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Mobile Access to Moodle Activities: Student Usage and Perceptions

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Introduction

The learning management system (LMS), Moodle, has been adopted by many higher education institutions around the world. To date, more than 1800 Moodle sites in over 120 countries have been registered to use Moodle which is available in more than 60 languages (Kennedy, 2004). Despite the increasing use of Moodle, concern has been expressed as to how Moodle is being used (Carvalho, Areal, & Silva, 2011).

With the rapidly increasing use of handheld mobile devices among staff and students in higher education, it has become more and more common for them to access teaching and learning related information and services using mobile devices (Peters, 2009). A 2011 survey on mobile services in academic libraries in Hong Kong and Singapore reveals that the possession rate of mobile devices was 93.4% among Hong Kong college students, and 61.9% of them used smartphones to access the Internet (Ang, 2012). It is not uncommon to see university students use smartphones to access learning resources on Moodle and other LMSs. However, how students use Moodle via mobile phones and what their perceptions of mobile access to Moodle have rarely been formally investigated. The current research aims at filling this gap by looking at which Moodle activities students would use mobile phones to access and exploring possible reasons behind the usage patterns.

Related Work

Use of LMS

Research has been conducted to describe and analyse the use of LMS in higher education. Francis and Raftery (2005) defined three levels of LMS usage. The first level is for depositing materials and distributing information; the second is for enhancing teaching and learning by using various tools in LMS for communication, collaboration, assessment, and quiz tests. The third and highest level is for supporting fully-fledged online courses where most learning takes place on the LMS. It is indicated that even though an e-learning platform is available, the institutions might not make full use of it (Nichols, 2008). Carvalho and her colleagues (2011) surveyed around 15,000 students for their use of two LMSs, Blackboard and Moodle. They found that for the majority of students, the use of the LMSs was still in the low level -- for accessing learning materials and checking course announcement. Only some of them used LMSs for sending emails or taking quiz tests. Participating in the course forum, course chat room and virtual classroom are among the least used functionalities.

On the other hand, the importance of learning through social interaction and collaboration has been confirmed repeatedly (Tu & Corry, 2003). Interaction plays a significant role in academic success and persistence (Shea, Sau Li, & Pickett, 2006), and it is believed that knowledge construction begins when a student has engaged in a collaborative activity, because knowledge is created in situation Chavez (2011). Therefore, educators increasingly make efforts to bring the use of LMS to a higher level that involves more interactions and collaborations among students.

Mobile learning

Mobile learning is thought to enhance opportunities for building a learning community, interaction, and collaboration among students (Donaldson, 2011). Cavus, Bicen, and Akcil (2008) investigated students' opinions of mobile learning by surveying 317 undergraduate students. They found students' learning greatly benefited from using e-mail, forum, and chat via mobile devices, and mobile learning was thought by students as effective in the communication between students and instructors. In their study, there was no statistically significant difference in mobile learning across departments, gender, or nationality. In this study, we attempt to find out how mobile learning and LMS can be integrated to support students' learning activities.

Methodology

The LMS and the courses

Moodle (version 2.6) was used in all the courses included in this study. Although there is a mobile app for Moodle, it cannot be integrated into the Moodle installation in the university where this study was carried out, due to the university policy on information security. Alternatively, the Moodle installation provides a Mobile Theme which is a display custom-designed for smartphone browser screens. When users use smartphones to access Moodle, the Moodle server can detect the access device and will automatically display the Mobile Theme. Students can use the Mobile Theme to view course content page, submit assignments, and access a number of the Moodle functions including News Forum, Forum, Choice, Feedback, Quiz, URL, and Wiki.

Seven courses of four instructors were selected for this study. The instructors were in four different disciplines, Education, Engineering, Social Sciences, and Humanities and Arts. The four instructors used Moodle in different levels. The instructor from Social Sciences used Moodle as a repository of teaching materials only. Besides uploading teaching materials, the instructor from Education also used discussion forums for student-student and student-instructor interaction. Links of external websites were also put on Moodle of this course. As for the course of Engineering, the instructor used Moodle as a platform where students read/download learning materials, submitted assignments, took quizzes, conducted group projects, and received feedback from the instructor. The instructor from Humanities and Arts used Moodle to host learning materials, send announcements and messages to students, and answer questions students asked. The Engineering course was a Common Core course that could be taken by any year-1 and year 2 students across the university. As the class size was big, there were six teaching assistants in this course. The Education course was a Master level course and the other courses were on the undergraduate level.

Participants and procedure

The study was conducted in a university in Hong Kong. Both survey and interview data were collected.

The survey

The surveys were conducted in the last class of the courses. 389 students from the seven courses in the main study were invited to participate in the survey. 253 students in total responded to the questionnaire with valid answers (65% response rate). The responses were collected partially online (n = 142) and partially on paper (n = 111). Table 1 presents the sample demographics.

Table 1. Demographic information of questionnaire respondents

| | N | Gender | | Moodle experience | | IT competency | |
|----------------|-----|--------|--------|-------------------|--------|---------------|--------|
| | | Male | Female | Mean | Medium | Mean | Medium |
| | | N | N | | | | |
| Education | 17 | 3 | 14 | 1.71 | 1 | 2.88 | 3 |
| Social science | 57 | 25 | 32 | 2.41 | 3 | 2.93 | 3 |
| Engineering | 125 | 91 | 34 | 2.16 | 2 | 2.74 | 3 |
| Arts | 54 | 15 | 39 | 2.93 | 3 | 3.19 | 3 |
| All | 253 | 134 | 119 | 2.35 | 3 | 2.89 | 3 |

Notes: Ratings of “Moodle experience” are based on a 4-point Likert-type scale: 1 – “less than 3 months”, 2-“ months to less than 1 year”, 3-“1 year to less than 2 years”, and 4-“2 years or more”; Ratings of “IT competency” are based on a 5-point Likert-type scale: 1 – “not competent”, 2-“ of little competency”, 3-“somewhat competent”, 4-“ competent” and 5-“ very competent”.

The interview

After the survey data were collected, emails were sent to 80 survey respondents (20 from each discipline) to invite them to the follow-up interviews. Twelve of them accepted the invitation and participated in the interviews (3 in the Education course, 3 Social Sciences, 5 in Engineering, and 1 in Humanities and Arts). The interviews were conducted partially face to face (n=2) and partially through phone (n=10). After the interviews, each interviewee was paid 30HKD for their participation.

Instruments

A questionnaire asking about the experience of using Moodle of the selected courses (Appendix 1) was used for collecting quantitative data. It included two parts: demographic information and frequency of course Moodle use. Part 1 asked for basic demographic information of as well as their experience with Moodle and self-perceived IT competency level; Part 2 asked about the frequency of using different categories of Moodle activities with variable in a 7-point Likert scale: ranging from 1 (never) to 7 (several times a day). A semi-structured interview protocol was designed to collect interview data. The main questions included: What did you do when you access Moodle via mobile phone, when did you do them and why?

Results

Questionnaire responses

Table 2 shows the statistics of student self-reported usage of Moodle via mobile phones. Access to learning materials was the most frequent activity while interacting with

instructors and other students was the least frequent. It is noteworthy that students' responses varied from "never" to "several times a day" in all usages.

Table 2. Descriptive statistics of frequency of using Moodle via mobile phones

| Moodle activities | N | Minimum | Maximum | Mean | Std. Deviation |
|------------------------|-----------|-----------|-----------|-----------|----------------|
| | Statistic | Statistic | Statistic | Statistic | Statistic |
| accessing resources | 252 | 1 | 7 | 3.70 | 1.526 |
| submitting assignments | 251 | 1 | 7 | 2.22 | 1.553 |
| taking tests | 252 | 1 | 7 | 2.30 | 1.567 |
| interaction | 251 | 1 | 7 | 2.06 | 1.457 |
| collaboration | 252 | 1 | 7 | 2.08 | 1.508 |

Notes: Ratings are based on a 7-point Likert-type scale: 1 – "never", 2- "Once a month or less", 3- "Once every 2 weeks", and 4- "1-2 times a week", 5 – "3-6 times a week", 6- "Once every day", 7- "Several times a day".

Statistics across different disciplines are presented in Table 3. Students in the Engineering course reported the highest frequency across all usage of mobile Moodle among all participating students. As the data are in ordinal scale, the non-parametric Kruskal-Wallis test is used to compare the frequencies across courses. The significance levels (p values) are reported in Table 3. Statistically significant differences were found in all five categories of usages: accessing resources submitting assignments, taking tests, interaction, and collaboration.

Table 3. Statistics of frequency of using Moodle via mobile phones across disciplines

| Moodle activities | | Humanities and Arts | Education | Social Science | Engineering | Sig. Kruskal-Wallis |
|------------------------|--------|---------------------|-----------|----------------|-------------|---------------------|
| accessing resources | N | 54 | 17 | 56 | 125 | .002** |
| | Mean | 3.35 | 3.06 | 3.39 | 4.08 | |
| | Median | 4.00 | 4.00 | 4.00 | 4.00 | |
| submitting assignments | N | 53 | 17 | 56 | 125 | .000** |
| | Mean | 1.38 | 1.53 | 1.50 | 2.99 | |
| | Median | 1.00 | 1.00 | 1.00 | 3.00 | |
| taking tests | N | 53 | 17 | 56 | 125 | .000** |
| | Mean | 1.41 | 1.00 | 1.50 | 3.22 | |
| | Median | 1.00 | 1.00 | 1.00 | 4.00 | |
| interaction | N | 53 | 17 | 55 | 125 | .000** |
| | Mean | 1.69 | 1.35 | 1.62 | 2.52 | |
| | Median | 1.00 | 1.00 | 1.00 | 2.00 | |
| collaboration | N | 54 | 17 | 56 | 125 | .000* |
| | Mean | 1.43 | 1.24 | 1.55 | 2.71 | |
| | Median | 1.00 | 1.00 | 1.00 | 2.00 | |

Notes: Ratings are based on a 7-point Likert-type scale: 1 – "never", 2- "Once a month or less", 3- "Once every 2 weeks", and 4- "1-2 times a week", 5 – "3-6 times a week", 6- "Once every day", 7- "Several times a day". ** indicates significance at $p < 0.01$ level.

Experience of using Moodle may have affected students' usage of Moodle via mobile access. Kruskal-Wallis tests revealed that students with different Moodle experience reported significantly different usage frequency in taking tests and collaboration ($p < 0.05$, Table 4). Follow-up pair-wise tests disclosed that, for both usages, students with 2 years' or more experience with Moodle actually reported lower frequencies than those with less than 3 months' or 1 year to less than 2 years' experience ($p = 0.02 \sim 0.04$). There was no significant difference between other pairs of experience values.

Table 4. Descriptive statistics of frequency of using Moodle via mobile phones across experience of using Moodle

| Moodle activities | less than 3 months | | 3 months to less than 1 year | | 1 year to less than 2 years | | 2 years or more | | Sig. Kruskal-Wallis |
|------------------------|--------------------|------|------------------------------|------|-----------------------------|------|-----------------|------|---------------------|
| | N | Mean | N | Mean | N | Mean | N | Mean | |
| accessing resources | 86 | 3.65 | 35 | 3.94 | 85 | 3.86 | 45 | 3.29 | 0.164 |
| submitting assignments | 86 | 2.48 | 35 | 2.29 | 85 | 2.15 | 44 | 1.82 | 0.155 |
| taking tests | 86 | 2.51 | 35 | 2.37 | 85 | 2.40 | 45 | 1.67 | 0.020* |
| interaction | 85 | 2.13 | 35 | 2.29 | 85 | 2.14 | 45 | 1.64 | 0.069 |
| collaboration | 86 | 2.19 | 35 | 2.29 | 85 | 2.22 | 45 | 1.47 | 0.015* |

Notes: Ratings are based on a 7-point Likert-type scale: 1 – “never”, 2-“Once a month or less”, 3-“Once every 2 weeks”, and 4-“1-2 times a week”, 5 – “3-6 times a week”, 6-“ Once every day”, 7-“ Several times a day”. * indicates significance at $p < 0.05$ level.

Besides, the difference of frequency of using Moodle via mobile phones across IT competency was also analysed. Table 5 indicates a statistically significant difference of frequency in interaction and collaboration ($p < 0.05$). For interaction, a follow-up pairwise test found that students who rated themselves as “not competent” reported significantly more frequent usage than those who rated themselves as “somewhat competent” ($p = 0.02$) or “competent” ($p = 0.03$). For collaboration, students who rated themselves as “not competent” reported significantly more frequent usage than those who rated themselves as “competent” ($p = 0.04$). There was no significant difference between other pairs of IT competency values.

Table 5. Descriptive statistics of frequency of using Moodle via mobile phones across IT competency

| Moodle activities | Not competent | | Of little competency | | Somewhat competent | | Competent | | Very competent | | Sig. Kruskal-Wallis |
|------------------------|---------------|------|----------------------|------|--------------------|------|-----------|------|----------------|------|---------------------|
| | N | Mean | N | Mean | N | Mean | N | Mean | N | Mean | |
| accessing resources | 29 | 3.83 | 54 | 3.91 | 96 | 3.75 | 59 | 3.44 | 12 | 3.58 | 0.5 |
| submitting assignments | 29 | 2.83 | 53 | 2.21 | 96 | 2.08 | 59 | 2.19 | 12 | 2.25 | 0.145 |
| taking tests | 29 | 2.76 | 54 | 2.31 | 96 | 2.17 | 59 | 2.27 | 12 | 2.50 | 0.26 |
| interaction | 29 | 2.79 | 54 | 2.09 | 96 | 1.96 | 59 | 1.93 | 11 | 1.82 | 0.018* |
| collaboration | 29 | 2.69 | 54 | 2.22 | 96 | 1.97 | 59 | 1.90 | 12 | 1.92 | 0.032* |

Notes: Ratings are based on a 7-point Likert-type scale: 1 – “never”, 2-“ Once a month or less”, 3-“ Once every 2 weeks”, and 4-“1-2 times a week”, 5 – “3-6 times a week”, 6-“ Once every day”, 7-“ Several times a day”. * indicates significance at $p < 0.05$ level.

The study also compares the difference of reported usage frequency between genders, and the statistics and results of Mann-Whitney tests are shown in Table 6. There are statistically significant differences in all usages but accessing resources.

Table 6. Difference of frequency of using Moodle via mobile phones between genders

| Moodle activities | male | | female | | Sig. Mann-Whitney |
|------------------------|------|------|--------|------|-------------------|
| | N | Mean | N | Mean | |
| accessing resources | 133 | 3.79 | 119 | 3.61 | .341 |
| submitting assignments | 118 | 2.55 | 118 | 1.85 | .002** |
| taking tests | 133 | 2.74 | 119 | 1.80 | .000** |
| interaction | 132 | 2.31 | 119 | 1.79 | .040* |
| collaboration | 133 | 2.38 | 119 | 1.75 | .003** |

Notes: Ratings are based on a 7-point Likert-type scale: 1 – “never”, 2-“ Once a month or less”, 3-“ Once every 2 weeks”, and 4-“1-2 times a week”, 5 – “3-6 times a week”, 6-“ Once every day”, 7-“ Several times a day”. * indicates significance at $p < 0.05$ level. ** indicates significance at $p < 0.01$ level.

Themes from interviews

All interviewed students answered that they used mobile phones to access Moodle of their courses, because mobile phone allowed them accessing Moodle at any place and any time. They could read learning materials and important information such as assignment deadlines when no computer or Wi-Fi connection was available. Mobile access also enabled them to read announcement, comments and feedback as soon as they were received. The students from the Engineering course (N =5) also mentioned that they used mobile phone in class to access Moodle because one of the requirements of the course was to complete a short quiz within 4 hours after each class. Therefore, when the students did not bring laptop to the class, they would use mobile phone to finish the quizzes.

However, students also indicated that mobile phone was not a preferred method to access Moodle. Most of them referred to usability issues such as small screens and awkward keyboard. As a result, they would only be comfortable to conduct simple and low-stake tasks using mobile access. It was a common theme among the students that the Mobile Theme of Moodle was found to be inconvenient. To start a Moodle session on mobile phones, they needed to launch a browser window/tab, type in the URL, and log into the system. As the session expires after a short period of idle time, students had to log in again virtually at each time of access. Besides, the display of Moodle course pages on mobile phone was mentioned quite often during the interviews. All the course pages contain rich information. While the text on the course pages was well displayed on computer screens, with proper headings and indentions, the format could become cluttered on the screen of mobile phones. Last but not least, several students mentioned that they did not know how to upload files to Moodle from their mobile phones or to find files downloaded from Moodle.

Discussion

Both the survey and interview data indicated that students used mobile phones to access Moodle for learning materials much more often than for other activities (Table 2), which indicates that the use of mobile access to Moodle was still at the lowest level suggested in (Francis & Raftery, 2005). One possible reason was that the usability limitations of mobile access discouraged the students from using it for complicated tasks (e.g., wiki edits, discussion posts) or activities that were deemed as not urgent. In addition, depositing learning materials is the most widely used function of Moodle across all courses in this study while there were much fewer Moodle activities related to interaction and collaboration (Table 7).

Table 7. Distribution of Moodle activities across courses

| Moodle activities | Education | Social science | Engineering | Humanities and Arts* | | | |
|---|-----------|----------------|-------------|----------------------|----------|----------|----------|
| | Course 1 | Course 2 | Course 3 | Course 4 | Course 5 | Course 6 | Course 7 |
| accessing resources | 69 | 48 | 62 | 30 | 9 | 58 | 68 |
| submitting assignments (assignment, turnitin assignment) | 2 | 0 | 12 | 0 | 0 | 0 | 0 |
| taking tests (quiz, questionnaire) | 2 | 0 | 15 | 0 | 0 | 0 | 0 |
| interaction (discussion forums, feedback, chatroom, choice) | 9 | 0 | 3 | 3 | 1 | 6 | 0 |
| collaboration (wiki, glossary) | 5 | 0 | 1 | 4 | 0 | 4 | 0 |
| Total | 87 | 48 | 93 | 37 | 10 | 68 | 68 |

Notes: * the instructor in Humanities and Arts taught four courses each of which had a Moodle page.

The distribution of Moodle activities shown in Table 7 could partially explain the significant differences on students' self-reported Moodle usages via mobile phones reported in Table 3. For accessing resources, a pair-wise test following the Kruskal-Wallis test reveals that the only significant difference ($p = 0.02$) lied in between the Engineering course and the courses in Humanities and Arts where much fewer learning resources were hosted in two of the courses. The Moodle of the Engineering course had substantially more assignment and test activities than others, and this is probably why the frequencies of using these activities reported in this course was significantly higher than those of all other courses ($p < 0.01$). In addition, the quizzes in the Engineering course were designed in small sizes, with 3-5 multiple choices questions in each, and students reflected that they were comfortable to access those quizzes via mobile phones since they only took a little time to complete and did not involve much typing on the keyboard.

For interaction and collaboration activities, even though the Engineering course did not have the highest number of activities in these two categories, the reported usage frequencies were still significantly higher than those in other courses (Table 3). This result suggests that creation of Moodle activities that are designed for interaction and collaboration does not necessarily result in more frequent access to those activities via mobile phones. Students from the Engineering course reported that they felt there was a learning community built on the course Moodle. There were a variety of learning activities that involved interactions and collaborations, including a group project, a group presentation and peer-assessments (inter- and intra- groups). In addition, the instructor and teaching assistants responded to students' posts in a timely manner. These may all contributed to the stronger motivations of the students in accessing the course Moodle via mobile phone.

Interestingly, the results also revealed that students who have used Moodle for a shorter period of time tended to use mobile access more often to take tests and collaborate on Moodle than those who have used Moodle for two years and more (Table 4). In addition, students with low self-perceived IT competency used more mobile access to Moodle for interaction and collaboration activities (Table 5). These seem to contradict with many studies where experience and IT competency are positively associated with technology usage (Venkatesh & Bala, 2008). We conjecture that the statistics might have been dominated by the students in the Engineering course who rated higher usage frequencies and lower Moodle experience and IT competency than other students. However, this would need further analysis to be confirmed.

The study also found male students used mobile access significantly more often than female students in using all listed Moodle activities except for resource access. During the interviews, some female students complained about the complexity of some Moodle activities and expressed the need of instructional help on using those activities. Such gender difference has also been found in other studies (e.g., Heemskerk & Dam, 2009). The implication is that providing instructions on how to use Moodle activities, especially with mobile access, would be helpful. On another note, student gender distributions vary a lot across the courses and the Engineering course was the only one with much more male than female students (Table 1). Therefore, it is possible that the observed gender difference may be partially affected by the higher ratings among students in the Engineering course.

Conclusion and Future Work

This study compares the usage of Moodle activities via mobile phone among college students enrolled in courses across four disciplines, and analyses the reasons behind the usage patterns. In general, students in this study did not prefer using their mobile phones to access Moodle, due to the limitations of mobile access on usability and reliability. However, most of them indeed used mobile phone to access Moodle when it was necessary. In addition, it was found that students preferred to do easy and low-stake Moodle tasks on their mobile phones. The students expressed the need for a more user-friendly mobile access. In comparing survey responses from students across the courses, it was found that good pedagogical design could at least partially mitigate the limitations of mobile access and encourage students to use Moodle more often including activities involving interaction and collaboration. Future work will include analysis of students' perceptions on usefulness of mobile access to Moodle and the factors that might affect the perceptions.

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Appendix 1: Questionnaire

Part 1: Demographic information

- What is your gender?
- How old are you?
- Where did you spend most of your life?
- How long have you used Moodle?
- Have you ever used any other learning management systems?
- What is your IT (information technology) competency level?

Part 2: Frequency of using different Moodle functions

- I used Moodle of this course via mobile phones to access learning materials (e.g., slides, notes, readings, assignments)
- I used Moodle of this course via mobile phones for submitting assignments.
- I used Moodle of this course via mobile phones for taking tests/quizzes/exams.
- I used Moodle of this course via mobile phones for interacting with instructors/classmates (e.g., replying to posts, sending messages, chatting, etc.).
- I used Moodle of this course via mobile phones for collaborating with classmates (e.g., editing wikis, contributing to glossary, discussing group projects, etc.).