

# Students' Typical Usage of Mobile Devices in Learning Activities

Simon K.S. Cheung<sup>(✉)</sup>

The Open University of Hong Kong,  
Good Shepherd Street, Ho Man Tin, Kowloon, Hong Kong, China  
kscheung@ouhk.edu.hk

**Abstract.** Mobile devices have been widely used by higher education students for learning purposes. This paper explores the students' typical usage of mobile phones, tablet devices and notebook computers in different learning activities, based on the online surveys conducted to the full-time undergraduate students in the Open University of Hong Kong over the past three years. It is revealed that, besides e-mail access and internet browsing, mobile phones are often used for social networking. They were not usually used for reading e-books and doing assignments. Tablet devices are often used for reading e-books, connecting to learning portal and internet browsing, but not for doing assignments. Notebook computers are frequently used in almost all learning activities, especially for doing assignments. The results affirm that the usage depends on the nature of the learning activities and the technical features and limitations of the devices.

**Keywords:** Mobile learning · Mobile device · Learning support

## 1 Introduction

Generally referring to smart phones, tablet devices and notebook computers, mobile devices have been widely used by higher education students for both learning and non-learning purposes. This concurs with the increasing penetration rate of mobile devices over the past few years. According to Pew Research Centre, as of 2014, 90 % and 64 % of American adults own a cell phone and a smart phone, respectively [1]. The percentage of ownership of a smart phone is almost double in three years. The growth is even more prominent for tablet devices, where the percentage of ownership increased from 8 % to 10 % in 2011 to 42 % in 2014.

With the advent of modern mobile devices equipped with processors, wireless and broadband network adaptor, mobile learning has evolved as another new mode or style of learning. Mobile learning is conventionally regarded as an extension or a variety of e-learning or online learning that further expand and make learning available anywhere and anytime through mobile devices [2]. It is also defined as the learning across multiple and different contexts using mobile devices, through social and content interactions [3]. From the techno-centric perspective, mobile learning is characterized by the use of mobile devices, which are small in size, portable, and interactive, for learning anywhere and anytime [4].

According to Cheung, the successful adoption of mobile learning depends on the technological feasibility of mobile learning, learners' needs of flexible learning, and pedagogical benefits [5]. Unquestionably, mobile learning offers the flexibility and convenience of learning anywhere and anytime. Apart from these, it is recognized and reported in the literature that mobile learning provides many unique pedagogical benefits [6–9]. In brief, mobile learning transforms the learning process and changes the ways of learning, creates new opportunities beyond the traditional face-to-face learning, offers more flexibility and mobility in learning, expands learning experience in terms of time and place, and facilitates communications and interactions among teachers, students and course administrators as well as encourages the mode of peer learning or collaborative learning.

In recent years, a number of studies have been conducted to explore the students' usage of mobile devices. In 2014, ECAR conducted a study to explore the students' technology experience and expectation through a survey on University undergraduate students in the United States and 15 other countries [10]. According to the survey, in 2014, 86 % of the students owned a mobile phone, 47 % owned a tablet device, and 90 % owned a notebook computer. Mobile devices are typically used in learning activities, such as communicating with the peers, accessing learning portal, receiving messages on events and activities, reading e-books or e-resources, accessing library resources such as e-books and e-databases, and recording the lectures and other in-class activities. Another study conducted by the University of Central Florida in 2013 showed that the ownership of mobile devices was high among students, and that tablet devices were the most popular mobile devices for academic purposes [11]. It also revealed that mobile learning typically occurred outside the classroom, with limited guidance from the instructors.

This paper investigates higher education students' typical usage of mobile devices in learning activities. Surveys have been conducted at the Open University of Hong Kong [12]. Starting from 2013, at the beginning of each year (usually in January or February), the University conducted a survey to study how mobile devices (including mobile phones, tablet devices and notebook computers) are used by the students for learning purposes. These surveys were conducted using online questionnaires to full-time undergraduate students. The students were asked on whether mobile phones, tablet devices and notebook computers were usually used in different learning activities, including checking e-mails, accessing learning portals, reading e-books or e-resources, communicating via social networking tools and online chats, doing assignments, and browsing the internet.

Based on the surveys in 2013, 2014 and 2015, this paper reports some findings on the students' typical usage and preference of mobile devices in different learning activities. The patterns of using mobile devices in the learning activities are derived. The rest of this paper is structured as follows. Following this introduction, Sect. 2 gives an overview of mobile devices in terms of technical features and limitations. Section 3 shows the above-mentioned surveys conducted by the Open University of Hong Kong over the past three years. Section 4 briefly concludes this paper with a discussion on the key findings.

## 2 Overview of Mobile Devices

Mobile devices generally refer to small, hand-held or portable computer devices with a display screen, touchpad, and physical or virtual keyboard. Having a weight of less than 2 kg, these devices broadly cover mobile phones or smart phones, tablet devices and notebook computer. They can readily access the internet through wireless network, 3G or 4G broadband networks. Internet browser, e-mail, e-book reader, social networking tools, online chat and message communication facilities are typical functional features of these devices.

This paper investigates the students' usage of mobile devices in different learning activities, where mobile devices cover mobile phones, tablet devices and notebook computers. They are briefly defined as follows.

**Mobile Phones.** Mobile phones broadly refer to mobile phones and smart phones which provide computing functions and internet accesses in addition to the usual phone communication. Also characterized by a flat touch-screen display with a few physical buttons, mobile phones use solid state storage, built-in or through a SIM card. Virtual keyboard, writing pad or voice recognition are provided to serve as the input devices. With specific processors and chip sets, mobile phones run on specific operating systems such as Android, iOS and Windows mobile. A typical mobile phone has a small screen display of less than 7 inch width. Like tablet devices, mobile phones adopt touch-screen based navigation. Its weight is less than 1 kg. If fully charged, a mobile phone can be continuously used for up to 9 or 10 h. All mobile phones support wireless network, 3G or 4G broadband network. Table 1 summarizes the technical features of mobile phones. Two representative examples are Apple iPhone [13] and Samsung Galaxy Note [14].

**Table 1.** Technical features of mobile phones.

Key items	Technical features
Screen size	Less than 7 inch
Disk storage	Solid state drive
Input device	Virtual keyboard
Pointing device	Touch screen navigation
Weight	Less than 1 kg
Battery life	up to 9 or 10 h
Network adaptor	Wireless network and 3G or 4G broadband network
Operating system	Mobile operating systems, such as Android and IOS
Application software	Mobile applications

**Tablet Devices.** Tablet devices broadly cover tablet computers and slate computers. They are characterized by a flat touch-screen display without any physical keyboard and pointing device. Solid state storage is used. Although a pop-up virtual keyboard is provided to serve as the main input device, a few physical buttons are provided for

convenient controls. The processors and chip sets are different from that of notebook computers. Also, tablet devices run on specific operating systems such as Android, iOS and Windows mobile. A typical tablet device has a screen display of 7 to 11 inch width, supporting touch-screen based navigation. Its weight is around 1 kg. If fully charged, a tablet device can be continuously used for up to 7 or 8 h. For network connectivity, all tablet devices are equipped with wireless network adaptor. Many of them also support 3G or 4G broadband network. Table 2 summarizes the technical features of tablet devices. Two representative examples are Apple i-Pad [15] and Microsoft Surface [16].

**Table 2.** Technical features of tablet devices.

Key items	Technical features
Screen size	7 inch to 11 inch
Disk storage	Solid state drive
Input device	Virtual keyboard
Pointing device	Touch screen navigation
Weight	around 1 kg
Battery life	up to 7 or 8 h
Network adaptor	Wireless network and 3G or 4G broadband network
Operating system	Mobile operating systems, such as Android and IOS
Application software	Mobile applications, such as browser and e-book reader

**Notebook Computers.** Notebook computers broadly refer to the conventional laptop computers which are functionally identical to desktop personal computers (PC). As notebook computers use the conventional PC processors and chipsets, PC operating systems and application software can run on notebook computers. A typical notebook computer has a screen display of 10 to 15 inch width, a physical keyboard with touch pad or track stick as the pointing device. Its weight ranges from 1 to 2 kg. In recent years, notebook computers tend to use solid state drives which consume lesser power than the traditional hard disk drives, thus having longer battery life. If fully charged, a notebook computer may be continuously used for up to 5 or 6 h. For network connectivity, all notebook computers are equipped with wireless network adaptor, and many of them also provide wired network adaptor. It is not common for notebook computers to support 3G or 4G broadband network. Table 3 summarizes the technical features of notebook computers. Two representative examples are Lenovo Thinkpad [17] and Apple MacBook [18].

In brief, notebook computers are the portable or mobile version of PCs that run on the conventional PC operating systems and application software. With the use of solid state drives instead of hard disk drives, notebook computers consume less power, and therefore, have longer battery life. Tablet devices and mobile phones are purpose-built for mobile usage, for example, touch-screen based navigation, virtual keyboard, small in size, longer battery life and built-in features for connecting wireless network and 3G or 4G broadband network. They are equipped with mobile applications, such as Internet browser, e-book reader, social networking tools, etc. Tablet devices can be

**Table 3.** Technical features of notebook computers.

Key items	Technical features
Screen size	9 inch to 15 inch
Disk storage	Magnetic-based hard disk drive or solid state drive
Input device	Physical keyboard
Pointing device	Touch pad or track stick
Weight	1 to 2 kg
Battery life	up to 5 or 8 h
Network adaptor	Wireless network (some supporting wired network)
Operating system	Conventional PC operating system
Application software	Conventional PC application software

regarded as mobile phones with a larger screen and more storage capacity but without phone communication functions.

### 3 Use of Mobile Devices in Learning Activities

In order to study the students' typical usage and preference of mobile devices in different learning activities, online surveys were conducted to full-time undergraduate students in the Open University of Hong Kong. At the beginning of each academic year starting from 2012/13, the students were asked on whether mobile phones, tablet devices and notebook computers were usually used in different learning activities. These learning activities include accessing e-mails (on the e-mail account provided by the University), connecting to the learning portal, reading e-books or e-resources, communicating via social networking tools and online chats, doing assignments, and browsing the internet.

In the following, we report and analyze the result of the online surveys in 2012/13, 2013/14 and 2014/15.

**Possession of Mobile Devices for Learning Purposes.** Table 4 reports the percentage of student possessing mobile devices for learning purposes. Almost all the students used at least one type of mobile devices for learning purposes. It is also found that the percentage of students possessing tablet devices is steadily increasing over the past three years.

**Table 4.** Possession of mobile devices for learning purposes.

Mobile devices	% of students possessing the devices for learning purposes		
	2013 (n = 385)	2014 (n = 368)	2015 (n = 359)
Mobile phones	95 % (367)	93 % (342)	94 % (337)
Tablet devices	29 % (111)	37 % (137)	43 % (153)
Notebook computers	53 % (204)	53 % (194)	64 % (228)
Nil	0 % (0)	1 % (2)	0 % (0)

**Usage of Mobile Phones in Different Learning Activities.** In the surveys, students were asked if mobile phones were usually used in different learning activities. Table 5 reports the results in term of the percentage of students using mobile phone for each learning activity. It is shown that, among other learning activities, accessing e-mails, connecting to learning portal, communicating using social networking tools or online chats, and browsing the internet are frequently used by students (where over 70 % of students indicated that they usually used mobile phones in these learning activities). It is also shown that less than half (44 % to 47 %) of the students usually use mobile phones in reading e-books or e-resources. It is very clear that the highest usage (over 94 %) of mobile phone is on social networking and online chats whilst the lowest usage (less than 30 %) is on doing assignment. Over the past three years, there were no significant variations (1 % to 7 %) on the percentage of students using mobile phones in the individual learning activities.

**Table 5.** Usage of mobile phones in different learning activities.

Learning activities	% of students using mobile phones in learning activities		
	2013 (n = 367)	2014 (n = 342)	2015 (n = 337)
Accessing e-mails	76 % (279)	75 % (257)	75 % (252)
Connecting to learning portal	74 % (271)	77 % (265)	79 % (267)
Reading e-books or e-resource	44 % (163)	44 % (150)	47 % (157)
Social network or online chat	93 % (342)	94 % (323)	94 % (316)
Doing assignments	29 % (106)	30 % (101)	23 % (78)
Browsing the internet	73 % (268)	76 % (261)	74 % (251)

Mobile phones have the definite advantages of the mobility and portability of the devices. They are small in size, light in weight and easy to carry. Moreover, mobile applications on communications are well available for mobile phones. These explain why students usually used mobile phones for communication, including e-mail access, social networking and online chats. However, mobile phones have the disadvantages on screen size and input devices. The screen of mobile phones is too small (usually less than 7 inch) for students to read e-books or e-resources. There is also a lack of convenience input devices, such as physical keyboard and pointing device. These are the reasons of low usage of mobile phones for doing assignments.

**Usage of Tablet Devices in Different Learning Activities.** In the surveys, students were asked if tablet devices were usually used in different learning activities. Table 6 reports the results in term of the percentage of students using mobile devices for each learning activity. It is shown that, except for doing assignment, tablet devices are usually used by the students in all learning activities (where over 60 % of students indicated that they usually used tablet devices in these learning activities). However, there is no particular learning activity with very high usage (for example, over 90 %) of tablet devices. The highest usage of tablet devices is on connecting the learning portal

and browsing the internet. Over the past three years, there were no significant variations (2 % to 11 %) on the percentage of students using tablet devices in the individual learning activities.

**Table 6.** Usage of tablet devices in different learning activities.

Learning activities	% of students using tablet devices in learning activities		
	2013 (n = 111)	2014 (n = 137)	2015 (n = 153)
Accessing e-mails	66 % (73)	64 % (88)	61 % (94)
Connecting to learning portal	74 % (82)	73 % (100)	75 % (115)
Reading e-books or e-resource	64 % (71)	68 % (93)	67 % (102)
Social network or online chat	71 % (79)	63 % (86)	65 % (99)
Doing assignments	50 % (56)	39 % (53)	48 % (73)
Browsing the internet	73 % (81)	69 % (94)	71 % (109)

Tablet devices have a clear advantage over mobile phones on the screen display. A wider screen (7 inch to 11 inch) is usually provided by table devices. Although tablet devices are bigger in size and heavier in weight as compared to mobile phones, they have advantages on the mobility and portability, and are still easy to carry. Moreover, mobile applications on communications and e-book readers are well available for mobile phones. These explain why students usually used tablet devices not only for communication but also for reading e-books, e-resources and browsing the internet. Since mobile devices lack convenience input devices, such as physical keyboard and pointing device, they are not usually used in doing assignments.

**Usage of Notebook Computers in Different Learning Activities.** In the surveys, students were asked if notebook computers were usually used in different learning activities. Table 7 reports the results in term of the percentage of students using mobile devices for each learning activity. It is shown that, except for social networking and online chats, notebook computers are usually used by the students in all learning activities (where over 60 % of students indicated that they usually used tablet devices in

**Table 7.** Usage of notebook computers in different learning activities.

Learning activities	% of students using notebook computers in learning activities		
	2013 (n = 204)	2014 (n = 194)	2015 (n = 228)
Accessing e-mails	64 % (130)	62 % (120)	68 % (155)
Connecting to learning portal	79 % (161)	74 % (143)	77 % (176)
Reading e-books or e-resource	70 % (142)	67 % (130)	70 % (160)
Social network or online chat	67 % (136)	54 % (105)	59 % (135)
Doing assignments	99 % (201)	93 % (181)	98 % (224)
Browsing the internet	70 % (142)	65 % (127)	72 % (164)

these learning activities). It is very clear that the highest usage of notebook computers is on doing assignments (over 90 %) whilst the lowest usage is on social networking and online chats (less than 60 %). Over the past three years, there were no significant variations (3 % to 13 %) on the percentage of students using notebook computers in the individual learning activities.

Notebook computers have a number of advantages over mobile phones and table devices. Besides providing a larger screen display (9 inch to 15 inch) and convenient input devices, such as a physical keyboard together with touch-pad or track stick, they can run on the conventional PC operating system, and hence, PC application software. These explain why notebook computers were usually used in almost all learning activities, especially doing assignments. However, notebook computers are rather less portable, as compared to mobile phones and tablet devices. They are also heavier in weight. For this reason, notebook computers are not usually used for interactive communication, such as social networking and online chats.

**Usage Patterns of Mobile Devices in Different Learning Activities.** Summarizing the above findings, some usage patterns of mobile devices can be derived. Table 8 states these usage patterns in different learning activities. For accessing e-mails and learning portal and browsing the internet, all three categories of devices (mobile phones, tablet devices and notebook computers) are usually used. For reading e-book or e-resources, tablet devices and notebook computers are usually used whilst mobile phones are less frequently used. For social networking and online chats, the usage of mobile phones is the highest. For doing assignments, notebook computers are almost always used whilst mobile phones and tablet devices are rarely used.

**Table 8.** Usage pattern of mobile devices in different learning activities.

Learning activities	% of students using tablet devices in learning activities (in 3 years)		
	Mobile phones	Tablet devices	Notebook computers
Accessing e-mails	frequent (75 % to 76 %)	frequent (61 % to 64 %)	frequent (62 % to 68 %)
Connecting to learning portal	frequent (74 % to 79 %)	frequent (73 % to 75 %)	frequent (74 % to 79 %)
Reading e-books or e-resource	not frequent (44 % to 47 %)	frequent (64 % to 68 %)	frequent (67 % to 70 %)
Social network or online chat	very frequent (93 % to 94 %)	frequent (63 % to 71 %)	less frequent (54 % to 67 %)
Doing assignments	not frequent (23 % to 30 %)	not frequent (39 % to 50 %)	very frequent (93 % to 99 %)
Browsing the internet	frequent (73 % to 74 %)	frequent (69 % to 73 %)	frequent (65 % to 72 %)



## 4 Discussion and Conclusion

Today, almost every student owns at least one mobile device for learning purposes. In this paper, we investigate the students' typical usage of mobile devices in different learning activities, where mobile devices are generally categorized as mobile phones, tablet devices and notebook computers. Following a brief review of mobile devices, this paper reports the results of the surveys on the usage of mobile devices, which were conducted to the full-time undergraduate students in the Open University of Hong Kong over the past three years.

In summary, it is found that the majority of students usually used mobile phones on e-mail access, connecting to learning portal, social networking and online chat, and browsing the internet. This is because of the definite advantages of mobile phones on mobility, portability and network connectivity. It is not often to use mobile phones for reading e-books or e-resources, and doing assignment due to the limitation of the screen size and lack of convenient input devices. With a balance between portability and usability, tablet devices provide a larger screen display than mobile phones. They were usually used in different learning activities except doing assignments. However, tablet devices were not usually used in doing assignment because of lacking some convenient input devices. Notebook computers offer very comprehensive functional features and are compatible with the conventional PC application software. Therefore, they were usually used in almost all the learning activities. Owing to the deficiency on portability and mobility, it is not common for using notebook computers in interactive communication such as social networking and online chats.

Besides, over the past three years, there are slight variations on the usage patterns of mobile phones, tablet devices and notebook computers. According to the survey, there were no significant variations on the percentage of students using mobile phones in individual learning activities, and so for tablet devices and notebook computers. This essentially reflects that the patterns of how mobile phones, tablet devices and notebook computers are generally used in different learning activities have been established and become stabilized. The findings further affirm that the usages depend on the nature of the learning activities and the technical features as well as limitations of the mobile devices. This indeed aligned to some previous studies on the topic, including the author's earlier studies [19, 20]. It is hoped that the findings and sharing can provide some insights on the students' typical usage of mobile devices in learning activities for higher education institutions.

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