.3), more data may gain from the sharing of interviewees, so H4 and H6 will be tested in the upcoming part.

9a. Have you ever used mobile devices for educational purpose during the COVID-19 epidemic for your university studies?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	97	94.2	95.1	95.1
	No	5	4.9	4.9	100.0
	Total	102	99.0	100.0	
Missing	System	1	1.0		
Total		103	100.0		

Figure 4.1 Frequency of Question 9a

9b. How often do you use mobile devices for educational purpose during the COVID-19 epidemic for your university studies?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Everyday	47	45.6	49.0	49.0
	At least once per week	42	40.8	43.8	92.7
	At least once per month	6	5.8	6.3	99.0
	Less than once per month	1	1.0	1.0	100.0
	Total	96	93.2	100.0	
Missing	System	7	6.8		
Total		103	100.0		

Figure 4.2 Frequency of Question 9b

9c. How much time do you usually spend on your mobile device in a day for educational purpose during the COVID-19 epidemic for your university studies?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 10 minutes	2	1.9	2.1	2.1
	10-30 minutes	13	12.6	13.5	15.6
	30 minutes to 1hour	25	24.3	26.0	41.7
	1-3 hours	38	36.9	39.6	81.3
	more than 3 hours	18	17.5	18.8	100.0
	Total	96	93.2	100.0	
Missing	System	7	6.8		
Total		103	100.0		

Figure 4.3 Frequency of Question 9c

4.2 Focus group interview

These interviews have invited ten students who are currently studying in universities in Hong Kong. They all come from diverse academic backgrounds, as indicated in their respective personal profiles (refer to Table 9). The interviews were conducted on two occasions via the Zoom online meeting platform, with each session lasting approximately one hour.

Student Code	Gender	Major	Interview that participated
A	F	Psychology	1
B	M	Computer Science	1
C	F	History Education	1
D	F	Business Management	1
E	M	Biological science	1
F	F	Secondary School Education	2
G	M	Multimedia Design	2
H	M	Actuarial Science	2
I	M	Chinese	2
J	M	Physical Education	2

Table 9: The personal information of interviewees

Following thorough discussions, each topic was in-depth examined, and the conclusions were derived from the integrated results of each topic's discussion. For more detailed records of the meetings, please refer to the appendix 2.

Question 1. How do you use mobile learning to help with your studies? What mobile learning applications or resources do you use? Through group interviews, the following

findings were obtained:

a. The majority of students used mobile applications as supplemental tools in addition to web resources and digital databases during COVID-19.

b. Students frequently access course materials, turn in assignments, and engage in conversations using online learning environments like Moodle and Blackboard.

c. Some students utilize tablets to read electronic books and other digital content and to quickly obtain information whenever they need it.

d. Professional requirements, such as those in psychology, education, the biological sciences, and multimedia design, influence the choice of mobile learning devices and the use of mobile applications.

e. Plenty of students utilize social media platforms like LinkedIn, YouTube, and Instagram to broaden their networks, get inspiration for their work, and improve their skills.

f. A small percentage of students enhance their use of traditional learning tools like books and notes with mobile learning.

Question 2. What impact does mobile learning have on your studies? Is mobile learning more helpful for your studies? Through group interviews, the following findings were obtained:

a. *Increased flexibility in learning time and location*: Many students highlighted that mobile learning allows them to access course materials and participate in online discussions at any time and from any location. This flexibility has improved their learning efficiency and allowed them to better balance their personal, work, and study commitments.

b. *Enhanced learning motivation*: Several students mentioned that mobile learning has positively affected their motivation to learn. This is because they can independently schedule their learning, choose learning resources based on their interests, and explore new topics outside of the traditional classroom setting.

c. *Importance of self-discipline and time management*: A common theme among the students' responses is that the effectiveness of mobile learning largely depends on an individual's self-discipline and time management skills. Students who have good planning and self-discipline are more likely to benefit from mobile learning, while those who are easily distracted may struggle to maximize its advantages.

d. *Supplementary tool and expanding knowledge domains*: Some students perceive mobile learning as a useful supplementary tool for traditional classroom instruction. It allows them to learn about topics that interest them in their spare time, broadening their knowledge base and potentially enhancing their future career prospects.

e. *Preference for face-to-face instruction*: A few students expressed that they prefer face-to-face instruction, as they find mobile learning too fragmented and not conducive to maintaining concentration. They believe that certain subjects, such as physical education, are more suitable for in-person learning.

f. *Impact on social interaction*: Some students noted that mobile learning might reduce opportunities for online interaction, which could negatively affect their motivation to learn and decrease their interest in learning.

g. *Health and well-being considerations*

Question 3. Have you encountered any problems or challenges related to using mobile learning? If so, how did you address these issues? What can you learn/ Can you benefit from overcoming those issues? Through group interviews, the following findings were obtained:

a. *Unstable network connection*: Several students mentioned unstable network connections as a problem. They addressed this issue by using wired internet connections, switching to lower-quality videos, or trying different network environments. This helped them learn adaptability and how to learn under different conditions.

b. *Device limitations*: Students faced challenges with small screen sizes, eye strain, and resource display issues on mobile devices. Solutions included using external keyboards, limiting study session lengths, and switching to computers for certain resources. This taught students how to adapt to different learning environments and be flexible with device usage.

c. *Distractions and time management*: Some students struggled with distractions from notifications and managing their study time effectively. They addressed these issues by turning off unimportant notifications, using the do-not-disturb mode, and creating schedules to balance study and rest. This helped them improve concentration, self-discipline, and time management skills.

d. *Content-related challenges*: Students encountered issues with shallow content, lack of suitable learning resources, and difficulty finding appropriate materials for certain subjects like P.E. courses. They overcame these challenges by seeking higher-level resources, actively searching for learning materials, and developing self-learning habits. This taught them independent learning skills and resourcefulness.

e. *Technical issues*: A few students experienced technical problems like app bugs. They tackled these issues by updating, reinstalling, or switching to alternative apps. This allowed them to develop problem-solving skills and adaptability in dealing with technical environments.

Question 4. What do you think are the advantages and disadvantages of mobile learning?

Through group interviews, the following findings were obtained:

The pros and cons recorded from the interviews will be succinctly listed in Point form due to the extensive material of the conversation.

Advantages of mobile learning：

a. Flexibility: Allows learning anytime, anywhere.

b. Access to resources: Provides a wealth of learning materials.

c. Independent learning: Fosters self-guided study and broadens knowledge.

d. Continuity during emergencies: Ensures uninterrupted learning in difficult situations.

e. Personalization: Offers tailored and autonomous learning experiences.

f. Multimedia and interactivity: Engages students with various formats.

Disadvantages of mobile learning:

a. Physical strain: Causes eye and body discomfort from extended device use.

b. Over-reliance on online resources: May hinder independent thinking.

c. Distractions: Requires self-discipline to maintain focus.

d. Limited effectiveness: Certain subjects may not be well-suited for mobile learning.

e. Fragmentation: Less suitable for topics requiring deep concentration.

f. Technical issues that may not be handled: Occasional disruptive technical problems.

Question 5. Compared to face-to-face classroom learning, which learning method do you prefer? Through group interviews, the following findings were obtained:

a. *Preference for face-to-face learning*: Most students prefer face-to-face classroom learning due to better interaction, real-time discussions, and the opportunity for practical skill development in their respective fields.

b. *Desire for a hybrid model*: The majority of students support a blended or hybrid learning model that combines the best aspects of face-to-face and mobile learning. This model allows for interaction with teachers and classmates, while still offering flexibility and access to online resources for independent study.

c. *Subject-specific preferences*: Students' preferences for learning methods vary depending on the subject matter. For example, physical education and actuarial science may require more face-to-face interaction, while computer science and business management can benefit from a mix of classroom learning and online practice.

The group interviews reveal that students value face-to-face learning but also recognize the advantages of mobile learning, and acknowledged the role of mobile learning during the epidemic. A hybrid or blended learning model is favored by many students as it

combines the best aspects of both learning methods and allows for subject-specific preferences.

Question 6. Do you think schools or teachers can better support students in using mobile learning during Covid-19/ post Covid-19 era (Now)? If so, what suggestions do you have? Through group interviews, the following findings were obtained:

a. *Need for better mobile learning resources*: Students suggest that schools and teachers should create or provide more engaging and subject-specific mobile learning resources, such as apps or virtual labs, to enhance learning experiences.

b. *Emphasis on interaction and communication*: Students express the importance of interaction and communication in both face-to-face and mobile learning environments. Teachers are encouraged to utilize discussion forums, online communication tools, and increase feedback for better engagement.

c. *Teacher training and support:* Some students mention that teachers may need additional training and guidance in utilizing online teaching tools and strategies effectively. Schools should provide support to help teachers improve their skills in distance learning.

Question 7. What impact do you think mobile learning will have on future learning and education? Will you continue to use mobile learning in the future? Through group interviews, the following findings were obtained:

Most students think mobile learning will have a significant impact on the future of learning and education, but concerns remain about potential over-reliance on technology and unequal access to resources. They see mobile learning as a supplement to traditional learning and expect it to be integrated with face-to-face classrooms to create blended learning experiences. The pace of adoption and the extent of its impact may vary depending on the region and field of study. The following are some key points mentioned by interviewees related to the future development of mobile learning in Hong Kong:

a. Positive impact on flexibility and convenience

b. Concerns about over-reliance on technology: Students express concerns about becoming overly dependent on electronic devices, which could negatively affect their mental health and interpersonal skills.

c. Inequality in access to education resources: Some students mention that mobile learning could lead to an imbalance in educational resources, as not all students can afford expensive mobile devices. They suggest focusing on making mobile learning more accessible.

d. Supplement to traditional learning: Students recognize that mobile learning is more likely to be used as a supplement to traditional face-to-face learning, rather than completely replacing it.

e. Integration with face-to-face classrooms: Students anticipate that mobile learning will become an important part of teaching and learning, integrated with face-to-face classrooms to achieve blended learning. However, they also acknowledge that the extent of mobile learning adoption may vary across different fields of study, such as physical education.

Hypothesis 4 and 6:

As question 1 to 2, and question 4 to 6 are designed under the dimension of ASU, ATML and LS, we will re-examine the responses of each interviewee to see if these two hypotheses are valid.

Hypothesis	Student Code	Valid	Evidence
H4 (ATML → ASU)	A	Yes	*ATML: One of the advantages of mobile learning is its flexibility. We can learn anytime and anywhere and use our time effectively. In addition, mobile learning provides a wealth of learning resources that make it easy for us to find information. (Q4)* *ASU: During the epidemic, mobile learning became especially important as I was unable to attend classes in person. This allowed me to view course materials, submit assignments and*

			participate in online discussions from home using my phone and tablet. (Q6)
	B	Yes	*ATML: Mobile learning allows me to study anywhere and anytime, which greatly enhances my learning efficiency. In addition, many attractive mobile applications have stimulated my interest in learning and have had a positive impact on my motivation to learn. (Q2)* *ASU: The main mobile learning resources I use are online course platforms. I usually watch the courses and practice programming on my smartphone. In addition, I use GitHub to view and share code, and to participate in various open-source projects. (Q1)*
	C	Yes	*ATML: As a student in education, I think mobile learning is helpful in developing independent learning skills and broadening my knowledge. (Q4)* *ASU: I use Blackboard to view course materials and participate in online discussions. I also regularly use my tablet to read digital resources and research papers. (Q1) During the epidemic, I fell in love with watching TED talks and attending online seminars through mobile learning platforms, which broadened my knowledge. (Q4)*
	D	Yes	*ATML: Mobile learning has increased the flexibility of learning, allowing me to study at any time and place. This has had a positive impact on my motivation to learn, as I can plan and progress my learning more independently. (Q2)* *ASU: I mainly use Moodle and Zoom for online courses and group discussions. I usually use my smartphone or tablet to view business management related materials and read digital resources. In addition, I use LinkedIn to expand*

			my network and keep up with industry news. (Q1)
	E	Yes	*ATML: Mobile learning allows me to choose learning resources based on my interests, thus increasing my enjoyment and motivation. (Q2)* *ASU: During the epidemic, I was unable to attend school, so I relied heavily on mobile learning for self-study. I used Duolingo on my phone to learn the language, and I read e-books and research papers on my tablet. (Q2)*
	F	Yes	*ATML: These tools are now indispensable to me. (Q1)* *ASU: I often use Moodle and Blackboard as my mobile learning tools. (Q1)*
	G	Yes	*ATML: I can study and learn from them, which helps me improve my design skills. (Q1)* *ASU: I usually use a lot of digital design tools and resources, so my common mobile applications are some digital drawing and animation tools, such as Procreate, Adobe series, etc. (Q1)*
	H	Yes	*ATML: The advantage of mobile learning is its convenience and flexibility, but the biggest disadvantage for me is that it is easily distracted and affects my concentration. (Q4)* *ASU: However, I rarely use online platforms and rely mainly on books and notes. (Q1)*
	I	Yes	*ATML: I think the advantages of mobile learning far outweigh the disadvantages. (Q4)* *ASU: I use mobile apps mainly for reading and writing. For example, I use eBook apps to read Chinese books, as well as Notability to take notes on my reading or writing inspirations. (Q1)*
	J	No	*ATML: For me, mobile learning is an option, not a necessity. Physical education courses are more suitable for face-to-face instruction, and*

			mobile learning can hardly achieve the same effect. (Q2) *ASU: But I also use some sports or fitness-related mobile applications, such as Nike Training Club, Strava and FitOn, etc. (Q1)*

Table 10 Evidence for Hypothesis 4

Hypothesis	Student Code	Valid	Evidence
H6 (ASU → LS)	A	Yes	*Mobile learning has increased the flexibility of learning, allowing me to learn anytime and anywhere. This has had a positive impact on my motivation to learn because I can schedule my learning independently, regardless of time and location. (Q2)*
	B	Yes	*I found mobile learning to be very helpful in terms of learning outcomes. (Q2)* *I personally prefer mobile learning because it gives me the flexibility to schedule my learning time and place. (Q5)*
	C	No	*In terms of learning outcomes, I think the effectiveness of mobile learning depends on individual self-discipline and learning strategies. For students who are able to discipline themselves, mobile learning may be more helpful. (Q2)*
	D	No	*In terms of learning outcomes, I think mobile learning has helped me a lot. (Q2)* *However, for the business management profession, face-to-face communication and teamwork are important and mobile learning may have limited effectiveness in this area. (Q4)*
	E	No	*However, learning outcomes depend heavily on my self-discipline and time management skills. For students who have good planning and self-discipline, mobile learning will be more helpful. (Q2)*

	F	No	*Mobile learning is more appropriate for learning pedagogical theories and materials. However, secondary education also involves a lot of skill development, and mobile learning is less effective in this area.(Q4)*
	G	No	*I don't think mobile learning has had much of an impact on my regular classes, it's more of a supplemental tool. (Q2)*
	H	No	*I think mobile learning is too fragmented and not suitable for my learning style which requires concentration. (Q2)*
	I	Yes	*During the epidemic, mobile learning became almost the only way for me to learn, and it has greatly reduced my learning load, and I am grateful for the support of this technology. (Q4)*
	J	No	*The effectiveness of distance learning in physical education is still far less than face-to-face, which is my biggest concern. (Q6)*

Table 11 Evidence for Hypothesis 6

Considering general trends and patterns arising in the interview cases, I found that 9 out of 10 student responses provided evidence for Hypothesis 4 while 3 out of 10 student responses show support toward Hypothesis 6 .

For Hypothesis 4 (ATML → ASU), the majority of students (9 out of 10) expressed support that a positive attitude towards mobile learning is associated with a higher likelihood of using a mobile learning platform (As shown in Table 10). Given the overwhelming support from the majority of students, it appears plausible to conclude that Hypothesis 4 is valid for this sample. For Hypothesis 6 (ASU → LS), only 3 out

of 10 students demonstrated a valid connection between the use of mobile learning platforms and increased satisfaction with the learning experience (As shown in table 11). This shows that Hypothesis 6 may not be as effective as Hypothesis 4 based on the interview cases, and it can also be inferred from the interview that respondents believe that there are more other factors that play a more important role in determining students' learning satisfaction.

V. Discussion and Implications

Before understanding students' views, we need to first understand the extent to which students use mobile learning, in order to verify the literature's claim that the majority of students in higher education institutions use mobile learning during the pandemic. The questionnaire revealed that 94% of respondents used mobile devices for learning, and 81% agreed that it became the main way of delivering content. Focus group interviews confirmed that respondents tried multiple mobile learning platforms. However, actual system usage did not positively relate to learning satisfaction, with mean scores for self-assessed mobile learning skills and satisfaction at 6.32 and 5.96, respectively. This indicates that respondents were not satisfied with their mobile learning experiences, but merely found them acceptable only.

For question 1, what were the students' perceptions of using mobile learning as a distance learning strategy during the epidemic? We attempted to gain a deeper understanding of students' perceptions of the use of mobile learning as a distance learning tool, and to consolidate the positive and negative perceptions frequently mentioned in questionnaires and group interviews.

Flexibility and convenience dominated students' discussions on mobile learning in both questionnaires and focus group interviews. A significant number of participants identified the capacity to engage in learning activities at any given time and location as a primary advantage of this educational approach. In the survey, flexibility in time and location was the top advantage, the mean score for agreeing that mobile learning allows for flexible learning reached 4.07. Ease of access to educational resources and adaptability of mobile learning platforms enhanced students' experiences during the pandemic. This concept also extended to the second most frequently mentioned advantage highlighted by students, which was "access to resources," with students appreciating the wealth of materials available for effortless information retrieval and content interaction. This easy access enriched their learning experiences and deepened their understanding of topics during the pandemic.

On the other hand, students often cite the fact that mobile learning has limitations in terms of the development of certain subjects or specific skills. This limitation is often related to keywords such as face-to-face, interactive, and hands-on. For example, in the interviews, students also mentioned that replicating hands-on lab work in science classes through mobile learning platforms can be challenging. In the questionnaire,

"Lack of face-to-face interaction and feedback from teachers" was also the second most common problem selected by students for mobile learning.

In addition to these limitations, many students are concerned that mobile learning may be distracting. In the questionnaire, "Difficulty in maintaining motivation and discipline" was also the most commonly selected possible disadvantage of mobile learning. Since mobile devices are often used as a source of entertainment and communication, students may find it difficult to stay focused and concentrate on learning when using them for educational purposes. This can lead to decreased productivity and a reduced ability to absorb and retain information.

Conclusions:

1. In general, students believe that mobile learning offers distinctive benefits that cannot be replicated by face-to-face instruction, particularly its flexibility and easy access to a wealth of knowledge.
2. However, for students, the drawbacks of mobile learning are more significant and may adversely impact their learning outcomes and experiences. Students may not select mobile learning as their main form of learning in the future since the benefits it presently provides cannot outweigh its drawbacks.

3. Students agree that mobile learning is an irreplaceable learning method during the pandemic, and its features can effectively make up for the inability to attend f2f classes in emergencies. However, students feel that it will be challenging for them to continue using mobile learning as their main form of studying in the future under normal conditions because of the drawbacks they encountered during COVID-19. Most students support the adoption of Hybrid mode, while some of them suggested that we should make good use of the power of mobile learning as an auxiliary tool.

For question 2, Can students benefit from the adoption of mobile learning for educational purposes during this COVID-19 pandemic? Obviously, there are two primary sorts of benefits for students: direct incentives and indirect benefits. Direct benefits result from learning experiences, such as academic achievement and mastery of specific skills. Indirect benefits, on the other hand, are the result of being forced to learn after facing difficulties.

We also asked survey participants about the direct benefit. The distribution of agreement on each item is more dispersed since it is evident from the combined data that each student experienced a unique benefit. While the mean scores for the other

items ranged from 2.61 to 3.87, the highest mean score was 4.0 for "I believe my software skills have improved (e.g., I can use office software or video editing software)". This is thought to be a result of students having to complete coursework using more varied technologies throughout the epidemic, such as transitioning from reporting tasks in person to submitting them via video. A significant impact included students' academic performance in addition to some directly gained competencies. In semesters of face-to-face mode or mobile learning mode, the majority of students achieve overall grade point averages (GPAs) that are comparable to or higher. Even while there are other variables that may affect GPA, changes in studying habits over the epidemic are unquestionably among the most important. The outcomes of focus group interviews are mainly responsible for indirect advantages. As was already noted, indirect benefits frequently refer to the accomplishments or skills that students have developed as a result of overcoming challenges during the learning process. According to an analysis of the interview data, a sizable portion of students indicated that their adaptability and flexibility in using the equipment had improved in the process of solving technical problems, such as dealing with network connectivity difficulties or dealing with equipment limitations. Losing motivation and distraction are two major issues that are regularly cited. Many students successfully improved their concentration and self-discipline in the process of solving these problems. Overall, students generally.

Overall, students believed that by conquering a variety of obstacles, their problem-solving abilities had greatly increased.

For question 3, What are the possible factors influencing the effectiveness of mobile learning from a students' perspective? After conducting an in-depth analysis of the questionnaire data and applying the TAM (Technology Acceptance Model), only three hypotheses were found to be valid among the possible factors that affect the effectiveness of mobile learning. Therefore, we believe that perceived usefulness, attitude toward mobile learning, and learning satisfaction are the potential key factors (As shown in Figure 5). In addition to this, participants have in fact verified that there are more external factors that also affect the effectiveness of mobile learning, such as the nature of the subject, the application of the device, and the ability of students to use mobile learning.

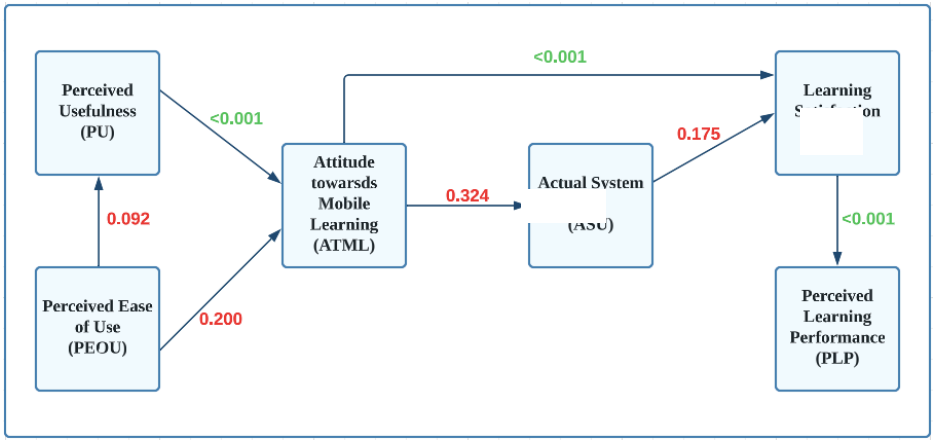

Figure 5 Hypotheses of TAM model

VI. Limitations and Future Research

The limitations of this study include the research design, sample size, and data collection. Firstly, regarding the research design, the TAM model's design could be more detailed or in-depth, for example, some external factors were not included in the model. Secondly, as the research objective is to explore the effectiveness of mobile learning applications among students of Hong Kong universities during the pandemic, the sample size needs to be improved. Currently, only about 102 questionnaires have been collected, and the covered student population does not include all universities or different disciplines in Hong Kong. Although students from different disciplines have been invited to participate, a broader range of data could be collected with more time. Furthermore, in terms of data collection, some questions in the questionnaire were ineffective in collecting data, and similar situations occurred in the focus group interviews. Therefore, some duplicate data may frequently appear, or some data may not be effectively collected through both research methods. These limitations may reduce the reliability and generalizability of the study. Therefore, in future research, priority could be given to modifying the TAM model's design and further expanding the sample size to gain a deeper understanding of the issues related to mobile learning.

VII. Conclusion

The goal of this report was to investigate any connections between the use and effectiveness of mobile learning during the epidemic, particularly from the viewpoint of students, to understand their perceptions of mobile learning and its effectiveness. Focus group interviews helped us learn more about students' perspectives after gathering data from the questionnaire, and we attempted to answer each of the research questions in order to accomplish the study objectives. In summary, the study aimed to understand the extent of mobile learning usage among higher education students during the pandemic and their perceptions of its effectiveness. The questionnaire revealed that while most students used mobile devices for learning, they were not satisfied with their experiences. Students appreciated the flexibility and convenience of mobile learning, but limitations included the lack of face-to-face interaction, difficulty maintaining motivation, and challenges in replicating hands-on lab work. The study identified perceived usefulness, attitude toward mobile learning, and learning satisfaction as potential key factors affecting mobile learning's effectiveness. Students benefited from mobile learning's direct and indirect benefits, including improved software skills and problem-solving abilities. The study suggested that external factors, such as the subject nature and device application, also affect the effectiveness of mobile learning.

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Appendix 1 Questionnaire

Section 1: Consent form

You are invited to participate in a project supervised by Dr. SONG, Yanjie and conducted by LEE Nga Ching, who are staff / student of the Department of Mathematics and Information Technology in The Education University of Hong Kong. This research aims to explore the actual application status and effectiveness of mobile learning as a distance learning strategy, together with the students' perception towards the adoption of mobile learning based on their learning satisfaction, targeted from the university students in Hong Kong, during the COVID-19 pandemic. Your participation in the project is voluntary. You have every right to withdraw from the study at any time without negative consequences. All information related to you will remain confidential, and will be identifiable by codes known only to the researcher.
If you would like to obtain more information about this study, please contact LEE Nga Ching
If you have any concerns about the conduct of this research study, please do not hesitate to contact the Human Research Ethics Committee by email at hrec@eduhk.hk or by mail to Research and Development Office, The Education University of Hong Kong. Thank you for your interest in participating in this study.

☐ Yes, I hereby consent to participate in the captioned research. (1)

☐ No, I DO NOT want to take part in the study. (2)

Section 2: Demographic Information

1. What is your gender?

○ Female (1)

○ Male (2)

○ Prefer not to Answer (3)

2. What is your age?

○ Under 18 (1)

○ 18-21 (2)

○ 22-25 (3)

○ 26-29 (4)

○ Over 30 (5)

3. What is your current grade in university?

- ○ Year 1 (1)
- ○ Year 2 (2)
- ○ Year 3 (3)
- ○ Year 4 or above (4)
- ○ Gradute (5)

4. What is your academic discipline/major?

- ○ Humanities Related: English, History, Philosophy, Religious Studies, Foreign Languages, Linguistics etc... (1)
- ○ Social Sciences Related: Psychology, Sociology, Anthropology, Political Science, Environmental studies, Gender etc... (2)
- ○ STEM Related: Computer Science, Mathematics, Biology, Chemistry, Physics, Engineering, Geology etc... (3)
- ○ Business Related: Business, Accounting, Hotel Management, Economic etc... (4)
- ○ Education Related (5)
- ○ Fine Arts Related: Fine Arts, Music, Theater etc... (6)
- ○ Health Sciences Related: Medical, Health Sciences, Nursing etc... (7)
- ○ Communication or Media Related: Journalism, Digital Media, Film studies etc... (8)
- ○ Others (9)

5a. What is the operating system of your smartphone?
(If you have multiple phones, please specify the one that you use most frequently.)

- ○ IOS (1)
- ○ Android (2)
- ○ Linux (3)
- ○ Windows (4)
- ○ Others (5)

5b. What is the operating system of your other smart mobile devices? (If anys.)

- ☐ IOS (1)

- ☐ Android (2)
- ☐ Linux (3)
- ☐ Windows (4)
- ☐ Others (5)
- ☐ No extra mobile devices (6)

6. How often do you use the Internet?

- ○ Everyday (1)
- ○ At least once per week (2)
- ○ At least once per month (3)
- ○ Less than once per month (4)

7. How much time do you spend on your mobile devices every day?

- ○ less than 1 hour (1)
- ○ 1-2 hours (2)
- ○ 3-4 hours (3)
- ○ 5-6 hours (4)
- ○ 7 hours or more (5)

8. What are your main purposes on using the mobile devices? (At most 3 choices)

- ☐ Communication (1)
- ☐ Education (2)
- ☐ Photo shooting (3)
- ☐ Entertainment (4)
- ☐ Online Shopping (5)
- ☐ Browsing Social Network site/apps (6)
- ☐ Others (7) _____

Section 3: Mobile Learning Experience

9a. Have you ever used mobile devices for educational purpose during the COVID-19 epidemic for your university studies?

- ○ Yes (1)
- ○ No (2)

9b. How often do you use mobile devices for educational purpose during the COVID-19 epidemic for your university studies?

- ○ Everyday (1)
- ○ At least once per week (2)
- ○ At least once per month (3)
- ○ Less than once per month (4)

9c. How much time do you usually spend on your mobile device in a day for educational purpose during the COVID-19 epidemic for your university studies?

- ○ less than 10 minutes (1)
- ○ 10-30 minutes (2)
- ○ 30 minutes to 1hour (3)
- ○ 1-3 hours (4)
- ○ more than 3 hours (5)

10. Which type of mobile learning tools did you use during the Covid-19 pandemic for your university studies?

- ☐ Online course platforms (e.g. Moodle, Blackboard) (1)
- ☐ E-books and digital resources (2)
- ☐ Mobile apps for specific subjects or courses (3)
- ☐ Social media platforms for academic purposes (4)
- ☐ Other (please specify) (5)

_____

11. How would you rate your mobile learning skills and abilities during the Covid-19 pandemic?

0 1 2 3 4 5 6 7 8 9 10

From 0 being very poor, 10 being very excellent ()

12. Please select the item below that best present your perception.

	A. Strongly Disagree (1)	B. Disagree (2)	C. Neutral (3)	D. Agree (4)	E. Strongly Agree (5)
Mobile learning makes it possible to complete assignments. (1)	○	○	○	○	○
Through mobile devices and relevant platform, it is easier for me to participate in class-related discussions during COVID-19. (2)	○	○	○	○	○
Mobile Learning offers rapid transfer of information to students. (3)	○	○	○	○	○
With the help of mobile learning, I can study whenever I want, anywhere. (4)	○	○	○	○	○
Mobile learning facilitates fast feedback. (5)	○	○	○	○	○
Internet speed does not affect my learning during COVID-19. (6)	○	○	○	○	○
Screen size of my mobile does not affect my learning during Covid-19. (7)	○	○	○	○	○
I did not face any technical issue when I am using mobile devices for educational purpose. (8)	○	○	○	○	○
During COVID-19, the use of social media applications helped to fulfill my education in any way. (9)	○	○	○	○	○

Section 4: Perception and Attitudes towards Mobile Learning

13. With the adoption of Mobile learning during COVID-19, I am satisfy with…

	A. Strongly Disagree (1)	B. Disagree (2)	C. Neutral (3)	D. Agree (4)	E. Strongly Agree (5)
Performance of Lecturer (1)	○	○	○	○	○
Course Material (2)	○	○	○	○	○
Course Content (3)	○	○	○	○	○
Learning platform (4)	○	○	○	○	○
Learning outcome (5)	○	○	○	○	○
Quality of the lesson (6)	○	○	○	○	○

14. How satisfied were you with the mobile learning experience during the Covid-19 pandemic for your university studies?

0 1 2 3 4 5 6 7 8 9 10

From 0 being very dissatisfied, 10 being very satisfied ()

15. What do you think are the advantages of mobile learning compared to traditional classroom learning? (Multiple choices allowed)

- ☐ Flexibility in time and location (1)
- ☐ Access to digital resources and online materials (2)
- ☐ Interactive and engaging learning experience (3)
- ☐ Collaborative and social learning opportunities (4)
- ☐ Personalized learning experience (5)
- ☐ Other (please specify) (6)

_____

☐ NO Advantage (7)

16. What do you think are the possible disadvantages of mobile learning compared to traditional classroom learning that you faced? (Multiple choices allowed)

☐ Lack of face-to-face interaction and feedback from teachers (1)

☐ Difficulty in maintaining motivation and discipline (2)

☐ Technical issues and problems with mobile devices and internet connection (3)

☐ Limited opportunities for practical and hands-on learning (4)

☐ Isolation and lack of social interaction with classmates (5)

☐ Other (please specify) (6)

_____

☐ NO disadvantages (7)

17. Please select the item below that best present your perception.

	A. Strongly Disagree (1)	B. Disagree (2)	C. Neutral (3)	D. Agree (4)	E. Strongly Agree (5)
During COVID-19, utilizing a mobile device allows for flexible learning. (1)	○	○	○	○	○
With the use of mobile devices, I can access essential information regarding my studies more easily. (2)	○	○	○	○	○
During COVID-19, mobile learning is a great help for learning (3)	○	○	○	○	○
During COVID-19, mobile learning becomes a key method of delivering content. (4)	○	○	○	○	○
During COVID-19,	○	○	○	○	○

mobile learning can reduce the study gap. (5) During COVID-19, mobile learning helps to increase my motivation to learn. (6)	○	○	○	○	○

18. How likely are you to continue using mobile learning tools and resources in your future university studies after the Covid-19 pandemic?

0 1 2 3 4 5 6 7 8 9 10

From 0 being NEVER, 10 being VERY LIKELY ()

19. How do you perceive the future development of mobile learning in university education after the Covid-19 pandemic?

- ○ It will become more important and widely used (1)
- ○ It will remain the same as before (2)
- ○ It will become less important and less used (3)

20. What improvements or changes would you suggest to make mobile learning more effective and beneficial for university students?

_____

Section 5: Academic related

21a. What is your CGPA?

- ○ Below 2.0 (1)
- ○ 2.0-2.49 (2)
- ○ 2.5-2.99 (3)
- ○ 3.0-3.49 (4)
- ○ 3.5 or above (5)

22b. What is your highest GPA of the seminar that conducting Face-to-face lesson mode?

- ○ Below 2.0 (1)
- ○ 2.0-2.49 (2)
- ○ 2.5-2.99 (3)
- ○ 3.0-3.49 (4)
- ○ 3.5 or above (5)

22c. What is your highest GPA of the seminar that conducting virtual mode/with the adoption of mobile learning?

- ○ Below 2.0 (1)
- ○ 2.0-2.49 (2)
- ○ 2.5-2.99 (3)
- ○ 3.0-3.49 (4)
- ○ 3.5 or above (5)

23. Please select the item below that best present your perception.

With the adoption of Mobile learning during COVID-19,

	A. Strongly Disagree (1)	B. Disagree (2)	C. Neutral (3)	D. Agree (4)	E. Strongly Agree (5)
I believe it improves my ability to learn. (1)	○	○	○	○	○
I believe it helps me learn knowledge more efficiently (e.g., I can achieve the same level of learning in less time). (2)	○	○	○	○	○
I believe I have improved my ability to communicate with my peers. (3)	○	○	○	○	○
I believe that I can work better as a team with my peers. (4)	○	○	○	○	○
I believe it stimulates my innovative abilities	○	○	○	○	○

(e.g., I can think more imaginatively, flexibly, or uniquely). (5)					
I believe my mindset has grown more independent (e.g., I can judge the truth of information and present arguments objectively). (6)					
I believe my ability to solve problems is better (e.g., I can come up with more solutions). (7)					
I believe my software operating skills were improved (e.g., I can use clerical software or video editing software). (8)					
I believe my hardware operating skills were improved (e.g., use a digital camera etc). (9)					

Appendix 2 Interview Scripts

Interview 1

Date & Time: 25th March, 2023 10PM

Interviewees information:

Code	Gender	Major
A	F	Psychology
B	M	Computer Science
C	F	History Education
D	F	Business Management
E	M	Biological science

Question 1:

Student A:

I mainly use Moodle to view course materials, submit assignments, and participate in online discussions. In addition, I often use my tablet to read e-books and digital resources so that I can find information whenever I need it. I occasionally use some psychology-related mobile apps but rely primarily on web resources and digital databases.

Student B:

The main mobile learning resources I use are online course platforms. I usually watch the courses and practice programming on my smartphone. In addition, I use GitHub to view and share code, and to participate in various open-source projects. Most of the time, I use mobile devices to study because they are portable, except when doing homework, because most of the programming programs are only available in computer software.

Student C:

As an education student, I use Blackboard to view course materials and participate in online discussions. I also regularly use my tablet to read digital resources and research papers. I occasionally use some mobile apps specifically for the education field, but rely primarily on web resources.

Student D:

I mainly use Moodle and Zoom for online courses and group discussions. I usually use my smartphone or tablet to view business management related materials and read digital resources. In addition, I use LinkedIn to expand my network and keep up with industry news. I use mobile apps sparingly and rely heavily on web resources and digital databases.

Student E:

I usually use Blackboard to view course materials, submit assignments, and watch recorded courses. For biological sciences, I primarily use my tablet to read digital resources, such as textbooks and research papers. I occasionally use some biology related mobile apps, but rely primarily on web resources and digital databases.

Question 2:

Student A:

During the epidemic, mobile learning became especially important as I was unable to attend classes in person. This allowed me to view course materials, submit assignments and participate in online discussions from home using my phone and tablet. Mobile learning has increased the flexibility of learning, allowing me to learn anytime and anywhere. This has had a positive impact on my motivation to learn because I can schedule my learning independently, regardless of time and location. In terms of learning outcomes, mobile learning may be more beneficial for students who are more self-disciplined. However, students who are easily distracted may need more self-discipline to take full advantage of the benefits of mobile learning.

Student B:

During the epidemic, I had to rely on mobile learning to complete my online courses
due to school closures. I watched courses on platforms like Coursera and Udemy on my smartphone and practiced programming on my phone. Mobile learning allows me to study anywhere and anytime, which greatly enhances my learning efficiency. In addition, many attractive mobile applications have stimulated my interest in learning and have had a positive impact on my motivation to learn. I found mobile learning to be very helpful in terms of learning outcomes. However, in order to take full advantage of mobile learning, I need to maintain self-discipline and keep my study time and rest time under strict control.

Student C:

During the epidemic, school closures forced me to rely on mobile learning to find information and participate in online discussions. I read digital resources and research papers on my tablet and used Blackboard for online interaction. Mobile learning allows me to find information at any time, which is convenient. However, there are fewer opportunities for online interaction, which may affect my motivation to learn and reduce my interest in learning. In terms of learning outcomes, I think the effectiveness of mobile learning depends on individual self-discipline and learning strategies. For students who are able to discipline themselves, mobile learning may be more helpful.

Student D:

During the epidemic, I had to rely on mobile learning to keep up with my studies as I was unable to attend classes at school. I used Moodle and Zoom to participate in online classes and group discussions, and I viewed business management-related materials on my smartphone or tablet. Mobile learning has

increased the flexibility of learning, allowing me to study at any time and place. This has had a positive impact on my motivation to learn, as I can plan and progress my learning more independently. In terms of learning outcomes, I think mobile learning has helped me a lot. However, I need to be careful not to rely too much on mobile devices as this may affect my eye health and quality of life.

Student E:

During the epidemic, I was unable to attend school, so I relied heavily on mobile learning for self-study. I used Duolingo on my phone to learn the language, and I read e-books and research papers on my tablet. Mobile learning allows me to study more efficiently because I can access digital resources at any time, regardless of time or location. This allows me to be more flexible with my study time. In terms of motivation, mobile learning allows me to choose learning resources based on my interests, thus increasing my enjoyment and motivation. However, learning outcomes depend heavily on my self-discipline and time management skills. For students who have good planning and self-discipline, mobile learning will be more helpful.

Question 3:

Student A:

I have encountered some problems with mobile learning. For example, the network connection is unstable, which makes it impossible to watch online courses. Also, studying on my phone and tablet for long periods of time sometimes makes my eyes tired. I tried to solve these problems by using a wired Internet connection and limiting the length of each study session. From these challenges, I learned to better manage my study time and device usage.

Student B:

I have encountered some problems related to mobile learning. For example, when programming on a mobile device, the screen size is small, which makes it difficult to operate. To solve this problem, I purchased an external keyboard to make programming more convenient. By overcoming these problems, I learned how to adapt to different learning environments and find appropriate solutions.

Student C:

The main problem I encountered during mobile learning was that I was easily distracted. For example, if I get a notification while studying, I may be distracted by the push content. To solve this problem, I turned off unimportant notifications and set my phone to do-not-disturb mode. After overcoming these problems, I learned how to improve my concentration and take better advantage of mobile learning.

Student D:

My main challenge in mobile learning is time management. Sometimes I would get so caught up in my studies that I would neglect my breaks and other life events. To solve this problem, I created a schedule

to make sure that my study and rest time were properly organized. From these challenges, I have learned how to balance my studies and life and improve my self-discipline.

Student E:

The problem I encountered in my mobile learning process was that some resources did not display properly on mobile devices. For example, some of the instructional websites do not lay out correctly on my mobile browser, making it impossible for me to read them. To solve this problem, I use my computer to view these resources when I need them. By overcoming these problems, I have learned to be flexible in using different devices for learning.

Question 4:

Student A:

One of the advantages of mobile learning is its flexibility. We can learn anytime and anywhere and use our time effectively. In addition, mobile learning provides a wealth of learning resources that make it easy for us to find information. In the psychology profession, we need to read a lot of literature and research reports. Mobile learning allows me to look up relevant literature while waiting for a bus or taking a break to improve my learning efficiency. However, the downside is that using mobile devices for long periods of time can be taxing on my eyes and body, and staring at the screen for long periods of time can make my eyes feel tired.

Student B:

I agree with you, Student A. Mobile learning allows me to practice programming and look up related data whenever I want. The mobile learning platform allows me to practice and look at other people's code whenever I want. However, I also find that I sometimes rely too much on online resources and don't think independently enough, which reduces our ability to think independently.

Student C:

As a student in education, I think mobile learning is helpful in developing independent learning skills and broadening my knowledge. During the epidemic, I fell in love with watching TED talks and attending online seminars through mobile learning platforms, which broadened my knowledge. But at the same time, it also made me more easily distracted, especially when I was studying at home. I think to overcome these problems, we need to develop the quality of self-discipline and focus on learning.

Student D:

I preferred to use mobile learning during the epidemic because it allowed me to continue learning in a safe environment. However, for the business management profession, face-to-face communication and teamwork are important and mobile learning may have limited effectiveness in this area. We used Zoom for online meetings and group discussions during the epidemic, but online communication fell short in

building trust and team cohesion compared to face-to-face communication.

Student E:

For science majors, laboratory operations and hands-on experience are essential. Although mobile learning can help us understand theoretical knowledge, it is not a complete substitute for field practice. During the epidemic, our laboratory practice was affected, making it more difficult to gain practical experience. Therefore, I believe that the impact of mobile learning on the biological sciences profession is limited.

Question 5:

Student A:

I prefer face-to-face classroom learning because it allows me to focus on the lesson and have the opportunity to interact with the teacher and classmates in real time. However, during the epidemic, mobile learning also helped me a lot in my studies.

Student B:

I personally prefer mobile learning because it gives me the flexibility to schedule my learning time and place. During the epidemic, I relied more on mobile learning to learn new knowledge through online resources.

Student C:

I think there are advantages and disadvantages to both learning styles. Face-to-face classroom learning has a good learning atmosphere, but mobile learning saves commuting time. After the epidemic, I hope to combine the two to take advantage of each.

Student D:

I prefer face-to-face classroom learning because it helps to build team cohesion and trust. During the epidemic, although mobile learning eased the disruptions, I still look forward to returning to the physical classroom.

Student E:

For me, face-to-face classroom learning was more important because it provided the opportunity for field practice. During the epidemic, while mobile learning helped me understand the theory, I was more eager to get back to my normal lab practice.

Interviewer: Thank you all for your sharing. Since more students chose face-to-face classes, if we could have a mixed mode of learning, which learning method would you prefer?

Student A:

For me, the hybrid mode is very suitable because I can interact with my classmates and the teacher in class, discuss psychology cases, and then do independent study and read related literature online.

Student B:

I agree, the hybrid model is really helpful for us computer science majors. We can solve problems in face-to-face classes and then continue to practice programming and practice online. I think this way of learning can make the best use of our time and resources.

Student C:

I found the blended model to be very beneficial to my learning. In face-to-face classes, I can discuss educational theories and practices with professors and classmates, and then further research cases and write papers online. Also, this mode gives me more flexibility in scheduling my study time.

Student D:

I also agree with the advantages of the hybrid model. In the business management profession, we need to learn a lot of theoretical knowledge, but we also need practice and experience. The hybrid model allows us to learn basic concepts in the classroom and then do simulation exercises and case studies online.

Student E:

I also support mixed mode classes. For the biological science major, we need to conduct experiments in the lab to observe and analyze data. However, sometimes lab time is limited, and the hybrid mode allows us to explore theoretical knowledge online and study the experimental results in depth.

Question 6:

Student A:

In the Covid-19 era, schools and teachers should better support students' use of mobile learning. For example, they could develop fun psychology-related apps that allow students to learn on mobile devices. In addition, teachers should encourage students to interact with their mobile devices in the classroom to enhance learning.

Student B:

I think schools and teachers can provide us with more programming instruction for mobile devices. This will help us understand and apply mobile technology better. In addition, the school could provide more hands-on opportunities for mobile application development so that students can learn in a hands-on environment.

Student C:

In the post-Covid-19 era, I think schools and teachers can place more emphasis on using mobile learning to support education. For example, teachers can use mobile learning platforms to assign assignments and provide feedback to students. Sometimes they just sent all the stuffs to us through email instead of using those platforms. In addition, schools can make it easy for students to access academic resources outside of the classroom by partnering with mobile learning platforms.

Student D:

I think schools and teachers could provide more support for mobile learning. For example, teachers could use mobile learning applications to increase classroom interaction and encourage students to participate in online discussions using their phones or tablets. Schools can also develop mobile learning resources for business management majors to enhance student learning.

Student E:

In the post-Covid-19 era, I wish schools and teachers would better support our use of mobile learning. For example, maybe teachers can use mobile learning platforms to provide virtual labs so that students can do experiments at home. In addition, schools could provide more mobile learning resources for bioscience so that we can learn in a variety of settings.

Question 7:

Student A:

I think mobile learning will have a great impact on the future of learning and education, as it makes learning more flexible and convenient. For example, I can learn about psychology through my cell phone while waiting for public transportation. However, there is also a risk that students may become overly dependent on electronic devices, which may affect their mental health. After graduation, I will continue to use mobile learning because it helps me to continue to enrich myself.

Student B:

Mobile learning will have a significant positive impact on the future of learning and education, especially in the area of technology. Mobile learning allows us to learn programming and new technologies anytime, anywhere. However, I am also concerned that students may use mobile devices too much and lose sight of the importance of face-to-face communication. For me, I will continue to use mobile learning, but I will also maintain face-to-face interaction with my classmates and teachers.

Student C:

I think mobile learning has a great impact on the future of education, as it allows students to schedule their own learning and increase their motivation to learn. However, it can also lead to an imbalance in educational resources, such as students from less well-off families who may not be able to afford expensive mobile devices. In the future, I will continue to use mobile learning, but I will also focus on

how to make mobile learning more accessible to more students.

Student D:

I believe mobile learning will have a great impact on the future of learning and education, especially in the field of business. It allows us to access business information and learn management skills more quickly. However, an over-reliance on mobile learning may weaken students' teamwork and interpersonal skills. In the future, I will continue to use mobile learning, but I will also strive to maintain practical interactions with colleagues and friends.

Student E:

Mobile learning has a great potential impact on the future of learning education by providing students with more learning resources and flexible learning styles. For example, virtual labs allow us to conduct experiments at home. However, an over-reliance on mobile learning may cause students to lose sight of the importance of hands-on learning. In the future, I will continue to use mobile learning, but I will be careful to maintain a balance between learning and hands-on learning.

Interview 2

Date & Time: 26th March, 2023 10:30PM

Interviewees information:

Code	Gender	Major
F	F	Secondary School Education
G	M	Multimedia Design
H	M	Actuarial Science
I	M	Chinese
J	M	Physical Education

Question 1:

Student F:

I often use Moodle and Blackboard as my mobile learning tools. Through these two platforms, I can access course materials, teacher's teaching slides, and do grading activities anytime and anywhere. These tools are now indispensable to me.

Student G: I'm majoring in multimedia design, so I usually use a lot of digital design tools and resources, so my common mobile applications are some digital drawing and animation tools, such as Procreate, Adobe series, etc. In addition, I often go to YouTube to watch some design courses and skills teaching videos to increase design inspiration and improve skills. These are very helpful to my learning. Also, I follow some designers and creators' Instagram accounts. Sometimes they share some creative inspiration

or tips, I can study and learn from them, which helps me improve my design skills. At the same time, I have my own design account, often posting some works and process, will also receive some feedback, which is also part of my learning.

Student H: I mainly use electronic calculators and some mathematical formula applications to help study and practice. These tools allow for faster and more accurate calculations and graphing. However, I rarely use online platforms and rely mainly on books and notes.

Student I:

I use mobile apps mainly for reading and writing. For example, I use eBook apps to read Chinese books, as well as Notability to take notes on my reading or writing inspirations. Occasionally, I also watch microblogs or videos from some literature or linguistics professional accounts to keep up with industry news. But overall, I still prefer paper books, so mobile learning is only an auxiliary tool for me to learn.

Student J:

As I am majoring in Physical Education, I usually study mainly by doing. But I also use some sports or fitness-related mobile applications, such as Nike Training Club, Strava and FitOn, etc. Through these applications, I can follow the exercise videos of famous coaches for remote coaching, and I can also record and share my exercise data and exercise with my friends. In addition, these applications will release some of the latest sports knowledge or exercise methods, I will be appropriate to borrow, this is also my mobile learning channels.

Question 2:

Student F:

For me, mobile learning was a big help during the epidemic. Since we couldn't go to school, we had to study on our own at home, and the mobile app allowed me to study anytime and anywhere, which improved my motivation. Some of the short and concise teaching videos are great to watch while commuting.

Student G:

I don't think mobile learning has had much of an impact on my regular classes, it's more of a supplemental tool. However, it really allows me to learn about topics that interest me in my spare time, rather than limiting myself to what I've learned in the classroom. This will broaden my knowledge base, which will be helpful in the future.

Student H:

I think mobile learning is too fragmented and not suitable for my learning style which requires concentration. However, during the epidemic, it filled in the gaps when I couldn't attend classes, so I

could study at any time, which was helpful in keeping up with my learning. But overall, I prefer the face-to-face mode of instruction.

Student I:

I personally prefer mobile learning; it is freer and more flexible. Some of the short video explanations are very good and deepen my understanding of certain knowledge points. Also, using mobile apps for learning has developed my self-learning ability, which I think is important for my future development.

Student J:

For me, mobile learning is an option, not a necessity. Physical education courses are more suitable for face-to-face instruction, and mobile learning can hardly achieve the same effect. However, for learning theoretical knowledge, mobile apps provide short and concise content that is convenient and practical for learning in your free time.

Question 3:

Student F:

The main problem I encountered was that the network connection was unstable, and sometimes there was a buffer when watching the teaching videos, which affected the learning experience. I usually change to a lower quality video or try again with a different network environment. This has enhanced my ability to adapt and learn to learn under different conditions.

Student G:

I personally didn't have too many technical problems, but it took me a little time to adjust to the schedule. It took a little time to find a balance between various assignments and life, and to arrange when to use the mobile app to study. But it has also taught me good time management skills, which has helped me in my studies and life.

Student H:

I think the mobile learning content is sometimes too shallow and does not meet my learning needs. However, this has driven me to look for higher level learning content and resources to develop my self-learning skills. Sometimes I still need guidance from teachers, but the whole process has improved my ability to learn independently.

Student I:

I occasionally encounter some technical problems, such as bugs in the app. Usually I try to update or reinstall the app, and if it's not resolved, I use another app instead. These minor setbacks can be frustrating, but they ultimately allow me to increase my problem-solving skills and flexibility to adapt to an unknown technical environment.

Student J:

For me, the biggest problem is finding appropriate mobile learning content and resources. Unlike other courses, P.E. courses have fewer learning materials, so it takes more time to collect them. However, it has helped me to develop the habit of actively looking for learning resources and to improve my self-learning skills, which will be very helpful in the future.

Question 4:

Student F:

The advantage of mobile learning is that it is convenient and flexible, and can be used anytime and anywhere, especially during an epidemic. However, its fragmentation is also a major drawback. It is not suitable for topics that require a high level of concentration and is easily distracted. Therefore, I will choose the appropriate method according to the content, and mobile learning is more suitable as a supplement. Mobile learning is more appropriate for learning pedagogical theories and materials. However, secondary education also involves a lot of skill development, and mobile learning is less effective in this area. I would use it for theoretical learning and practice to develop skills in the classroom or in teaching practice. It is difficult to become a qualified secondary school teacher by relying only on mobile learning.

Student G:

The biggest advantage of mobile learning is that I can explore the topics I am interested in on my own, and I am not limited to classroom learning. The multimedia and interactive elements of mobile learning are very suitable for my major. I can get the latest design techniques and technology trends through mobile learning and expand my design ideas. However, I know it is not healthy to use electronic products for a long time, so I will control the time of use appropriately.

Student H:

The advantage of mobile learning is its convenience and flexibility, but the biggest disadvantage for me is that it is easily distracted and affects my concentration. Therefore, I would only choose mobile learning when necessary, such as for make-up classes or review. For courses that require a high level of concentration, I still prefer face-to-face learning.

Student I:

I think the advantages of mobile learning far outweigh the disadvantages. It is convenient and flexible, making learning more autonomous and personal. mobile learning can be used to broaden our horizons and gain inspiration for my compositions. On the downside, technical issues are occasionally unavoidable, but acceptable. During the epidemic, mobile learning became almost the only way for me to learn, and it has greatly reduced my learning load, and I am grateful for the support of this technology.

Since adopting mobile learning during the pandemic, I've noticed that my GPA has improved. I believe this is because I can review course materials more frequently and easily on my mobile device, which helps me retain information better and perform well on exams.

Student J:

As far as I am concerned, the biggest advantage of mobile learning is that it can supplement the theoretical knowledge that is not available in face-to-face classes. However, the disadvantage of mobile learning is that it is difficult to achieve the effect of face-to-face instruction. The main learning contents of the PE program is skill formation and development, which needs to be done with face-to-face instruction and practice. Therefore, I will choose the appropriate learning mode according to the content. During the epidemic, it was undoubtedly my only choice and helped me to maintain a certain level of learning progress.

Question 5:

Student F:

Face-to-face classes are better for skill development, especially as a secondary school teacher in the future. However, mobile learning has some advantages in terms of theoretical knowledge, which can reduce the burden of the classroom. Therefore, I will use both approaches and choose the appropriate mode according to the content of learning.

Student G:

For me, there are advantages to both learning styles. Mobile learning provides access to the latest information, but face-to-face classes are more effective in terms of critiquing and coaching skills. Therefore, I choose the appropriate method according to the specific topic.

Student H:

Personally, I prefer face-to-face classes for actuarial science. It requires teacher guidance and interactive discussion, which is difficult to achieve with mobile learning. Of course, mobile learning is useful for learning certain basic theories and knowledge points, and can reduce the burden of the class. But overall, face-to-face classes are still my first choice. During the epidemic, distance learning was barely acceptable, but not nearly as good as face-to-face.

Student I:

A combination of the two approaches would be ideal. Face-to-face classes allow learning through communication and discussion, which is important for literature and language learning. However, mobile learning can also help me gain a broader range of knowledge and inspiration. Therefore, I will use both approaches flexibly depending on the specific topic.

Student J:

The face-to-face classroom is the cornerstone of the physical education program. Skills and practices can only be learned with face-to-face instruction. Mobile learning has its place but for the overall curriculum, face-to-face learning is the most important and my preferred method.

Question 6:

Student F:

During the epidemic, the school as a whole tried to adapt to the new way of teaching and was understanding of their difficulties. However, we need more skills instruction for future secondary school teachers. So, my suggestion is to increase the number of face-to-face classes as soon as possible after the epidemic, so that we can have more opportunities to practice. For the current distance learning, teachers could improve their results by increasing interaction and feedback with students.

Student G:

Generally speaking, I am satisfied with the support from the school and teachers. However, some teachers are not very proficient in distance learning techniques, and sometimes there are technical problems that affect the effectiveness of teaching. Therefore, my suggestion is that schools can strengthen the training and guidance for teachers in online teaching. Teachers can also make use of different tools and methods, such as recording, live streaming, and discussion forums, to improve the effectiveness of teaching.

Student H:

The biggest problem is the lack of classroom discussion and interaction. Therefore, my suggestion is that the teacher can add group discussion or peer review to increase the communication among students, which can greatly improve the effectiveness of distance learning. Of course, this depends on the nature of the course, and some courses may not be suitable. However, in general, it is helpful to increase interaction.

Student I:

I understand the efforts of the school and teachers. For the Chinese Department, the biggest difficulty in distance learning is the lack of interaction and communication. Therefore, my suggestion is that teachers should use discussion forums, online communication, and student interaction as much as possible to promote communication among students and make up for the shortcomings in this area. When the epidemic subsides, face-to-face classes will be added as soon as possible to take advantage of the classroom.

Student J:

The effectiveness of distance learning in physical education is still far less than face-to-face, which is

my biggest concern. So, my suggestion is to resume PE practice and face-to-face classes as soon as the epidemic permits. If some of the online classes are to be retained, teachers will need to interact more with students and provide more detailed skills instruction and demonstrations, but the results will still be limited. In general, face-to-face classes are too important to our profession to be completely replaced.

Student G:

I think the school has provided great support in terms of technology, so that most teachers and students can use various online tools for teaching and learning. However, in terms of teacher training, the school could provide more support to help teachers improve their skills and level of distance learning. This would further improve the quality of teaching and learning.

Student J:

For physical education courses, the effectiveness of distance learning is limited, so the support provided by the school can hardly make up for the lack of face-to-face teaching. Unless it is technical support, other support is not very helpful to my profession. Therefore, I am looking forward to the school resuming its regular physical education program after the epidemic, which is the most important support I need. Distance learning is only suitable as a supplement, and it is difficult to replace it completely.

Question 7:

Student F:

I think mobile learning will become a trend in higher education in Hong Kong in the future, but probably not to the same extent as in other Western countries. The education system in Hong Kong is relatively conservative, and face-to-face classes are still regarded as a more important teaching method. However, with the development of information technology and the change of the new generation of students, the use of mobile learning will grow, but probably at a slower pace. I expect it to be used more to supplement and complement traditional teaching.

Student G:

I believe that mobile learning will be an important trend and development direction for higher education in Hong Kong in the future. The new generation of students are already accustomed to mobile education, and they will be more proactive and active in using various mobile learning methods for independent learning. At the same time, as teachers' knowledge and mastery of mobile education increases, the use of mobile learning will also expand. I anticipate that mobile learning will become an important part of teaching and learning, integrated with face-to-face classrooms to achieve blended learning.

Student I:

I think the use of mobile learning in higher education in Hong Kong will increase, but probably at a slower pace due to educational traditions. It is more likely to be an effective supplement to classroom

teaching, enriching and expanding the curriculum. However, the face-to-face classroom will remain dominant and mobile learning will be difficult to replace completely. Liberal arts majors value the importance of face-to-face classrooms for thinking and communication. Therefore, the trend of mobile learning applications will be limited to a certain extent, and the pace of development will be relatively slow.

Student J:

For my professional physical education program, the trend and scope of mobile learning is relatively limited. It is difficult to replace the importance of face-to-face classes for skill acquisition and physical training because it is difficult to play a substantive role. Therefore, I expect that mobile learning will only be used as a supplement to theoretical knowledge and will have limited application and impact on the PE curriculum as a whole. Face-to-face classes are still the mainstream of physical education in Hong Kong.