



Adopting Mobile Technology in the Higher Education Classroom

By Christopher B. Davison and Edward J. Lazaros

ABSTRACT

Mobile technologies have become inexpensive and ubiquitous. This has led to the proliferation of mobile technologies being employed by students for mobile learning (mLearning) purposes. Preferences for mLearning technologies among a higher education student population at a mid-sized Indiana research and teaching university are explored in this article. The findings of this research are compared to similar research from several years prior conducted by Conole, Laat, Dillon, and Darby, 2006. This comparison yielded some interesting findings such as students in both studies strongly agreeing that mLearning is an important aspect of their coursework. Other interesting findings include the laptop remaining as a preferred student technology, and the discussion board gaining in popularity among the U.S. population when compared to their U.K. counterparts in the Conole et al. (2006) study. Opportunities for future research relating to mLearning still remain and are described in this article.

Keywords: mLearning, mobile technology, mobile learning, discussion boards, technology adoption, educational technology.

INTRODUCTION

The utilization of mobile learning (mLearning) technology is an increasing trend in the higher education setting (Mansureh, 2010). El-Hussein and Cronje (2010) defined mLearning as “any type of learning that takes place in learning environments and spaces that take account of the mobility of technology, mobility of learners and mobility of learning” (p. 20). In this article, the findings that resulted from a study of students’ use and experiences with mobile technologies are presented. A higher education student population at a mid-sized Indiana research and teaching university was surveyed, and the results were statistically analyzed. The results of this study were compared to a similar study (upon which this one is based) of British students (Conole, Laat, Dillon, & Darby, 2006). The findings suggest that students employ a number of mLearning technologies, and they have a

consistent preference for laptops, which they use during their course of studies. The U.S. students demonstrated similar attitudes and preferences to their British counterparts who were surveyed six years earlier. However, student preferences for the Discussion Board, as an online facility, were notably different across studies.

RESEARCH PROBLEM STATEMENT

There is a great deal of research that examines mobile technology adoption within higher education. Conole et al. (2006) investigated U.K. students’ utilization of experiences with technologies. Respondents answered questions that were both qualitative (in-depth interviews) and quantitative (via a survey). This current research serves to replicate the quantitative portion in the USA with minor adjustments to fit a web-based delivery system.

The problem is twofold in nature: (a) This research on the use of both mobile and smartphone technology within the higher education classroom tends to be geographically bounded, and (b) there is little longitudinal work in this area. This article adds to the body of scientific knowledge on mLearning in that it is a geographically bounded (i.e., a mid-sized, east-central Indiana research and teaching university) research study. Furthermore, it expounds upon the Conole et al. (2006) study, from several years prior, and compares the new data to that study.

LITERATURE REVIEW

There is a great deal of research and information addressing technology infusion into the classroom across all grade levels from K-12 to the university setting. However, these studies report mixed results of effectiveness, but overall, the trend continues to support an increase in adopting mobile technology within the higher education classroom environment (Mansureh, 2010). Emerging technologies revolutionize the way students and faculty members communicate and interact with each other (Hirumi, 2014). The literature indicates that mLearning technologies have the potential to facilitate learning in a pedagogical environment (Patten, Sanchez, & Tangney, 2006).

Mobile learning can be used in place of having a computer in every home, and it can allow for greater freedom, because the learning material can be accessed from anywhere. Hardware and software are advancing rapidly enough that accessing learning content on a mobile device has no downside when comparing it to accessing the content on a computer (Shao & Seif, 2014, p. 3). mLearning can engage students in active learning that can lead to the development of critical thinking and problem solving skills. Mobile learning allows students to do hands-on learning and combine it with traditional course material (Granić, Ćukušić, & Walker, 2009, p. 170).

There are other positive aspects of using mLearning. Students that are able to interact with the course using mLearning are likely to have fun and enjoy the course, and they pursue the content that they find the most interesting. mLearning allows students to work at their own pace, in the environment that is the most comfortable to them (Granić, Ćukušić, & Walker, 2009, p. 180). These technologies represent a shift from knowledge procurement to a more interactive form of learning (Conole, 2007). Furthermore, these technologies can foster “self-regulation” (Beishuizen, 2008, p. 183) within the student.

Prior to the implementation of mLearning, there are many considerations. For example, the content should be designed so that it works on the least advanced device, so that the largest range of students can access it (Wang & Shen, 2012, p. 567). It is also important for designers to use different techniques when designing mLearning to appeal to many types of learners (Wang & Shen, 2012, p. 570). Consideration needs to be given to the potential detriments to the learning process. Mobile technologies have the potential to facilitate non-learning activities in the classroom and serve as a distraction (Wood, De Pasquale, & Cruikshank, 2012). While mLearning technologies can have a positive impact on student learning, the technologies are not without issues.

Challenges pre-sentenced by mLearning technologies are instructor technology adoption as well as instructor facilitation of electronic learning (eLearning) platforms (Darby, 2004). A number of barriers to the adoption of technology exist in the educational environment. These barriers range from technical capabilities of the infrastructure to

policy enactment (McKay, Seward, & Davison, 2014). Seminal research on the Technology Acceptance Model (TAM) in the education sector indicates that the highest determinant of adoption is the perceived usefulness of the technology (Hu, Clark, & Ma, 2003).

The Conole, Latt, Dillion, and Darby et al. (2008) work informs researchers that students tend to select mobile technologies that enhance their learning style, and their choice is often a matter of trial and error. This study was one of the many studies funded by the U.K.’s Joint Information Systems Committee (JISC) as part of an ePedagogy program. The purpose of the program, and subsequently the Conole et al. (2006, 2008) works, was to understand learners’ experiences with eLearning technologies. Their work was both quantitative and qualitative in nature, including in-depth interviews, case studies, and surveys. The research in this area was lacking because mLearning tools were relatively new at the time.

Conole et al. (2006) performed a quantitative, survey-based, study on the experiences and usage of technologies by students. The survey instrument from their work was used as the data collection instrument for this study. As in this study, the researchers sought to provide empirically grounded data on students’ actual use and usage patterns of technologies. The focus of both studies is to examine how learners engage and experience both eLearning and mLearning technologies and how those technologies fit into the entire learning experience.

A definition of eLearning from eLearningNC.gov (2015) is given as “utilizing electronic technologies to access educational curriculum outside of a traditional classroom. In most cases, it refers to a course, program or degree delivered completely online” (para. 1). Even though mobile technology adoption is a continuing trend, the issues presented above create real barriers in adopting mobile technology in the classroom and facilitating eLearning. Coupled with implementation issues (e.g., budget, technology procurement, bandwidth, and support) faced by the organization (McKay, Seward, & Davison, 2014), mobile technology adoption is a difficult proposition. Despite the barriers that exist, mLearning is increasingly a part of campus life/education.

From the literature, it is found that mLearning is an increasing trend. As such, the authors of this article sought to discover the mLearning trends occurring at their home university. This study fits into the broader context of the literature from a geographic as well as a temporal perspective. The Conole et al. (2006) study was performed in the nascent stages of mLearning technologies and took place in the U.K. Even though mobile technology is still evolving, this study occurs at a point after which the technology has experienced some maturation and took place in the United States.

PURPOSE OF THE STUDY

The purpose of this quantitative cross-sectional survey study is to ascertain characteristics of use and adoption of both smartphone and mobile technology within a student population at a mid-sized Indiana research and teaching university. The data will be compared to data obtained by Conole et al. (2006) in their similar British study. A cross-section design was deemed appropriate, because it examines current practices, attitudes, beliefs, and opinions within a definitive group (Cresswell, 2005).

This study addresses the technological impact that mLearning has on pedagogy practice. The authors attempt to identify specific technologies and specific technology usage patterns. Such identification is important in order to assist educators in identifying and planning for mLearning technologies and incorporating those technologies into the classroom.

RESEARCH QUESTIONS

1. Are students utilizing smartphones and other technologies for their courses?
2. If yes: to what degree and how?
3. What technologies appear the most useful or preferred?
4. How are these technologies being utilized?

RESEARCH DESIGN AND METHODOLOGY

Subjects, Participation, and IRB

The survey population consisted of 20,503 graduate and undergraduate students at one mid-sized Indiana research and teaching university. Participants were recruited via mass campus email in the Fall of 2014. The entire

population was surveyed. To be eligible to participate in the study, the students must have been over the age of 18. Sample participation (ratio of invites to participation) was .7 percent, with 148 electing to participate in the survey.

This study was cleared through the Ball State University IRB office. The study procedures were cleared as “Exempt” under federal regulations. The assigned protocol number is: 601429-1.

Measuring Instrument: Design and Procedure

Data was obtained through the use of an online questionnaire. The questionnaire was based on the eLearning Research Center (2013) work and slightly modified (see details that follow) for web-based delivery. The eLearning Research Center instrument contained a series of matrices of technologies against types of learning activities that was derived from the DialogPlus taxonomy (Canole, 2006). This served as a basis for the instrument as it is widely utilized and accepted as valid and reliable.

After slight modifications of the instrument to facilitate the Qualtrics system, a pilot test was performed. These modifications were only functional in nature, where a slider bar was added along with selection boxes as the original survey from Conole et al. (2006). Feedback from this test was then incorporated into the final, web-based survey instrument. The participants in the pilot test, while suggesting no major changes to the instruments, did generally agree on two areas where the instrument verbiage needed clarification. This was due in large part to the adaptation of a United Kingdom survey to American students. For example, the term “hall of residence” was changed to “dorm” for clarity purposes.

The second area of modification proved to be more significant after the data was collected and analyzed. The pilot test participants suggested adding another modality of communication: social media. As it turns out, this was a significant form of communications (see Results discussion) in many categories.

Following the pilot testing, the instrument was then implemented and delivered through the Qualtrics analytics system. The University Communications office was contacted and they agreed to deliver email solicitations to the student population inviting participation.

Implementation and Content

The study was carried out by surveying all students at a mid-sized Indiana research and teaching university. Participants were emailed an invitation to fill out a validated survey instrument and the results were statistically analyzed. The survey sample set (N) was 148. To answer the research questions, students were surveyed in three general categories relating to mLearning: digital technology usage, communication tool usage, and online learning facility usage. Next, the subjects were asked several questions regarding their attitude toward mLearning technologies. Finally, each student was asked to assess their technology usage in their studies as compared to their personal utilization of such. This information would be useful in answering research question number four relating to how technologies are being utilized.

RESULTS

Digital Technology Utilization

The respondents showed a larger preference for laptop utilization as an mLearning tool over all other technologies: almost 90 percent of the students used a laptop as an mLearning device. This was followed by 60 percent utilization rate for smart phones and then 45 percent for tablet devices. In every surveyed category of digital

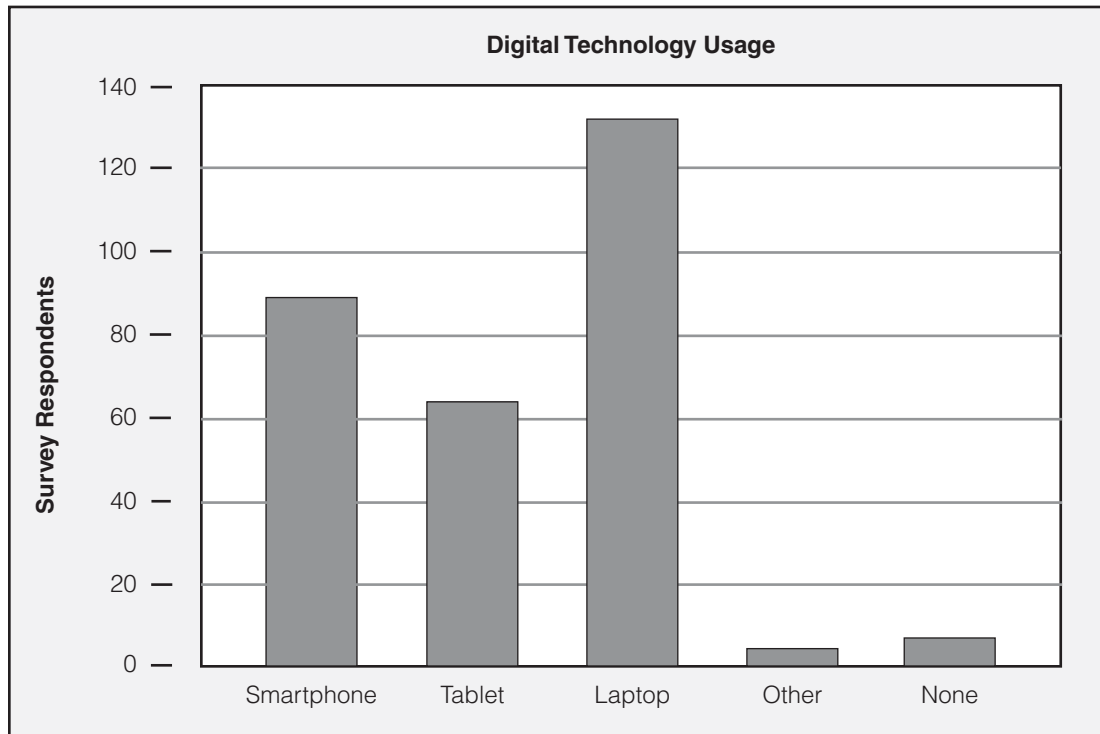
technology for studies, the laptop was favored. See Table 1 for a visual depiction of the digital technology survey results.

In this research, just over 70 percent of the students utilized more than one mLearning device, with many students possessing and utilizing three or more mLearning technologies. The data indicates that students utilize a wide variety of mLearning technologies to facilitate learning, while only three percent indicated they did not utilize any mLearning devices.

Interestingly, even for student to student communication the laptop, as a device, was favored over all other technologies including mobile phone texting. Comparatively, students preferred mobile phones as a digital technology (texting, calling) with friends and family over any other technology. Aside from personal communications, the laptop appears to be a ubiquitous and utilitarian mLearning tool.

These results from this research are similar to the Conole et al. (2006) study. In that research the laptop/desktop was the primary student-to-student communication tool. As in this study, the mobile phone was second. Similarly, as in this study, Canole et al. (2006) found mobile phones to be the primary digital technology for communications to family and friends, followed by the laptop/desktop (as in this study).

Table 1



Communication Tools Utilization

The most utilized method of communicating with other students was via email (85 percent of students use this method), followed by texting (65 percent). Communication with teachers/tutors was similar (see Table 2), with 88 percent of respondents communicating via email. With regard to personal communications, texting was the most used communication tool (85 percent) followed by voice calls at 74 percent. Email was a close third with 66 percent.

Email was also found to promote group collaboration. When asked about tools that promote group efforts such as task collaboration and task planning, 76 percent found that email did promote task collaboration. In this category, email was clearly preferred. The next ranked technology was texting at only 45 percent.

Email, in the Conole et al. (2006) study, was by far the most utilized communication tool. This was true for student to student, student to friend/family, and student to instructor communications. While their 2006 version of their instrument did not specify texting, it did specify instant messaging. In their study, instant messaging was the second largest category of student-to-student and student-to-friend/family communications tool. In this study, only 40 percent of the respondents selected instant messaging as a communications method with friends and family.

Online Learning Facilities

Online learning facilities are those facilities such as digital libraries, search engines, discussion boards, and virtual environments that are utilized for pedagogy. In this research study the Virtual Learning Environment (VLE) and, more specifically, the Discussion Board is the most utilized online learning facility in each category with the exception of friends/family communications. Students utilize these two facilities for everything from exam review to reading course materials. Search engines showed very high rankings in certain categories, such as information gathering (67 percent) and individual learning task performance (44 percent).

The preference for the VLE is congruent with the Conole et al. (2006) in the areas of exam review and course material delivery. In both studies, the VLE and search engines were popular. However, in this study, the Discussion Board was very highly favored, which is the opposite of the Conole et al. (2006) findings. In their study, the Discussion Board was utilized very little in almost every category, except for communications. Surprisingly, the Conole et al. (2006) study reports the Discussion Board being highly utilized in the communications with friends/family category. This study found only four reported instances of the Discussion Board being highly utilized by the students who responded to the survey instrument for the purposes of communicating with friends and family.

Table 2

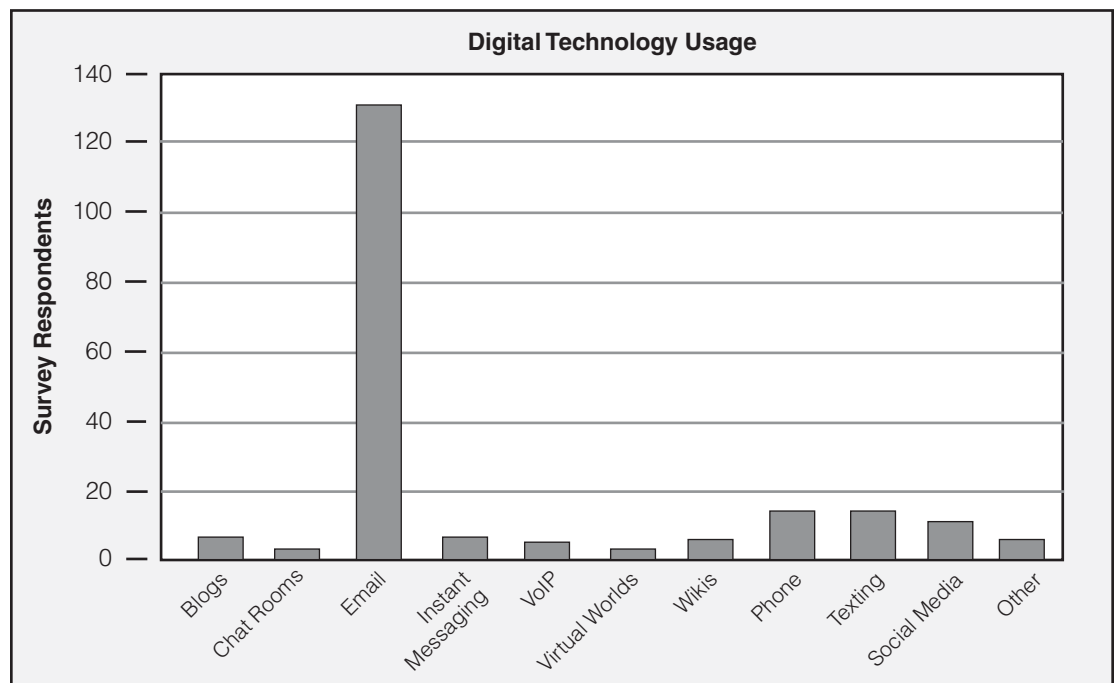
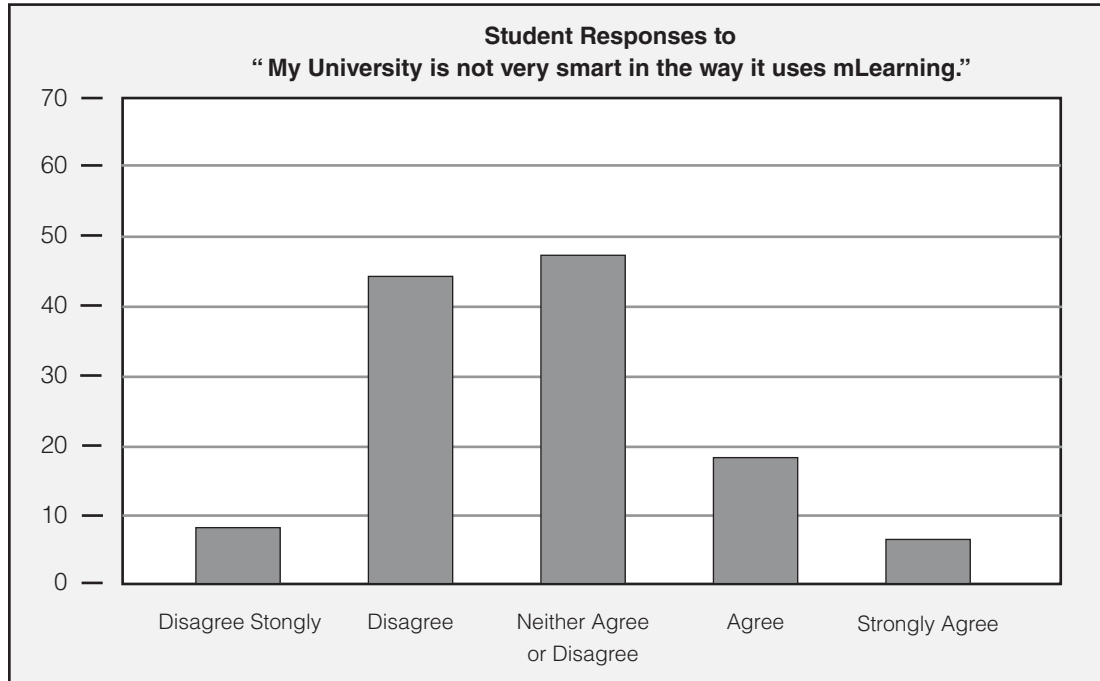


Table 3

Student Perceptions of mLearning Technologies

This section of the instrument, varies slightly from the wording in the Conole et al. (2006) study instrument. As those researchers were interested in eLearning overall, they utilized the term eLearning, while this study focused more narrowly in this section on mLearning. The operational definition provided in the instruments was comparable in each study: “any kind of Internet or communication service or electronic device that supports you in a learning activity.”

In both studies, the students strongly agreed that eLearning/mLearning is an important aspect of their course work. Similarly, in both studies students were ambivalent with regard to eLearning/mLearning being crucial to their study capability. In the Conole et al. (2006), 18 percent of the students neither agreed nor disagreed that eLearning was crucial to their study capability. Respondents in this study neither agreed nor disagreed to that statement at a rate of 17 percent.

Most students agreed mLearning technology was an important element to making their course work more enjoyable. Conole et al. (2006) eloquently surmised this by stating that “...in general most of the students across the disciplines are responding rather positively towards eLearning in their courses and are quite neutral about how eLearning is being used within the institutions” (p. 76). The students responding to this survey were generally neutral when asked if their university was not very

smart in the way it uses mLearning technology. The largest majority of respondents “neither agree nor disagree” with that statement, followed closely “disagree” with that statement (see Table 3).

As expected, the students responding to this survey experienced little trouble finding Internet connected computers. The current study and Canole et al. (2006) indicated almost 50 percent of participants strongly disagreed with this statement. In both surveys, the next largest percentage was disagree with that statement (Conole et al. (2006) at 35 percent and this study at 31 percent). When asked if they had trouble utilizing technology or computers, most (77 percent) strongly disagreed or disagreed with that statement. Again, that is congruent with the Canole et al. (2006) survey.

Comparison to Previous Research

The results of this study are strikingly similar to the Conole et al. (2006) study. Separated by several years and a hemisphere, the students showed quite similar attitudes toward, and preferences in, mLearning technologies. Worthy of note is the absence of a tablet device in the Conole et al. (2006) research. The iPad and Galaxy Tab was not introduced until 2010, the Kindle in 2011, and the Surface was not available until 2012. In this research study, tablet devices did make a strong showing in every category: 45 percent of respondents indicated utilization of a tablet device as an mLearning tool.

DISCUSSION

Although no major change in attitudes and preferences existed between this study and the Conole et al. (2006) study; that is in itself an interesting finding. With the ever-changing advances in technologies in the intervening years between studies (e.g., Google Glass, iPad, and ubiquitous touch screens) the laptop is still the workhorse of mLearning and the preferred student technology.

The preference for the discussion board among the students surveyed in this research is surprising. This shows a striking gain in popularity compared to the Conole et al. (2006) study; friends/family communications notwithstanding. Given these findings, certain questions can be hypothesized. Has the Discussion Board technology matured to a point of acceptance and usability over the years? Or have educators and students become more adept at using the technology? Are their cultural factors in Discussion Board preferences between the U.S. and U.K. students? Each of these questions provide opportunities for further research (see below).

Research Questions

With regard to research question one, “Are students utilizing smart phones and other technologies for their courses?”: the answer is yes. Students indicated that they are using smartphones and other technologies for their courses. Regarding research question two, “If yes: to what degree and how?” and research question three, “What technologies appear the most useful or preferred?”: 60 percent of students indicated that they utilized smart phones as an mLearning tool. Laptop usage exceeded smartphone usage by 30 percent. Tablet devices were the third most utilized at 45 percent. In terms of research question four, “How are these technologies being utilized,,:” students favor the laptop for student-to-student communication. In terms of personal use, preference for mobile phones was indicated. With regard to student-to-student communication tool utilization, email was the most utilized at 85 percent, followed by texting at 65 percent. For student-to-teacher/tutor communication, 88 percent favored email with no other significant communication methodology preference reported.

LIMITATIONS

As the sample was specifically limited to one university, the potential to generalize the results could be similarly limited. As with any online survey instrument, there are issues such as self-selection bias (Wright, 2005).

While the Conole et al. (2006) study encompassed a larger geographical area (the U.K.’s Higher Education Academy), the sample was limited to a much smaller geographically bounded area. In this case: east-central Indiana. This limitation presents an opportunity to expand this study to other academic institutions in the United States (see the following text).

OPPORTUNITIES FOR FUTURE RESEARCH

Pedagogical practices with mLearning technologies should evolve over time. As such, a suggested future research endeavor would be a longitudinal study that samples the cross-sectional group (a mid-sized Indiana research and teaching university) at several intervals over time. This would reveal any changes or trends within the sample group as related to mLearning adoption and practice.

For both longitudinal and larger regional sample reasons, replication of this study at other universities is also suggested. This will give a broader picture (over time) of student experiences with mLearning technology. Of particular interest would be university students in less developed countries. This will provide a comparison of technology adoption across a wider socio-economic stratification.

Given the advances in technology in the years that have elapsed since the Conole et al. (2006) study, there assuredly will be further advances in technologies. In a number of categories, there was a large preference for an “other” category within the mLearning communication tools section. With some qualitative research, the identity of this category could be found.

Discussion Board preferences by students in the United States as opposed to those in the United Kingdom (see discussion above) is another opportunity for further research. These preferences could be a result of cultural differences or of technology maturation. Advancements in technology within the

years between studies could account for the difference. Conversely, this could be a result of familiarity and utilization of this technology. The Discussion Board has been a staple technology in learning and in online education for quite some time (Blackmon, 2012).

CONCLUSION

In this research, findings that resulted from a study of US students' use and experiences with mobile technologies were presented. The survey population was derived from one mid-sized Indiana teaching and research institution. The students typically employed several types of mLearning technologies such as laptops, smart phones, and tablets. The findings suggest that laptops are the preferred mLearning technology and are utilized in a number of categories such as student-to-student communications as well as for completing learning assignments. These findings are congruent with the Conole et al. (2006) research findings. Of notable difference was the U.S. students' preference for Discussion Boards as an online learning facility compared to the British students surveyed in prior years.

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