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Mobile Learning: How Students Use Mobile Devices to Support Learning

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Abstract

Mobile learning is a trend in higher education that is redefining the manner in which learn takes place and instruction is delivered. The purpose of this exploratory study to begin to investigate whether mobile devices are currently used to enhance or support learning in a graduate level Occupational Therapy program in order to facilitate student achievement. Forty six participants were administered a questionnaire containing Likert scale items and open-ended questions to obtain information regarding frequency and quality of mobile device use among students. The findings indicate that students are using their mobile devices to enhance learning outside of the classroom.

Introduction

Mobile learning, the use of portable electronic devices to access and share information, is a trend in higher education, and is redefining the manner in which learning takes place and how instruction is delivered (Geist, 2011; Miller, 2012). Mobile learning presents students and professionals with the unique opportunity to access information instantaneously regardless of location (Rossing, Miller, Cecil, & Stamper, 2012). This means that learning can occur anywhere at any time through the use of these devices. Devices commonly used are smartphones with the Windows©, LG Android ™, or Apple® operating systems; or tablet computers. More specifically, the iPad is currently at the forefront of tablet use accounting for 97% of all tablet-based web traffic in 2011 (Arnet, 2012).

Although the implementation of mobile device use is well documented in elementary and high school education with 1.5 million tablet-pcs currently being used in public school districts, there

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is limited research supporting the use of these tools in higher education (Kessler, 2012). However, literature related to device use at the collegiate level is proving to be positive and influential on student learning. For example, Seton Hill University and George Fox University are among the numerous institutions of higher education that have recognized the potential of using mobile devices to enhance learning and have integrated the devices into their curricula (Kolowich, 2012). Current research has validated the potential of these devices as they have been found to facilitate engagement and participation in discussion when used in the classroom setting (Rossing et. al, 2012). Moreover, students report that use of mobile devices allows them to adapt course content to fit their learning style and pace (Rossing et. al, 2012).

Mobile learning devices have also been found to be efficacious in the consumption of information with one of its most notable capabilities being its utility as an e-reader. Students are choosing to buy e-books that they can easily download on their tablets, while professors are choosing to upload excerpts from texts as pdf files and sharing them with students (Geist, 2011). Publishers are seeking ways to stay viable in this new market and looking to exploit the capabilities of tablet-pcs by creating visual interfaces and multimedia built in to their e-books to make learning more interactive ("iPad in Education", n.d.)This is particularly important as a study by Rossing et. al (2012) found that the visual and tactile learning opportunities presented by these devices made the learning experience more "hands-on". Similarly, studies have found that tablet-pcs have applications that serve as study aides and productivity tools for students. Not only were students able to use "apps" to help create flashcards for studying, but they were also able to access and edit documents on Google docs for assignments (Miller, 2012). The design of tablet-pcs combines e-reading capabilities with web-browsing, as well as an assortment of applications, or 'apps' that facilitate the integration of information by making accessibility

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instantaneous (Rossing et. al, 2012). Due to these capabilities and their potential to revolutionize education, these tools are highly relevant to higher education.

In the classroom, the use of mobile devices has been found to contribute to the learning experience and engage students during lectures. Students perceive the tablet PC to be effective in improving their learning environment. Moreover, students report the tablet PC to facilitate their ability to understand key concepts and personalize their learning experience (Schuler et. al, 2012). With regards to group work, a study by Schuler et. al (2012), found that the use of tablet computers helped to create a cooperative learning environment among students. Students were able to share information more efficiently, formulate responses to questions, and increase their sense of accountability. Within the context, accountability for learning is important to foster in graduate students, as they are encouraged to be self-directed learners. Therefore, it is necessary to investigate strategies to integrate the use of mobile devices in higher education, especially in graduate studies.

As collegiate institutions begin to recognize the paradigm shift of mobile device use, redefining the way information is consumed, disseminated, and used, it is essential to conduct more studies in this area (Geist, 2011). Mobile devices will indubitably change the way instruction is delivered in higher education settings, and it is important to investigate and apply these concepts to teaching strategies.

The purpose of this exploratory study is to begin to assess how mobile devices are currently used to enhance or support learning in a graduate level Occupational Therapy program in order to facilitate student achievement. This study will use information obtained from the students in order to provide suggestions on applications and web resources that can be accessed at little or no cost. Specifically, the study will address the research questions: Do Master of Science in

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Occupational Therapy (MSOT) students have access to/use mobile devices (cell phones, tablets, etc.)? How is mobile device use among students used to enhance learning in a graduate student program?

Methods

Design

A mixed quantitative and qualitative designed was employed. Through quantitative data analysis, information regarding frequency and purpose of mobile device use was obtained. Qualitative data were collected to obtain information that will aide professors in developing strategies to support and enhance classroom learning through mobile devices.

Instrumentation – See Appendix A

A questionnaire containing Likert scale items and open-ended items was utilized in this study to obtain both quantitative and qualitative information regarding student use of mobile devices in their academic role. The tool contained items adapted from the Rossing et. al (2012) study. The tool was not tested for validity or reliability.

Participants

The sample included forty-six students from a Master of Science in Occupational Therapy program. Participants were both male and female, ranging in age from twenty-one to thirty-eight years old. Participation in this study was voluntary and no costs were incurred on the part of the students as they were not required to buy any additional devices to participate in this study.

Data Analysis

The questionnaire was administered to students before class and they were instructed to take approximately ten minutes for completion. Quantitative data from the questionnaire were analyzed using SPSSv.21 software to compute descriptive statistics and frequency tables.

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The qualitative data gathered from the questionnaire were reviewed, reduced, and coded to develop relevant themes. Researchers reviewed the surveys extensively until saturation was achieved. Data that was recurrent in the surveys was highlighted and extracted into a word document. To increase the rigor of the study, the data from the survey were compared one against the other to ensure accurate reduction. The data extracted were then reviewed again to form codes, and these codes were further reduced and analyzed to form themes. The researchers maintained a journal detailing the coding decisions to reduce bias.

Findings

Quantitative Results

Quantitative results revealed that 45 of the 46 student participants reported using their mobile devices for academic purposes. 91% of students reported feeling very comfortable using mobile devices and 97% reported using mobile devices multiple times a week. Mobile devices used by students and types of use are represented in charts 1.1and 1.2.

Chart 1.1: Mobile Devices Used by Students

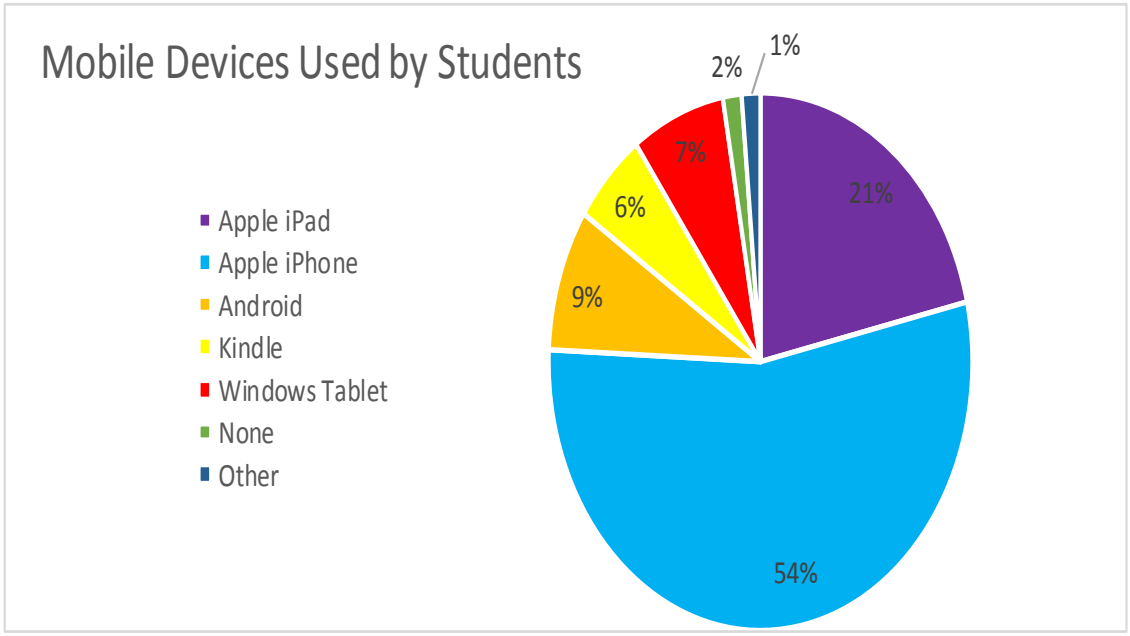
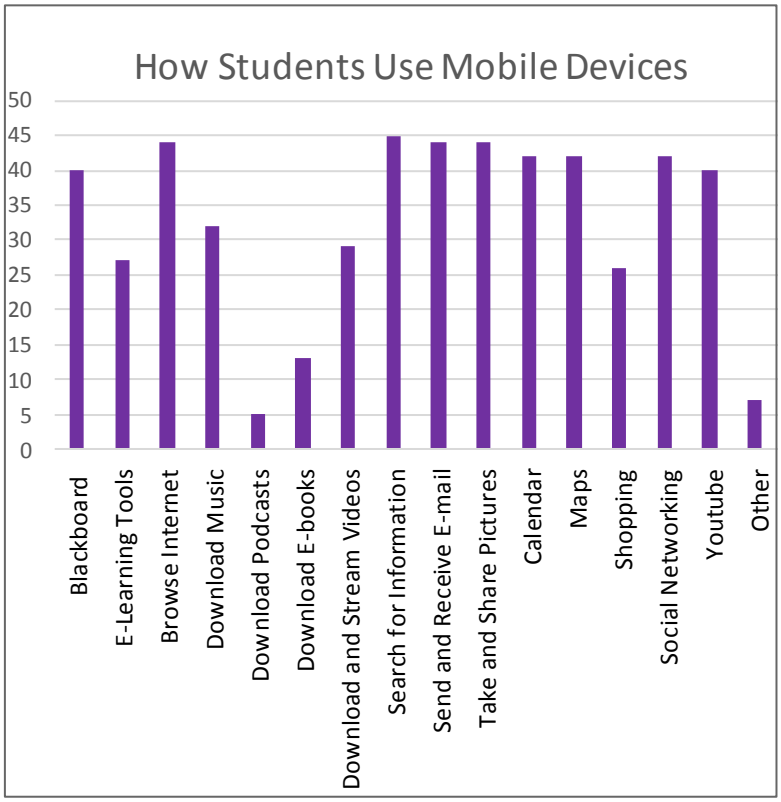


Chart 1.2: Types of Mobile Device Use



Qualitative Results

Qualitative data analysis yielded the following themes: 1) Mobile devices as learning tools 2) Mobile devices support student role 3) Integration of mobile devices into classroom 4) Use of social networks to communicate 5) Convenience and Utility.

The majority of students utilize their mobile devices as learning tools.

Students turn their mobile devices into learning tools through the use of mobile applications, or "apps". A majority of students reported the use of the Quizlet LLC "app" as a study tool. Quizlet

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LLC is a company that creates free study tools that can be accessed through their website or mobile apps Through the use of Quizlet LLC, students are able to upload course content to create flashcard sets that can be shared and edited by their classmates. Other features include games and quizzes to help students learn exam material.

Apart from Quizlet LLC, applications used to study anatomy were reported to be widely used. Students make use of apps such as Nerve Whiz, Pearson Med Terminology, Medterm Scramble, Stretching HD, Visanatomy, Ess Skeleton, Human Anatomy Atlas, and Visual Anatomy Lite to learn anatomy. The MSOT curriculum requires extensive knowledge of human anatomy and physiology, especially bones, muscles, and nerve innervations. This knowledge serves as the foundation for all of the student coursework, and students are expected to be proficient in it prior to enrollment. In this context, apps prove to be useful resources in that they provide the user with instant access to specialized information in a manner that is faster and more efficient than using search engines. Unlike web resources, apps require fewer selection steps and keystrokes to access information as their content is highly targeted and specific to an area of interest.

Students use mobile devices to support student role.

Through the use of "apps", students are able to use their mobile devices as communication tools. Applications such as Blackboard enable students to access course content to perform actions such as grade viewing, viewing and posting discussion board threads, as well as uploading assignments and downloading pdf files. Other functions include accessing school e-mail, student bills, and class schedules, among other options.

Students reported using the Google Mail "app" to access their student e-mail in order to receive and send communications to professors and classmates. The ability to retrieve e-mail through

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mobile devices enables students to stay informed, especially with regards to changes in deadlines, course syllabi, meetings, lectures, and trainings. Further, instant access to e-mail facilitates prompt response to faculty, thereby improving communication.

Students would like to see mobile devices integrated into the classroom to make learning interactive and dynamic through the use of Apps.

Students surveyed reported a desire to have mobile devices integrated into classroom learning. When asked to provide suggestions on possible methods of integration, results indicated a focus on making learning both more interactive and dynamic. With regards to making the classroom experience more interactive, the use of mobile devices as personal response systems, or "clickers", was reported. The use of clickers allows students to answer questions synchronously and anonymously during lectures through a live polling system. The implementation of devices in this manner enables participation, which in turn makes learning more interactive.

Further, students suggested the use of online classroom tools and programs to supplement lectures with activities that would allow them to work independently on their devices. Students emphasized the use of these devices to research information during lectures as another possible learning tool. The ability to access scholarly journals to discuss current evidence-based practice and/or stream video content demonstrating clinical performance of evaluations in real-time may open up a dialogue between students and instructors. This makes the learning process more dynamic as students are able to take on have a self-directed role and become active participants in their learning process.

Lastly, specific to the occupational therapy curriculum, students suggested a lecture specific to the American Occupational Therapy Association (AOTA) mobile app bank, which is an online

resource created by AOTA to provide therapists with apps that can be used in clinical practice. One student stated,

> *"a lesson regarding all or some of the beneficial apps which would be good learning tools for OT. I would also like to learn more about AOTA's mobile app bank, and where to find it since I have been unaware of it until now".*

Social networks have become a medium for communication outside of the classroom, mainly through Facebook. Students access Facebook through Apps on their mobile devices. Students report extensive use of social networks, specifically Facebook, to communicate with each other outside of the classroom. Through Facebook, students can create private groups in which membership is restricted by invitation only. The exclusivity provided by these groups gives students a free resource in which they discuss class lectures, share documents, and plan group projects. One student reported that,

> *"In several groups I've been in for projects, we create a Facebook group to send each other information, sources, articles we used or found, and we also send each other documents".*

Moreover, students use these groups to discuss difficult concepts and explain lectures, essentially using this medium as a platform to teach each other. Further, students reported accessing the National Board of Certification for Occupational Therapy (NBCOT) Facebook page that regularly posts questions related to the occupational therapy licensing exam they will have to take to become practitioners.

The convenience and utility of mobile devices in the classroom.

Student reports were divided with regards to preference of using laptops versus tablet computers. Those who favored tablet computers cited that they are easy to store, light weight, and more

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portable than laptop computers. Those who preferred the laptops stated that the bigger screen and keyboard made it the better tool for activities such as note-taking, research, and completing assignments. Those who reported using an external keyboard with their tablet computers stated they still preferred their laptops for note-taking. Further, laptops have capabilities to run flash and also come equipped with USB ports; whereas, tablet computers do not.

Discussion

The results from this study reveal that students are using mobile devices for both academic purposes and for support outside of the classroom. These findings are consistent with those of previous studies investigating the use of mobile devices in higher academic settings. Miller (2102) found that the capabilities of these devices encourage learning and engagement. This is evident in students' reports of using their mobile devices to access course content and use 'apps' to support their learning. Notably, these devices played a significant role in students' creation and utility of study materials. Students reported using a variety of human anatomy apps to review muscles and the nerves that innervate them. These findings are consistent with Rossing et. al's (2012) findings that mobile devices can be utilized to facilitate adaptation of the course content to fit students' learning styles and pace. The apps that can be downloaded to these devices provide students with interactive visual representations of the information. The touch screen capabilities of mobile devices allow students to enlarge or rotate images with ease, thereby making learning more hands on (Miller, 2012; Geist, 2011). Moreover, they provide visual representations of anatomy that more closely resemble the structures in the human body. For programs in the field of health sciences that do not include a cadaver lab as part of their curriculum, anatomy apps may be a useful resource for enhancing student learning.

Apart from human anatomy apps, students reported utilizing the app version of the web resource Quizlet LLC which is available for various operating systems. This finding is consistent with that of Shuler et. al (2012), where students reported that tablet computers enhanced their ability to understand key concepts. The Quizlet LLC resource presents students with the opportunity to rehearse and reflect on lecture material in order to extrapolate key concepts that may appear on their exams. The formatting of Quizlet LLC requires students to interpret the information in a manner that is concise and succinct, so as to translate well the creation of data sets. Accurate surmising of information may be indicative of understanding; however, this determination, as well as the effects of Quizlet LLC on academic performance are beyond the scope of this study. It can be confirmed that students are seeking out electronic resources to supplement their in class learning.

The portability of mobiles devices coupled with their processing speed made them the preferred medium for accessing Quizlet LLC to study outside of the classroom. Further, students reported sharing their data sets with their classmates; therefore, it can be concluded that the use of mobile devices in this context plays a role, perhaps indirectly, in encouraging sharing and collaboration among students (Miller, 2012; Schuler, 2009). These findings are consistent with Rossing et. al (2012) which found that use of mobile devices encourages participation and engagement among students. Through resources such as Quizlet LLC, students are able to work cooperatively with their classmates by creating study materials that can be shared by all (Shuler, et. al 2012).

To further expand on this idea of sharing and collaboration among students through the use of mobile devices, a discussion regarding student creation of online communities such as Facebook groups may provide clarification. This online resource was used uniquely by classmates to have an open forum where all cohort members could contribute and respond to posts. Posts on the

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Facebook group pertained to assignment due dates, clarification of lecture topics, and the sharing of web-based media and videos to teach concepts. The processing speed couple with the easy access to information afforded by mobile devices facilitated the use of Facebook groups. Students would be able to monitor updates and respond to post anywhere from their mobile devices. As stated by Schuler (2009), the use of mobile devices facilitates learning 'anywhere, anytime'. Furthermore, this finding is consistent with previous studies that found mobile device use increased both speed and cohesiveness in group work (Miller, 2012; Schuler 2012). The current finding not only supports this idea, but indicates that this is also true for mobile device use outside of the classroom.

Previous studies have found the use of mobile devices to be considered fun and convenient (Miller, 2012). This supports findings of the present study where students found mobile devices to be more portable than laptops. However, with regards to use in the classroom the findings were inconclusive. Those who preference a laptop for in class use cited the bigger screen and external keyboards as the reason. Students reported a preference for the laptop when it came to use in the classroom. One student stated that "I like having the physical keyboard for quick typing and while many tablets have this as an add-on, it may be expensive." Those who preferred the tablet computer for note-taking purposes cited its portability and light-weight characteristics. One student stated "Yes, because it is less bulky and does all the same things."

The findings of the present study provide valuable information regarding the use of mobile devices by students to support learning outside of the classroom. The findings indicate that students have employed various strategies to ensure their academic success. Most notably, they have chosen to form online communities through the use of social networks with the purpose of reinforcing course content, sharing information, and planning projects. Further, sharing and

collaboration have become methods through which students support one another's academic performance with the preferred medium for achieving this being electronic resources. Mobile devices have been the vehicle through which students have been able to exploit the electronic resources available to them. Their portability and processing speeds make learning anywhere and anytime possible and students are seizing these opportunities.

Limitations & Implications for Further Research

The present study used a convenience method of sampling which resulted in a small sample that contained more female than male participants. This is due to the researchers sampling from an MSOT program, a graduate program that predominately attracts female students.

Further, many MSOT programs, such as the one being studied are cohort programs in which students transition through academic courses together. Therefore, the dynamics of the relationships among these students may differ from that of non-cohort undergraduate and graduate students. This may influence students' willingness to create online communities such as the Facebook groups or study resources through apps such as Quizlet LLC for the purpose of sharing and discussing information.

Lastly, students in graduate programs are expected to be self-directed learners who independently locate resources to supplement their learning. This may be a motivating factor for students to use mobile devices for learning outside of the classroom.

Further study is necessary to investigate whether mobile device use has an impact on academic performance. Also, if these devices encourage or support self-directed learning.

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Appendix A

Stockton MSOT Mobile Learning Survey

The purpose of this survey is to provide faculty with information about whether you utilize mobile devices as they relate to your studies in the MSOT program. This survey is for general program development and is voluntarily. However, your participation is greatly appreciated and will be useful in course planning, development, and improvement. Portions of this survey have been adapted from:

Rossing, J.P., Miller, W., Cecil, A.K., Stamper, S.E. (2012). iLearning: the future of higher education? students perceptions on learning with mobile tablets. *Journal of Scholarship of Teaching and Learning, 12*(2), 1-26. Retrieved from http://josotl.indiana.edu/article/view/2023/1985.

Tell us about yourself

Circle response indicative of age and gender

Age Group:	21-24	25-30	30-35	40-45

Gender	Female	Male

Mobile Device Use

1. Do you own a smartphone or tablet pc that is capable of accessing the Internet (whether or not you use that capability)?
   - ☐ No, and I don't plan to purchase one in the next 12 months.
   - ☐ No, and I plan to purchase one in the next 12 months.
   - ☐ Yes.

2. What tablet/smartphone brand/model do you own?
   - ☐ Apple IPad
   - ☐ Apple IPhone
   - ☐ Android
   - ☐ Kindle

- ☐ Windows Tablet
- ☐ None
- ☐ Other (Please Specify)

3. How do you use smart phone or tablet pc? Check all that apply.

- ☐ Access BlackBoard
- ☐ Access other e-learning tools
- ☐ Browse the Internet
- ☐ Download and listen to music
- ☐ Download and listen to podcasts/audio books
- ☐ Download and read e-books/print-based content
- ☐ Download and view streaming movies/video clips
- ☐ Search for information
- ☐ Send and receive e-mail
- ☐ Use camera to take and share pictures
- ☐ Calendar
- ☐ Maps
- ☐ Shopping
- ☐ Social networking
- ☐ YouTube
- ☐ Other (Please specify)

4. How often do you use your mobile device?

- ☐ Never
- ☐ Once a week
- ☐ Three times a week
- ☐ Multiple times a week

5. What is your level of comfort with your mobile device/handheld device use?

☐ Not at all comfortable
☐ Not very comfortable
☐ Fairly comfortable
☐ Very comfortable

Mobile Learning

6. Do you use the device for academic purposes?

YES ☐ NO ☐

7. Do you use any Apps related to your role as an MSOT student?

YES ☐ NO ☐

If yes please specify:

8. Do you use any Apps for studying?

YES ☐ NO ☐

If yes please specify:

9. Are you familiar with AOTA's mobile app bank for practitioners?

   YES ☐ NO ☐

   If yes, have you ever downloaded an app based on this site? Please specify:

10. Describe possible ways that you would like to see the use of tablet pcs and smartphones integrated into the classroom.

11. Do you communicate with classmates via social networks? If so, explain.

12. Do you access social networks through your tablet pc or smartphone?

13. Do you use social networks for school related things? If so, please specify.

14. Do you prefer the use of a tablet pc over the use of a laptop in the classroom? Why or why not?

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