

Framework of Mobile-based Learning (M-Learning): An Exploratory Study on the Use of Mobile Devices for University Students' Academic Learning

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ABSTRACT

This paper reports the results of 15 in-depth interviews with university students in the Greater Boston area regarding their mobile learning experiences, including the kinds of learning activities performed, and the advantages and challenges of m-learning. Mobile devices were used mainly for initial exploratory learning or a way for quick access and interacting with classmates. Participants avoided using mobile devices for complicated tasks or deep learning. The limited usability of mobile devices in supporting advanced learning is alarming. A conceptual framework of m-learning containing dimensions of *mobility and ubiquity*, *convenience*, *interaction and collaboration*, and *usability* was presented.

TOPICS

mobile system; online learning; ubiquitous computing

INTRODUCTION

Background.

M-learning refers to an education setting where learning occurs through utilizing mobile devices. Previous studies revealed that mobile devices were used primarily for personal (Evans, 2008) or informal learning purposes (Dabbagh & Kitsantas, 2012). There is limited empirical investigation into the extent to which mobile devices facilitate academic learning. Some researchers stressed smartphones' limitations due to small screens (Dukic, Chiu, & Lo, 2015), whereas others valued that mobile devices connect teachers and learners (Loomba & Loomba, 2009). While the "ubiquity" feature of on-demand mobile computing was deemed beneficial for learners (Hummel & Hlavacs, 2003), poor usability would be an obstacle for m-learning (Shackel, 2009). To date, there is no study investigated m-learning and its association with user

experience. This study fills this gap by examining m-learning and exploring usability requirements pertinent to its success.

Research questions.

The current study seeks to answer the following research questions:

RQ1. How do participants use their mobile devices to support their academic learning?

RQ2. What do participants perceive as the advantages and challenges of m-learning?

RQ3. What factors impact on the success of m-learning?

METHODOLOGY

In summer 2017, 15 semi-structured in-person or phone interviews were conducted with students from four universities in the greater Boston area. Each interview lasted 45-60 minutes. Seventeen questions were included in the interview, ranging from demographic background, history of using mobile devices for communication, experience with m-learning, and their thoughts on using mobile devices for academic tasks. Example interview questions were “What are the class-related activities have you tried on mobile devices?” and “Do mobile devices improve your access to the course content, the instructors and the classmates, compared to being without one?”. Coding was performed after interview responses were transcribed. For fixed response questions, coding categories were based on pre-defined options. For open-ended questions, descriptive coding involving assigning a label to summarize “the basic topic of a passage” (Miles, Huberman, & Saldana, 2014) was used.

Participants (11 female and 4 male) were in the age range of 20 to 45. Five were undergraduates and 11 were graduate students. Their majors ranged from arts and humanities, social sciences, to engineering and hard sciences. Participants came from multiple geographic regions of the world, including the Middle East, Asia, and United States. Smartphones were the most frequently used tool for m-learning (n=15), and iPhone was the most popular model (67%). Other phone models included Samsung (12%), LG, Huawei, and BLU. Tablets were also used by participants (n=8) for course-assigned readings. Kindle was the preferred tablet both as a device (38%) and as an app (50%).

RESULTS

M-learning activities.

Participants’ learning activities can be grouped into independent and collaborative learning (see Table 1). For solo learning, participants used their mobile devices for “reading on

the move” [P2], or to “make use of” [P12] their commuting time. Besides reading, participants (n=12) accessed learning management systems (LMS) and checked grades on their mobile devices. Participants (n=12) used phone camera to take pictures of their graded assignments [P14], blackboard notes [P9], or call numbers [P2]. For collaborative learning, participants (n=15) used their mobile devices to schedule teamwork activities, as they believed that inquiries by texting and calling ensured a timely response [P6]. Participants (n=11) used their phone to ask or reply to course or assignment related questions.

Independent Activity	#	%	Collaborative Activity	#	%
Reading e-materials	15	100%	Setting meeting time	15	100%
Accessing LMS, checking grades	12	80%	Q&A	11	73%
Taking photos of documents	12	80%	Social networking	10	67%
Searching for coursework	10	67%	Discussion	5	33%
Checking calendars, setting reminders	8	53%	Attending virtual classes	5	33%
Watching class videos	7	47%			
Accessing library resources	6	40%			
Writing papers	5	33%			
Posting to discussion boards	3	20%			
Taking quizzes	2	13%			

Table 1. Independent and collaborative m-learning activities.

M-learning activities were straightforward and interruptible. Reading when on the move could be easily stopped when “my subway station was near” [P13]. Limited input activities were used: Participants seldom reported carrying out heavy-duty tasks such as writing a paper, or taking a quiz. When they were actually involved in intensive learning, participants would “mute the phone” [P12] or “put it in the drawer” [P4] to avoid disruptions.

Advantages and Challenges.

Mobile devices support several but not all formal learning activities. P15 reported using her phone to record her thoughts for a paper while driving. Portability, instant access to learning information, and the convenience of taking notes and taking photos of learning documents were viewed as the advantages (see Table 2). Disadvantages included distraction and interruption (n=15).

A number of mobile specific usability issues prevented participants from learning efficiently. Typing on their phones required longer time because “the screen was small and the

keyboard was even smaller” [P11]. Mobile access to learning materials also proved difficult because the content was hard to view. Mobile unfriendly sites made participants stop using their phone to access library resources, “I can’t even find where to login on our library website” [P2]. Furthermore, since what they entered through a smartphone can be “easily changed or collapsed” [P11], participants were worried about “What if I made a typo?” [P5].

Category	Item	#	%
Advantages	Portability	15	100%
	Instant access	12	80%
	Convenient taking/sharing photos	12	80%
	Easy paper drafting/taking notes	6	40%
Challenges	Interruptions & distractions	15	100%
	Screen size	7	47%
	Information architecture	7	47%
	Format & delivery issues	5	33%

Table 2. Advantages and challenges of using mobile devices for learning.

DISCUSSION AND CONCLUSION

As one of very first studies investigating m-learning, the findings provide insights into various attributes of mobile technology in supporting academic learning. Through examining relevant dimensions including mobility & ubiquity, convenience, interaction & collaboration, and usability, a conceptual framework of m-learning was developed (see Figure 1). Facets of mobile solutions that help to empower learning by expanding its environments or enabling efficient content transfer are included, as well as dimensions (e.g., usability) where technological solutions have yet to be developed to facilitate deep learning.

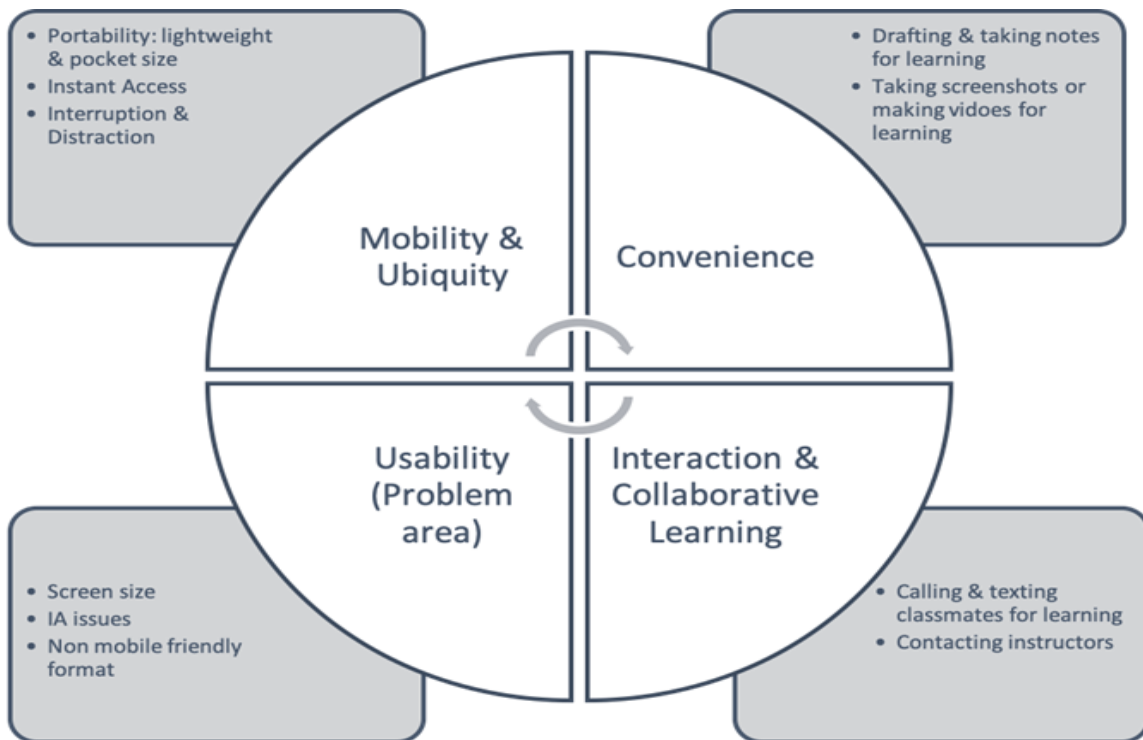


Figure 1. Conceptual framework for m-learning.

The present study shows that mobile devices function as a bridging mechanism between initial exploratory learning and formal systematic learning. These devices also enable a quick access and interaction with classmates. Nonetheless, “usability” of mobile devices or apps/sites was a problem area where multiple complaints were made. The limited usability of mobile device and LMSs presents a serious gap in facilitating more advanced m-learning. Findings of this study also helps to raise the awareness of higher education instructors about the prevalence of mobile devices used by their students for learning. In delivering their course materials and assignments through LMS, instructors should be mindful to take full advantages of m-learning while try to minimize problems associated with using mobile devices for academic tasks.

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