Pepperdine University

Graduate School of Education and Psychology

AN EXPLORATORY STUDY: MOBILE DEVICE USE FOR ACADEMICS

A dissertation submitted in partial satisfaction

of the requirements for the degree of

Doctor of Education in Learning Technologies

by

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Master's of Educational Technology Program Coordinator & Assistant Professor, Concordia University, Irvine, CA – 2013-present
Educational Technology Master's Program Coordinator
Courses Taught: Foundations of Educational Technology Teacher Leadership, Curriculum Design & Assessment, Educational Technology, and Emerging Technology for All Students
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- Mentor Subject Matter Experts and develop rich engaging content in all courses
- Develop signature assignments and assessments
- Oversee day to day management of the Educational Technology Program student issues
- Procure technology resources and recommend course instructors
- Development of innovative course designs for online and hybrid formats
- Present on current trends in education at local, state, and national conferences
- Collaboration with educators in higher education professional development sessions at the University
- Orange County Computer Using Educators Board of Directors

Assistant professor, Marian university, Fond Du Lac, WI – 2007-2013
Courses Taught: Introduction to Technology in Education, Social Studies Methods, Developing Action Research: Educational Technology, Teaching and Learning with Multimedia, iPods in the Classroom, iPads in the Classroom, Innovations in Education, Foundations in Educational Technology, Learning with Technology: Effective Strategies, Teaching and Learning Online, Electronic Portfolio, Educational Telecommunication, Developing Grant Proposals Integrating Technology, Contemporary Topics in Educational Technology

- Development of innovative course designs for online and hybrid formats
- Assistant and collaboration with the Educational Technology Director in the recruitment of prospective student and program design

- Present on current trends in education at local, state, and national conferences
- Collaboration with teachers in professional development sessions around the state
- Higher Education Teacher Licensure Evaluator, WI Department of Public Instruction Higher Education Professional Development Plan

8th Grade Educator, De Pere Middle School, De Pere, WI – 2006-2008
Course Taught: Language Arts and Social Studies

- Designed motivational lessons to enhance student learning
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- Motivated adolescents in curriculum and in athletics: softball, track, and volleyball to instill healthy competition
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6th Grade Educator, Lineville Intermediate, Howard-Suamico, WI, 2003-2006
Courses Taught: Language Arts and Science

- Educated, mentored, and motivated students with diverse backgrounds, abilities, and needs to students with a solid educational foundation
- Team taught special education students, collaboratively planned units and assessments to meet the diverse needs of all learners
- Designed the school webpage and assisted faculty in their web construction for continuity
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SKILLS

Specialized in educational technology skills including but not limited to, online learning and course design, mobile devices, multimedia, web 2.0, web design, flipped classrooms, SMART software, staff and faculty training, peripheral devices, educating all levels and experienced individuals

PROFESSIONAL MEMBERSHIPS

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- Marian University Graduate Council – Discuss and oversee university graduate course changes and university policies
- Curriculum Committee Chairperson – Overseeing curriculum changes in The School of Education
- Executive Board Member of Jurnie's Shelter Domestic Abuse Shelter – Technology coordinator and grant manager, www.jurniesshelter.org
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- Marian University Facebook, (2009); http://www.facebook.com/#!/pages/Fond-Du-Lac-WI/Educational-Technology-at-Marian-University/201686140819?ref=ts
- Mobile Devices and Academic Use, (2014): https://sites.google.com/a/pepperdine.edu/mobile-devices-and-academic-use/
- Multimedia Wiki, (2009); https://edt658.wikispaces.com/
- Orange Tree 2009 Wiki, (2009); https://orangetree2009.wikispaces.com/
- Orange Tree 2010 Wiki, (2010); http://orangetree2010.wikispaces.com
- Portfolio Wiki, (2013); http://mhoffmannportfolio.weebly.com/index.html
- Professional Wiki, (2008); https://maliahoffmann.wikispaces.com/
- Twitter, (2009); http://twitter.com/optimistmalia

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Hoffmann, M. & Wagner, R. (2009). *Podcasting in the classroom*. Howard-Suamico School District, Howard-Suamico, WI.

Hoffmann, M., Linskens, J. & Wagner, R. (2009). *Podcasting in the classroom*. Wisconsin Business Education Association Conference, Stevens Point, WI.

Hoffmann, M., Linskens, J. & Wagner, R. (2010). *Web 2.0 ~ web 2.0 ~ what is web 2.0?* Wisconsin Business Educator Association spring conference, Fond du Lac, WI.

Hoffmann, M., Linskens, J. & Wagner, R. (2010). *Web 2.0 ~ web 2.0 ~ what is web 2.0?* Wisconsin Catholic Educators spring conference, Oshkosh, WI.

Hoffmann, M., Linskens, J. & Wagner, R. (2010). *Web 2.0 ~ what is it and how can I use it in education?* Wisconsin Business Educator Association fall conference, Wisconsin Dells, WI.

Hoffmann, M., Linskens, J. & Wagner, R. (2010). *Web 2.0 ~ what is it and how can I use it with learning management systems?* Wisconsin Association of Independent Colleges and Universities, Fond du Lac, WI.

Hoffmann, M., Linskens, J. & Wagner, R. (2010). *Web 2.0 ~ what is it and how can I use it in Education?* Wisconsin Association for Middle Level Education fall conference, Wisconsin Dells, WI.

Hoffmann, M., Linskens, J. & Wagner, R. (2010). *Web 2.0: what is web 2.0?* Wisconsin Business Education Association Conference, Fond du Lac, WI.

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Hoffmann, M. & Linskens, J. (2011). *SMARTBoards in education.* John Paul II School. Kenosha, WI.

Hoffmann, M., Linskens, J., & Shaw, K. (2011). *IPads in education.* School Leaders Advancing Technology in Education Conference. Wisconsin Dells, WI.

Hoffmann, M., Linskens, J., & Shaw, K. (2011). *IPads in education.* Wisconsin Association for Middle Level Education fall conference. Wisconsin Dells, WI.

Hoffmann, M., Linskens, J., & Shaw, K. (2011). *Web 2.0 in education.* Wisconsin Association for Middle Level Education fall conference. Wisconsin Dells, WI.

Hoffmann, M., Linskens, J., & Shaw, K. (2011). *IPads in education.* Wisconsin Business Educator Association Conference. Green Bay, WI.

Hoffmann, M., Shaw, K., Wagner, B. (2011). *Moodle training*. Oshkosh High School. Oshkosh, WI.

Hoffmann, M. & Wagner, R. (2011). *Web 2.0 in education*. St. John Bosco School. Sturgeon Bay, WI.

Hoffmann, M. (2012). *EPortfolios using Google apps*. Freedom Tech Academy. Freedom, WI.

Hoffmann, M. (2012). *IPads in education.* Holy Angels School. West Bend, WI.

Hoffmann, M. (2012). *IPads in education.* John Reilly Technology Day Conference. Rothschild, WI.

Hoffmann, M. (2012). *Middle school iPad applications.* St. Mary Springs Academy. Fond du Lac, WI.

Hoffmann, M. (2012). *Multimedia technologies in education.* Wisconsin Educational Media & Technology Association Conference. Wisconsin Dells, WI.

Hoffmann, M. (2012). *Podcasting in education.* Wisconsin Educational Media & Technology Association Conference. Wisconsin Dells, WI.

Hoffmann, M. (2012). *SMARTBoard for the advanced user.* St. Mary Springs Academy. Fond du Lac, WI.

Hoffmann, M. (2012). *SMARTBoard for the beginner user.* St. Mary Springs Academy. Fond du Lac, WI.

Hoffmann, M. (2012). *Web 2.0 in education.* Antigo School District. Antigo, WI.

Hoffmann, M. (2012). *Web 2.0 in education.* Sacred Heart School. Shawano, WI.

Hoffmann, M. (2012). *Web 2.0 in education.* St. Paul School. Genesee Depot, WI.

Hoffmann, M. (2012). *Web 2.0 productivity in education.* John Reilly Technology Day Conference. Rothschild, WI.

Hoffmann, M. (2012). *Website design.* Shepard of the Hills School. Eden, WI.

Hoffmann, M. (2012). *Website design.* St. Mary School. Sheboygan Falls, WI.

Hoffmann, M. (2012). *Website design.* St. Mary Springs Academy. Fond du Lac, WI.

Hoffmann, M. & Shaw, K (2012). *SMARTBoards in education.* St. John's School. Little Chute, WI.

Hoffmann, M. & Shaw, K (2012). *Web 2.0 in education.* Lake Geneva School District. Lake Geneva, WI.

Hoffmann, M. (2013). *Creating cross-curricular Google Earth walks with Google Earth.* Society for Informational Technology & Teacher Education. New Orleans, LA.

Hoffmann, M. (2013). *SMARTBoards in education.* Faith Lutheran School. Fond du Lac, WI.

Hoffmann, M. (2013). *SMARTBoards in education.* Lake Geneva School District. Lake Geneva, WI.

Hoffmann, M. & Shaw, K. (2013). *ITunes U and iBook's author.* Florida's Educational Technology Conference. Orlando, FL.

Hoffmann, M. & Shaw, K. (2013). *ITunes U and iBook's author.* Society for Informational Technology & Teacher Education. New Orleans, LA.

Hoffmann, M. (2014). *Flipped side of ELA learning with common core.* Orange County Reading Association Keynote Speaker. Irvine, CA.

Hoffmann, M. (2014). *Heads or tails: To flip your classroom and how to do it.* Computer Using Educators Conference. Palm Springs, CA. https://maliahoffmann.wikispaces.com/Flipped+Classrooms

Hoffmann, M. (2014). *ITunes U and iBook's author.* Pacific Southwest District Lutheran Educator's Conference. Palm Desert, CA.

Hoffmann, M., & Shaw, K. (2014). *Mobile application evaluation*. International Society of Technology Education Conference. Atlanta, GA. https://sites.google.com/site/mobileapplicationevaluation/

Hoffmann, M., & Shaw, K. (2014). *Open professional development*. International Society of Technology Education Conference. Atlanta, GA. https://sites.google.com/site/openprofessionaldevelopment/

Hameister, T., Hoffmann, M., & Shaw, K. (2014). *Mobile application evaluation*. Florida Educational Technology Conference. Orlando, FL. https://sites.google.com/site/mobileapplicationevaluation/

Hoffmann, M., & Shaw, K. (2014). *Heads or tails, should you flip your class*? Florida Educational Technology Conference. Orlando, FL. http://maliahoffmann.wikispaces.com/Flipped+Classrooms

Hoffmann, M., & Shaw, K. (2014). *Creating ePublications on mobile devices*. Florida Educational Technology Conference. Orlando, FL. https://sites.google.com/site/epubworkflow/

RESEARCH

Hoffmann, M. (2014). *An exploratory study: Mobile device usage for academics.* (Doctoral dissertation).

Hoffmann, M. (2010). *How computer games affect motivation for students' learning*. Retrieved from https://maliahoffmann.wikispaces.com/EDL+804

Hoffmann, M. & Linskens, J. (2012). *The student engagement project: How iPads affect motivation and achievement*. North Fond du Lac School District. Fond du Lac, WI.

ABSTRACT

As mobile devices become more and more ubiquitous among teens, such devices have also been fighting their way into the educational landscape. In this digital world where people are constantly entertained, educators have found it difficult to capture their students' attention and motivate them to stay engaged in formal class. Rather than focus specifically on types of devices as education has historically done, this study focused on ways in which those tool could be used. Using a TPACK framework (technological, pedagogical, content knowledge) allows educators to pull the attention from specific types of devices and focus on how those devices could be used academically. This exploratory study surveyed how undergraduate students and higher education instructors at two small faith-based universities in Southern California used mobile devices in and outside of the class for academic purposes. The researcher cross-referenced the results from the 2 groups to make correlations. The results of this study showed that nearly all instructor participants had multiple devices and almost half of the student participants had 2 or more devices as well. Those devices are being used in and outside of formal class for academics in very basic and emerging way that are just touching the surface of their capabilities. This study found that students use their devices in class to read, reference, or search materials. Faculty reported using their devices as presentation devices most often. Both groups, students and teachers, reported a few unique mobile devices using special purpose applications. Those special purpose uses are beginning to move in the direction progressive mobile learning and beginning to touch the surface of TPACK integration. This study aimed to integrate the current uses of mobile devices by students and faculty with the TPACK educational framework. It connected current mobile device usage to advanced device usage to integrate TPACK teaching strategies for educators to integrate those devices into their future instruction.

Key words: mobile devices, TPACK, formal learning, informal learning

Chapter One: Introduction

The popular Apple computer company has changed the educational landscape with the reinvention of traditional music players and basic cellphones, as well as the creation of advanced mobile devices, including the iPod Touch, iPhone, and iPad. Apple has inspired other companies like Google and Microsoft to reinvent cellphones, transform them into smartphones, and also create tablets. These devices, though used by individuals of all ages, have become quite popular on college campuses. According to the Pew Organization (Rainie & Smith, 2013), 56% of all American adults own a smartphone. Eighty percent of those adults who own smartphones are between the ages 18 to 29 years old. The undergraduate population that participated in this current study was within that age range. In addition to smartphones, e-readers and tablet computers have also become commonplace for Americans ages 16 and older, with 24% owning those devices.

Undergraduate students appear to use their devices for more than just talking, texting, and social networking; these devices have also become tools for academic learning. Capitalizing on students' use of mobile devices could help lead educators to include these devices in their courses more deliberately. According to the Pew Institute (Rainie & Smith, 2013), 34% of all cellphone Internet users used their phones, rather than a desktop or laptop computer, as a primary tool to access the Internet . With these statistics in mind, it was apparent at the time of this study that there was much to be learned about the ways in which undergraduate students were using these devices for academic purposes. By uncovering the way students use academic mobile device, educators can begin to merge technological, pedagogical, and content knowledge (TPACK) practices into their pedagogical approaches (Koehler & Mishra, 2008).

TPACK guided the theoretical framework for this study. TPACK builds on and expands Shulman's (1986) PCK (pedagogical and content knowledge) framework for teaching by adding the important technological piece that is so evident in today's learning environment. TPACK suggests best teaching practices to provide a blend of technological, pedagogical, and content knowledge into all courses. By providing an equal blend of each of the TPACK components (technological, pedagogical, and content knowledge), educators can establish rich learning environments for their students to keep them engaged while utilizing specific technologies and pedagogies that relate to their content areas.

Very few research studies have been done regarding the use of mobile devices in the higher educational environment. Additionally, none of those existing studies connected mobile learning to the TPACK framework. Therefore, the purpose of this exploratory study was to determine the mobile learning of undergraduate students and instructors and correlate the two groups' data. The correlated data gathered on both groups was connected with the TPACK framework to suggest pedagogical strategies for instructors to provide a richer learning environment that meets the needs and demands of today's mobile learners.

Research Questions

The following research questions were explored:

1. In what ways, if any, do undergraduate students use mobile devices in class for academic purposes?
2. In what ways, if any, do undergraduate students use mobile devices outside of class for academic purposes?
3. In what ways, if any, do higher education instructors use mobile devices for academic purposes in class?

4. In what ways, if any, do higher education instructors use mobile devices outside of class for academic purposes?

Significance of the Study

At the time of this study, limited research was available on student and faculty usage of mobile devices for academics in and outside of the classroom. Wu et al. (2012) discussed studies on mobile devices that focused on motivation, perceptions, and attitudes of teachers and students toward mobile learning; however, those studies did not research the manner in which instructors and students used such devices for academic purposes. One exception is the Chen and deNoyelles (2013) study from the University of Central Florida (UCF), which examined the ways in which undergraduate students used mobile devices for learning; however, instructor usage was not taken into consideration in this study. Thus, the purpose of the present study was to explore undergraduate students' and higher education instructors' uses of mobile devices for academics and connect their pedagogical strategies to those mobile devices. The present study's focus on students and faculty will provide valuable information that is currently scarce in the literature.

Recent research involving the use of TPACK has focused largely on how TPACK was utilized and embedded in pre-service teacher programs; those studies analyzed and assessed the quality and effectiveness of TPACK instruction (Archambault & Barnett, 2010; Chai, Koh, & Tsai, 2010; Pamuk, Ergun, Cakir, Yilmaz, & Ayas, 2013; Polly & Brantley-Dias, 2009; Tomak, Incikabi, & Ozgelen, 201; Tomak, Yelken, & Konokman, 2013). Such studies did not include or provide suggestions for mobile device pedagogical applications. Some of the specific technological uses that were studied included: 3D objects, PowerPoint, Blogs, chats for communication, and educational games (Tomak et al., 2012, 2013). Of these technological tools,

several now have mobile devices applications; however, in those past studies, neither uses nor applications were discussed. A more descriptive and specific look at TPACK using mobile devices was needed. The current study attempted to provide more specific examples of uses by the two groups, which made it possible to provide integration suggestions for mobile devices into postsecondary instruction. Furthermore, this study used TPACK as the theoretical framework to connect student and teacher uses of technology to make suggestions for further mobile device integration into course instruction.

Significance

Undergraduate students have been utilizing mobile devices for socialization for years, by taking pictures, sharing videos, sending messages, etc. When walking through campus, one could observe these students multitasking with their mobile devices while moving from class to class, eating lunch, or communicating with friends. The manner in which learning with these devices happened on campus could be presumed, but the specific tools, purposes, and methods for doing so were unknown. There was a need to uncover the tools that both students and instructors utilized with their mobile devices to enhance everyone's classroom experiences. The purpose of this study was to uncover the ways in which undergraduate students and instructors used mobile devices for academic purposes both in and outside of the classroom. This research has uncovered the variety of tools used in order to better inform instructors' future teaching practices.

Future Contributions of the Study

This study sought to provide information that could be useful to students and teachers about the impact of technological tools on learning. This includes new tools or methods that student may have learned about that could have helped influence their learning and/or professors that may have become better informed of tools that students were using, and to apply those tools

in their teaching environments. Yet, students and the instructors did not benefit directly from the immediate research. However, the data collected has been shared with the university communities that participated in this study.

Delimitations

Two universities in Southern California with similar demographics were used to triangulate the data. Both universities had traditional undergraduate programs (students who attend classes full-time, may live on campus, and are traditionally young adults, ages 18-22), adult undergraduate programs (attend classes full-time, but also work full-time. These classes are accelerated and offered once or twice a week at night for large blocks of time), and graduate programs (masters or doctoral degree programs). The sheer size of all the programs combined would not have allowed a specific enough look into how mobile devices were being used for academic purposes. The traditional undergraduate students that were typically of the ages 18-22 made up about 80% of the American smartphone user population in 2013 (Rainie & Smith, 2013). Since this age group represents the majority of smartphone users, researching these subjects was deemed to be most beneficial.

The quantitative survey was hosted online to provide easy access and privacy for the subjects. The data were analyzed using descriptive analysis and cross-tabulation. These analyses provided enough data so that additional qualitative survey data was not needed; however, a second round of survey data could be collected in a second iteration of a later study. The literature review explored mobile learning theories, mobile learning studies, mobile learning pedagogies, PCK, and TPACK to provide a broad overview of many elements of mobile devices used for academic purposes.

Limitations

The results of this study are best applied to other universities with similar demographics and populations. Information about participants was obtained through self-report measures; therefore, the results may reflect personal uses that are not demonstrative of the entire university populations' usage. The researcher pulled a random sample from each research site to provide a representative population sample. The sample of research subjects was limited to those who consented to participate in the study and were students who attended two small Christian liberal arts universities in Southern California. The intent of surveying a random sample was to obtain a cross section of the population to provide the most accurate view of the universities' student populations. The researcher adapted the student survey instrument that was used by researchers from UCF (Chen & DeNoyelles, 2013) to incorporate the most up to date research data; those adaptations are discussed further in Chapter Three. The student and faculty surveys were piloted before the start of the data collection. Two experts in the educational technology field validated those pilot study survey results. Data collection was limited to the time allowed by the Institutional Review Board (IRB). The researcher gathered data over the course of 6 weeks during in-session semesters to best capture the participants' uses of mobile devices for academic purposes.

Definition of Terms

The current study defines undergraduate students as, traditional undergraduate students as young adults if they are within the age range of 18-22, live on campus, or are enrolled in school full time. This population of students was representative of the typical undergraduate population of students across America. The faculty members that were studied taught at least one course per semester in the higher educational setting. Instructors could have taught across programs,

graduate and undergraduate, and were asked to respond to survey questions overall with one of their most typical classes in mind.

Mobile devices were defined as portable electronic devices with applications, e-mail, texting, and Internet capabilities utilizing Wi-Fi or cellular networks (Ally, 2004, 2009; Greco, 2013; Traxler, 2010; Wu et al., 2012). Laptop computers, Chromebooks, and Netbooks were not considered mobile devices because they lack applications and are typically used for productivity tools like the Microsoft Office Suite or Google Drive. As the focus was on immediate accessibility, Smartphones, tablets, and the iPod touch were all considered mobile devices. The aforementioned terms for mobile devices were used interchangeably throughout the research.

Learning was viewed in in two different ways: informal learning and formal learning. Informal learning describes the learning that happened outside of direct teacher instruction or *just in time* information that contributed to one's body of knowledge. This learning was student directed and included personal and social aspects that contributed to their body of knowledge. An example could be using Evernote (a cloud based productivity application) to record lectures, taking photos of notes on a whiteboard, and taking notes that can then be hosted and shared online. The student would initiate this process on his/her own and use it for studying and learning. Formal or classroom learning describes teacher-directed and occurred in the classroom, including include application usage or classroom activities, such as assigning students to use Prezi (dynamic multimedia presentation tool that can be shared and collaborated with online) to create a presentation.

Summary

Extensive research on both faculty and student mobile device usage for academic purposes has not been conducted at this time, nor has a descriptive and cross-tabulation analysis

been done connecting the two groups. Uncovering the ways in which undergraduate students and instructors use mobile devices for academic purposes may help educators better understand how to implement these devices into their classrooms appropriately. This study exploratory survey research study complements the existing research surrounding mobile learning practices and contributes by building upon the current body of knowledge.

Chapter Two: TPACK Integration Through Mobile Devices

This study explored the ways in which college students and faculty used mobile devices: portable web-enabled devices for learning. The role of technology has changed the way people communicate with each other, which has also led to changes support of students' learning. Pedagogical efforts and instructional theories were also considered when proposing mobile technologies for learning. TPACK connects technologies with specific pedagogical strategies (Koehler & Mishra, 2008). Many qualitative and quantitative studies have been done on how young adults use technologies regularly. However, there is still much to be learned about how young adults use these technologies for academic purposes. Current non-academic uses and other mobile device studies, as well as TPACK studies, are discussed subsequently.

Mobile Devices Defined

Traxler (2010) included the following items in his definition of mobile devices: smart-phones, satnav (navigational devices), games consoles, digital cameras, media players, netbooks, and handheld computers. However, he found generalizing mobile devices to be difficult because there was:

> No standard footprint or format. They can be any size from slim matchbox to sturdy paperback book, landscape or portrait. They may open out, slide open or not open at all, with a real keyboard, a virtual keyboard or may respond to touch, gesture or stylus; they capture or play various media and connect to various networks and devices. Mobile devices are pervasive and ubiquitous, conspicuous and unobtrusive, note-worthy and taken for granted by people in America. (p. 5)

Mobile devices have become so ubiquitous that the Federal Aviation Administration (FAA) has updated their regulations on portable electronic devices (PED) for takeoff and landing

of flights. Traditionally, all PEDs needed to be shut down at these times, but with an updated regulation in 2013, the FAA differentiated between all electronic devices and PEDs. The FAA (as cited in Greco, 2013) defined a PED as "any piece of lightweight, electrically-powered equipment...consumer electronic devices capable of communications, data processing and/or utility. Examples range from handheld, lightweight electronic devices such as tablets, e-readers and smartphones to small devices such as MP3 players and electronic toys" (p. 23). Flight attendants have defined PEDs as weighing three pounds or less. This definition would include an 11" MacBook Air, as it weighs 2.38 pounds.

The agreed upon generalization of mobile devices focuses on their lightweight and portable nature. For the purpose of this study, laptops or netbooks were not included in the term *mobile devices.* Mobile device was used to describe any smartphone, tablet, or hand-held device that was carried on the person the majority of the time either in one's pocket or handbag, and or is easily accessible. A mobile device had to be web-enabled, via Wi-Fi or cellular networks, and possess communication capabilities via text messaging or e-mail.

Rather than define mobile devices, Ally (2009) defined mobile learning, which could utilize Wi-Fi or cellular networks. So often in the literature and within schools there has been a heavy focus on the devices that were used rather than what was being done with them. Mobile devices were only the tools, or *nouns,* to complete a task. The *verbs* were the actions or the tasks that students were asked to complete. The tools were useless to learning objectives without the tasks (Prensky, 2010). By defining mobile learning, the emphasis shifted from the devices to the ways in which those devices are being used. Mobile devices are available just in time, on the go, anyplace, and anywhere. Portability is deemed key in mobile learning. Mobile learning allows learning to happen anywhere, at any time. Mobile learning allows access to immediate, just in

time, information at the moment it is needed. The devices are merely the vehicle that allows questions to be answered and knowledge to be shared (Prensky, 2010).

A meta-analysis of trends from mobile learning studies found that the key factors to define mobile devices were mobility and the ability to engage in educational activities without being tied to a location. Users are able to access wireless technology to access data, communicate, and mediate other educational activities (Wu et al., 2012). However, many users were not using the devices to their fullest potential. Being device centric, focusing on the device rather than the pedagogy in the devices' use, has hindered the ability to completely conceptualize the educational capabilities of those powerful mobile devices. Contrary to being device centric, using TPACK does not focus on the device; rather, it focuses on the full integration of technology into required content areas with appropriate pedagogies (Wu et al., 2012).

Revisiting the role of technology in learning when students have had constant access to multiple devices has provided an untapped potential to educators. Through TPACK, technologies can be integrated into the classroom while allowing students to use their own mobile devices. Such mobility offers an opportunity for students and educators to make connections and learn on the go. Education has misplaced its focus on emphasizing the importance of content knowledge, discounting the equal importance of pedagogical and technological knowledge for educators. The emphasis on integrating technology has been neglected over the last decade; however, the best way to accomplish this has been discussed through TPACK. TPACK provides a framework for how to integrate the demanded technology while still incorporating important aspects of pedagogy and content knowledge (Koehler & Mishra, 2008).

Early adopters slowly began to integrate technology into classrooms. Educators who were *digital natives,* typically born after 1979, found it easy and second nature to use technologies in

their instruction, whereas *digital immigrants* needed to make a mind shift to incorporate these tools in everyday instruction. Digital natives are individuals who have grown up with and are surrounded by technology. Digital natives speak the digital language, and go to the Internet first to get answers. All students in K-12 today and at the time of this study can be considered digital natives. In contrast, digital immigrants comprise most current educators, especially in higher education. Digital immigrants do not think naturally in terms of technology tools. They mainly use the Internet as a secondary source, and they look for a user's manual rather than expect the technology to be intuitive. Technology integration specialists have believed that digital natives' brains were physically different than those of digital immigrants, thus the difficulty creating a teaching connection between the two groups (Prensky, 2010). Educators needed to begin learning how to use technology in diverse ways because technology is a key tool of instruction and the teaching practice has evolved.

Pedagogical Content Knowledge

Shulman (1986) observed the focus of education on teachers' content knowledge in terms of teacher certification. Up until around 1986, teachers were to prove their knowledge of subject matters through tests, while never really needing to prove they understood pedagogical strategies to use with that content knowledge. He emphasized that both pedagogy and content knowledge needed to have shared importance when educating students. Too much focus on one or the other disrupted the necessary balance for students to learn accurately and effectively. If there was too much emphasis on the content knowledge but the teacher did not know how to convey those facts, the student would not learn. If the teacher was good at explaining content to students, varying their teaching techniques, but the content knowledge was wrong, then it still did not matter because the knowledge being taught was useless. Teachers needed to learn not just

pedagogy itself, but also different pedagogical strategies in regard to different subject matter. Teaching should not be a one size fits all model. For example, science may require more hands on experiences like dissection, language arts requires peer-to-peer writers' workshops, and social studies may require utilization of primary source materials to enrich the learning environment. Shulman described this content-pedagogy connection as Pedagogical Content Knowledge (PCK), and it has changed the nature of teacher education in 1986 from that point forward.

Development of Technological Pedagogical and Content Knowledge (TPACK)

TPACK became relevant as a technology integration expert in higher education while considering how undergraduate professors can begin to integrate mobile devices into their formal instruction. Koehler and Mishra (2008) built upon and extended Shulman's (1986) theory of PCK to include technology integration. K-12 teachers have been pressured for about the past 2 decades, 1990-2014, to integrate technology. Higher education teachers have more recently begun to feel the pressure of technology integration; however, both groups of teachers have seen very few models that address how to accomplish this. TPACK emphasizes teachers' knowledge because teachers are the biggest influences in the classrooms. In respect to the curriculum and standards, teachers have historically decided what would be taught and how it would be taught on a daily basis. Focusing on teachers' knowledge was the key place to start when looking at transforming classrooms. As new technology tools hit the stage like the iPads in 2010, some researchers posed questions regarding whether certain pieces of technology made a difference in the classroom, for instance, *Do iPads influence learning?* When realistically, the question that should be asked is, *How do teachers use iPads to influence learning?* Or, *What subject matter instruction is enhanced by the use of iPads?* The technologies used are irrelevant if the teacher is not equipped to use those technologies properly. Using the TPACK framework allows educators

to look at equal distribution of focus on each of the core aspects of TPACK: Technological, Pedagogical, and Content Knowledge.

Teachers most commonly have used and are using combinations of *Knowledge* and any of the three core components of TPACK. Each component is equally important and equal distribution each of the components creates the best learning environment (Koehler & Mishra 2008). Figure 1 taken from Koehler and Mishra (2008) demonstrates the combination of components of the TPACK framework.

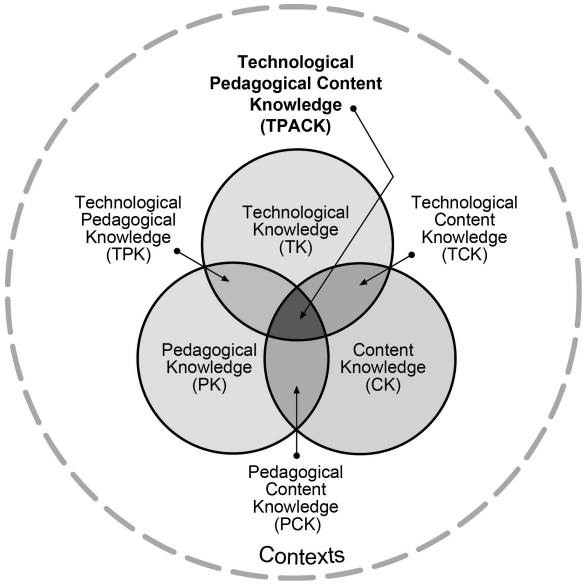

Figure 1. TPACK. Reprinted from *Handbook of Technological Pedagogical Content Knowledge (TPACK) for Educators,* p. 12, by M. J. Koehler & P. Mishra, 2008. New York, NY: Routledge/Taylor & Francis Group for the American Association of Colleges for Teacher Education. Copyright 2008 by the authors. Reprinted with permission.

Any combination of the three TPACK components with knowledge and the core components can exist. Content knowledge is the knowledge of the subject matter that is to be taught. Historically, higher education has been full of subject matter experts or individuals who are accomplished in their fields, hold much experience, and may even be well published. These individuals are known as content knowledge experts. Being a content knowledge expert is an important aspect of teaching because misrepresentation of content knowledge could impact

students greatly (Mishra & Koehler, 2006). Students have looked to their professors as the subject matter experts, and for the most part have accepted information given by teachers without question. If the content was misrepresented, it created holes in the students' foundational knowledge, impacting how they used that knowledge, creating the need for clarification of that knowledge down the road and further supporting the importance of content knowledge.

Pedagogical knowledge is the educators' knowledge regarding how to teach, including educational objectives, students' evaluation, and learning processes (Mishra & Koehler, 2006). Educators typically learn pedagogy through their teaching experiences and in their pre-service teaching programs. Knowing how to create lesson plans, vary instruction, and manage a classroom effectively demonstrate pedagogical expertise. Professors in teacher education programs are usually former teachers who have gained teaching or pedagogical expertise through teacher training and experiences. They then share this expertise with pre-service teachers (their students) to prepare those future teachers to prepare lessons, teach, and assess students appropriately. Solid pedagogy refers to how students viewed what were good teachers. This pedagogy can be demonstrated through differentiation of instruction and a strong sense of care for the students' education and well-being. Being an expert in pedagogy is what separates knowledgeable *people* from knowledgeable *educators* (Mishra & Koehler, 2006).

Not only is it important to have a strong foundation in the content knowledge, but sound educators must also be experts in content pedagogy as well. Combining *Content Knowledge and Pedagogical Knowledge* creates a better learning experience for students. Educators who could do this effectively are able to choose appropriate teaching techniques and arrange the content so it can be best understood (Mishra & Koehler, 2006). Often, educators who understand and apply Content Pedagogical Knowledge receive positive student evaluations. Students feel that the

instructors are able to meet their diverse learning needs and create positive educational environments for them while further increasing their content knowledge. For instance, when teaching mathematics, a teacher might pose meaningful questions related to what the students know. A teacher who is sound in his/her content knowledge and Pedagogical Knowledge will be able to find errors in students work and suggest corrections. The instructor will not only know math concepts, but also be able to adapt the instruction to meet the students' needs (Mishra & Koehler, 2006).

Technological Knowledge is the knowledge someone has regarding technology tools, whether analog (books and/or whiteboards) or digital (Internet, tablet applications, and/or web 2.0 tools; Mishra & Koehler, 2006). Technological knowledge is always changing since technologies are always changing. With that in mind, it is difficult to define technological knowledge due to its state of flux. Becoming computer literate is a skill that an educator holds with the ability to stay flexible and apply knowledge across platforms or tools, making an educator knowledgeable in technology (Koehler & Mishra, 2008). Educators who have technological knowledge are able to troubleshoot technology on their own or with little to no direction or support. Individuals with sound technology knowledge do not require a lot of direction and they also have a large repertoire of tools to use. However, possessing technological knowledge alone does not make an effective educator (Mishra & Koehler, 2006).

Teachers are blending *Technological Knowledge* and *Content Knowledge* when they find or create connections between content areas and technologies. An expert teacher in this regard would be able to find tools that connect to the core subject areas, for instance using Geometer's Sketchpad for teaching mathematics. *Technological and Content Knowledge* teachers are able to replace tasks that were done without technology and provide technologies to achieve those

same learning objectives (Mishra & Koehler, 2006). For example, rather than have a teacher provide a lecture on Newton's laws of physics, he/she might provide interactive games or use web 2.0 tools to teach the same content.

Technology teachers are usually strong in *Technological and Pedagogical Knowledge* and are able to choose the right technologies for the learning objectives at hand. Such an educator understands and demonstrates different teaching strategies and varies the uses of technologies. An expert in this area is able to find a variety of tools for a variety of instructional uses (Mishra & Koehler, 2006). He/she is able to adapt to and stay up to date on the latest trends in technology, educational and otherwise. Rather than take an analog task and rework it with technology, this type of teacher will use technology as a tool to make that learning project better. For example, studying Newton's Laws of Physics again, an instructor could have students digitally record gravity at work by dropping two different weighted items at once, and have the students slow the recording down to re-watch to see if the heavier object drops first or at the same time. The key to technological and pedagogical knowledge is the diversity in tools and strategies that the teacher implements. The technology is the tool, not the purpose (Mishra & Koehler, 2006).

Finally, *Technological Pedagogical and Content Knowledge* is the ideal blend of all four components. It requires a full understanding of each area and how to use and apply each of the core components. TPACK applies a variety of technologies that represent concepts and facilitate pedagogical techniques to differentiate teaching (Mishra & Koehler, 2006). An educator who incorporates TPACK effectively is able to build on students' prior knowledge by including appropriate technologies and best pedagogical practices. The incorporation of all three components, Technological Pedagogical and Content Knowledge, blends technology

seamlessly into the classroom. TPACK applies to the technology teachers and their courses as well as the subject matter instructors. The teacher does not use technology for its own sake, but rather has an educational purpose, and is able to find several different applications of those tools. An effective TPACK integrating educator is able to model this framework in instruction daily and provide an integrated teaching approach to meet the diverse needs of all learners (Mishra & Koehler, 2006).

Resistance to Changes in Education

New innovative technologies are appearing on the educational landscape everyday. Many teachers in K-12 schools are discovering and implementing these technologies into their classrooms daily. However, in higher education, students rarely see this technology integration. Some professors are courageous and ambitious enough to explore these technologies for the sake of their students' learning. However, many educators are somewhat apprehensive in tackling new technologies for fear of their lack of educational impact or the time vacuum implementing technology might incur. Teachers should provide immersive, meaningful learning activities that engage the students actively in the content (Ackermann, 2001). This immersion should be representative of the way these technologies are used in the world or in today's workplace.

Dewey's (1938/1988) model of learning through active engagement in meaningful activity is the way technology in education would be best put into practice. Working on real life problems as those problems arise brings more meaning to those tasks (Shaffer, 2006). Implementing technology naturally in higher education will provide a seamless transition for students to present real life problems and solutions. For many years universities have had technology education courses held outside of the core subject areas solely for students interested in computer programing or other technology fields. These stand-alone courses make it difficult

for students to make the content related to real-life connections. The technological real life integration is vague because it does not hold a logical place within the curriculum. As a result, students see technology as separate from their coursework and their personal lives (Mishra & Koehler, 2006).

Some educators have expressed great resistance to technology integration due to the constant, rapid changes in technology. Time is an important and precious commodity and technology integration requires a lot of time in order to stay up to date. Many educators, especially those who are not comfortable with technology, feel that new technologies will take them too long to figure out how to use, and they are more comfortable teaching the way they have been teaching for years. Not only do the tasks take more time to figure out, but also technologies are unstable (Koehler & Mishra 2008). Technological knowledge is never fixed; it is constantly changing, thus making it difficult to have complete understanding of the tools at hand. This makes it difficult for teachers to keep up and create a fluid, seamless, technology integrated classroom. If teachers or students are required to utilize new technologies, training is essential to ensure proper usage and the most efficient use of time (Chang et al., 2012). Taking advantage of the availability of mobile devices and taking a mobile teaching and learning perspective to integrating technology into the classroom may yield better results.

Integrating the TPACK framework into higher education will create a relevant teaching and learning experience all students. By integrating mobile technologies educators, can be the necessary facilitators between task-based and sense-making activities. Students can perform a task and the educators can help schematize the content to its life applications. The instructor's assistance will help students to move between tasks and form connections between activities (Rogers, Connelly, Hazlewood, & Tedesco, 2010). Learning tasks and materials must be

sensitive to the five psychological challenges of the mobile learning experience: context dependency, resource limitations, distributed cognition, and attitudes and preferences concerning technology use (Terras & Ramsay, 2012).

Participants in this study will learn firsthand that the technologies exist in world outside of the formalized classroom settings. Using a blend of TPACK provides an example of what the world is today and how those technologies exist within it.

Pedagogical Uses of Technology

Today's learners are surrounded with technologies, emphasizing the importance of not only pedagogy and content knowledge, but also technology integration. Some studies have been conducted with pre-service teachers and their use of TPACK when preparing to become teachers. Sahim (2011) studied the relationship of study grade point averages (GPAs) to the usage of the three components of TPACK. He found that higher use of TPACK components was associated with higher GPAs. This study showed that with equal distribution of the TPACK components, students excelled more overall in school.

Today's educators use technology as *efficiency aids* or as *extension devices* rather than as transformative tools (Harris, Mishra, & Koehler, 2009). PowerPoint or other presentation type tools are used daily to serve as visual aids to lecture presentations. Websites are utilized as references or productivity tools, but these are just digital way of doing what used to be done on paper. Technology has afforded individuals the opportunity to do more than consume information through those devices. Now, users can collaborate, create, and connect to enrich the learning experience. Harris et al. (2009) critiqued how educators are using technologies today and are scathing the surface of what is possible. They offer ideas on how to integrate TPACK

into every lesson effectively and to think about each of the components when planning new lessons.

The following topics are teaching approaches adopted by several university educators that demonstrate sound steps toward using technology tools of instruction through implementing TPACK.

Pedagogy and Technology

Problem Based Learning. Problem Based Learning (PBL), a pedagogical teaching strategy that is now being taught to pre-service teachers, is beginning to gain popularity within K-12 education. The Illinois Mathematics and Science Academy (IMSA, 1993) made a big push for this constructivist teaching style in the early 1990s within professional career training. This approach tasks students with real world problems to solve; the idea is to create a cross-curricular experience for the students in which their learning becomes more relatable to real life situations. Technologies are being integrated into these projects loosely. Since this approach is student centered, the digital natives naturally uncover technologies that are useful in solving these problems. In cases where teachers feel comfortable with technologies, they can help point students in the direction of helpful technology resources. PBLs offer a solid foundation of content knowledge and a reason behind the instruction. Both technological and pedagogical knowledge can be integrated into PBL by applying several relevant technologies and formative and summative assessments through content focused inquiry. Integrating the TPACK framework with PBL will provide students with a well-rounded curricular experience.

Flipping the classroom. Creating learning vidcasts or podcast for students to view before class has taken the name of *flipping the classroom.* In a flipped classroom, teachers provide lectures or presentations through direct instruction techniques, allowing them to use their

class time more effectively for collaboration, remediation, or student presentations. Flipping the classroom is becoming more popular recently due to the easy access of technology and the growing popularity of Khan Academy. Companies like Kahn Academy and Sophia.org, made possible by Capella University, have created a heightened awareness of inverted or flipped classrooms. This inverted content can be consumed easily on handheld devices. This type of teaching style is appealing to today's students because of their constant connection to their mobile devices, where they can log into their courses and watch brief videos. Today's students are mobile learners; the same technology that once required a computer now only requires a mobile device. Students can pull out their smartphones while waiting for an oil change, in the doctor's waiting room, or on the commute. In addition to Kahn Academy and Sophia.org, the growth and popularity of iTunes and iTunes U inspire learning on the go. Students are beginning to demand this portability from their teachers and creating flipped content fills this need. Video-on-demand is available with mobile devices (Traxler, 2010). Creating a flipped classroom experience allows teachers to make better use of their class time. Students have more time to engage with each other and their instructors authentically. Uploading lectures online saves time and meets the needs of diverse learners. Seeing or hearing the lesson repeatedly as many times as they need to allows students more practice, and they can learn at their own pace. With the growing popularity of the flipped classroom, technologies are being used to create additional classroom content for students to access outside of the schools' four walls (Lage, Platt, & Treglia, 2000).

The flipped classroom technique is a way to begin to model TPACK for teachers while utilizing students' preferred tool: mobile devices. Teachers who can create mobile content like flipped lessons are beginning to incorporate TPACK ideas into their classrooms. For example,

teachers can model the technologies in use while teaching how to solve an algebraic equation in a few different ways. Educators can then utilize differentiated instruction by creating several teaching videos for students to view, opening up class time to work with students individually. Educators are able to provide a strong pedagogical approach while embedding solid content knowledge, and the technologies used demonstrate their technological knowledge. Flipping creates a differentiated pedagogical approach when teachers provide a variety of content and tools taught through videos. Creating podcasts or vidcasts allows teachers to connect technology to their content. In addition to the videos, classroom time allows teachers to reteach difficult material and use a variety of pedagogical strategies (Bergmann & Sams, 2012).

Mobile devices and applications. The use of mobile devices opens up many opportunities to integrate TPACK into undergraduate education in a culture where students already have devices and the university does not have to worry about acceptable use policies because the clientele are young adults and technology is easier to implement than in K-12. Campuses are already equipped with Wi-Fi throughout common areas, dorms, and classrooms, and mobile devices are already being used in all of these areas. Academically, pedagogical experts ask students to recognize, recall, analyze, reflect, apply, create, understand, scaffold, and evaluate or assess learning. Since mobile devices heavily utilize applications, students can easily display their knowledge with these powerful tools. Every day hundreds of new applications emerge onto the application market, making it easier for students to use their devices for learning (”Number of Android Available Apps,” 2014). Many of these applications are designed for users to use the previously mentioned learning techniques. Educators can ask students to reflect through online blogging applications like Wordpress or Blogger. Students can scaffold through mind mapping applications like MindMeister or SimpleMind+. Applications like Socrative can

ask students to recall, recognize, and or apply knowledge. Creating can be taken to a new level with augmented reality, podcasting, videos, and or music applications. With careful direction from educators, students can begin to integrate their mobile devices more effectively into a more productive learning experience.

Growth of Technology and Mobile Devices

Walk onto any college campus across America and you will find the majority of undergraduates connected to their mobile devices. According to a recent PBS Frontline study by Evan Wexler (2014), of teens between the ages of 12-17, 74% are mobile Internet users. That age group may indicate the mobile Internet usage of undergraduate students today. The ubiquity of students' mobile devices contributes to how, when, and where learning can and does happen (Barnhart & Pierce, 2011). Most students own at least one mobile device and spend a great deal of time and money "choosing, buying, customizing, enhancing, exploiting their personal mobile devices" (Traxler, 2010, p. 25). According to Pertierra (as cited in Traxler, 2010),

> Unlike desktops and other immobile technologies, mobile phones more closely resemble tools or prosthetic devices as extensions of the body. They become extensions of the hand, allowing us to connect anytime, anywhere, with anybody. Bodies themselves become writing devices as phones negotiate new urban spaces. (p. 27)

Connections worldwide. With mobile devices becoming more and more ubiquitous, the ways in which undergraduates use those devices has gone understudied. As mobile technologies are becoming more popular among teens, and it is argued that such technology should become more embedded within education (Merchant, 2012). The purpose of this quantitative study was to discover how undergraduate students and instructors use their mobile devices in and outside of formal class. Timberg (2013) noted that world's population is about 7.1 billion, and the number

of mobile devices is growing toward 7.4 billion, up from 6.8 billion devices in 2012. The rise of mobile devices is growing faster than the world's population. Table 1 shows the rapid growth of technology and dependency on these technologies worldwide. With the growth of Internet connectivity, users are finding more and more ways to access the web, and mobile devices are a tool for that connection.

Table 1

Internet Users Worldwide

World Region	Internet Users 2012	Penetration % Population	User Growth 2000-2012
Africa	167,335,676	15.6%	3,606.7%
Asia	1,076,681,059	27.5%	841.9%
Europe	518,512,109	63.2%	393.4%
Middle East	90,000,455	40.2%	2,639.8%
North America	273,785,413	78.6%	152.3%
Latin America/Caribbean	254,915,745	42.9%	1,310.8%
Oceania/Australia	24,287.919	67.6%	218.7%
World Total	2,405,518,376	34.3%	566.4%

These mobile devices are fighting their ways into the educational landscape and classrooms. Mobile devices are embedded in people's everyday lives; however, many instructors see mobile devices as a distraction or as unnecessary (Merchant, 2012). The current study explored how undergraduate students and instructors describe their academic use their mobile devices in and outside of formal class, asking questions about teacher-directed uses as well as student-initiated academic uses. The data gathered in this study will provide information to merge the two groups uses of mobile devices to provide the best possible learning environment rather than serve as a distraction.

Ubiquity of mobile devices. In PBS Frontline's 2011 study of teens between the ages of 12-17 and their use of mobile devices, they found that 37% of all teens have smartphones in

2012, up from 23% in 2011 and 95% of teens use the Internet (Wexler, 2014). This group of 12-17 year olds comprises the group of students just before they attend college. It can be predicted that even more undergraduate students have smartphones than the group of 12-17 year olds that PBS studied due to their independence and being away from home.

In terms of access, 93% of teens have computer access at home but 71% say the computer or laptop they use at home is shared with other family members (Wexler, 2014). Shared devices raise the demand for personal mobile devices for privacy and personalization. According to danah boyd (as cited in Wexler, 2014), principal researcher at Microsoft Research, "teens want a place of their own to hang out with the people they want to and not with the people that drive them crazy" (p. 1). With so many teens being connected today and the lack of restriction on university campuses, it exposes the possibilities of these devices being used academically.

Ease of access to technologies today. The growing popularity of mobile devices is due to anytime anywhere access to information . Mobile devices allow people to communicate, negotiate, socialize, and learn in cooperative and collaborative ways that would not happen otherwise. Educators who are taking advantage of the anytime anywhere devices utilize them for the extended "possibilities for formal educational activities of active collaboration, real-time chats, shared screens and boards, support for team creation, awareness of participation, and control time of activities" (Cruz-Flores & Lopez-Morteo, 2010, p. 9).

Sharples, Milrad, Arnedillo, Sánchez, and Vavoula (2009) redefined the idea of a physical learning space, or classroom learning space. As the physical, conceptual, and social spaces become mobile, time has become more flexible and malleable for the user. Additionally, Plant (2001) suggested making changes to commonly used definitions and notions of time.

Rather than viewing time as a common structure in place, it has become approximate, allowing approx-meetings or multi-meetings. Time is now socially negotiated (Sørensen, Mathiassen, & Kakihara, 2002) and the "micro-coordination of everyday life" (Ling, 2004, p. 69) alongside the "softening of schedules" (Ling, 2004, p. 73) that is afforded by mobile devices. Nyíri (2007) stated that, "with the mobile phone, time has become personalized" (p. 301). Or perhaps, "…this means the replacement of one time by a series of overlapping times" (Traxler, 2010, p. 7). Since students are becoming busier and busier, running from class, work, jobs, and other responsibilities, this notion of not needing to be tied to a location in order to learn has become more important.

Not only are mobile devices changing the definition of time, but they are also eroding physical space. Now individuals can be present without actually being present, also known as *absent presence* (Gergen, 2002). Groups can be together in "physically co-located groups, in the family home or in the university common room, all connected online elsewhere and by *simultaneity of place*" (Traxler, 2010, p. 8). Mobile devices have changed physical space into virtual spaces of social and conversational interaction (Traxler, 2010), allowing today's students and teachers to still connect with each other anytime, anywhere. Students no longer have to spend long hours in the library to meet with study groups; rather, they can use their mobile devices, FaceTime, Google Hangout, or Skype to accomplish the same goals without having to be in the same room.

With the notion of physical space being reexamined, today's libraries are looking at ways to integrate with mobile devices. Mobile devices have changed the ways in which learning, research, and teaching happen (Barnhart & Pierce, 2011). For example, EBook readers and mp3 media players allow for transportability of information. The traditional media of books and

records are longer necessary to store and transmit literature and music (Traxler, 2009). Transformation changes the ways in which students seek and obtain information. Mobile devices offer greater mobility and connectedness than laptop or desktop computers (Traxler, 2010). With mobile devices, students are no longer restricted to traveling to the library to research. Instead, libraries are adapting to learners' needs and demands, creating mobile content for learners on the go. Additionally, libraries are offering Adobe Connect virtual student library orientations to accommodate the needs of today's digital on the go learners. The power of mobile devices has changed the way humans communicate because of the variety of communication options offered by a single device (Barnhart & Pierce, 2011). Learning and knowledge are now no longer confined to physical places or artifacts (Traxler, 2010).

Mobile devices now provide easier capabilities for mini instruction or *microinstruction* among the masses in formats, such as Massively Open Online Courses (MOOCs). Microinstruction transforms the traditional classroom of students and provides means for meeting the needs of the underserved population (Barnhart & Pierce, 2011). "One hundred and eighty million children in developing countries will have the opportunity to stay in school between now and 2017 due to Mobile Education" (GSMA & A. T. Kearney, 2013, p. 34). Because of the unique characteristics of mobile devices—such as portability, connectivity, convenience, expediency, immediacy, accessibility, individuality, and interactivity—they have taken education to the next level (Song, 2011). Students no longer need to take field notes and wait to get back to the lab to record or further their knowledge; instead, they may locate information in the field at the moment it is needed (Merchant, 2012).

Applications and usage of mobile devices. Mobile devices are certainly popular, but what do people do with their devices? When PBS Frontline asked teens (12-17) what services

they used several times a week, answers were 49% Facebook, 39% Snapchat, 38% Instagram, 26% Twitter, and 8% Pinterest. When asked what they do online, 91% reported posting photos of themselves on social media, up from 79% in 2006, and 24% reported posting videos (Wexler, 2014). Many of these uses are creative or social media applications. However, academic uses of those applications that can be implemented. PBS Frontline's study only surveyed teens, not undergraduate students or educators, nor did it ask about academic mobile device uses.

Ally (2009) conducted a study with approximately 200 participants, 150 of whom participated in that survey on how smartphone users worldwide use their devices regularly. This survey was conducted via the Internet to reach the maximum number of participants around the world. The coded results of the study are presented in Figure 2.

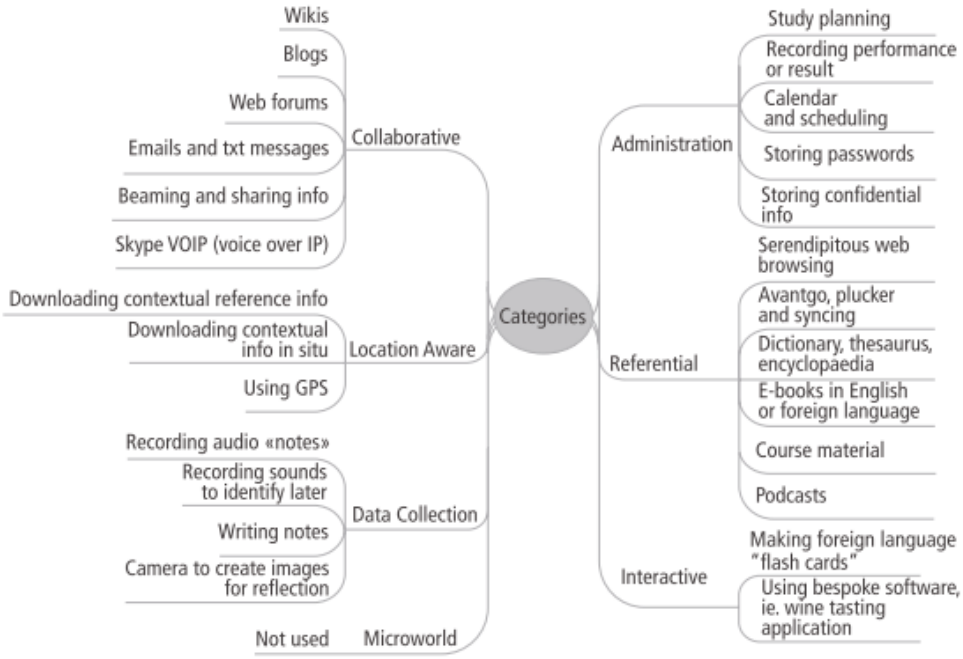

Figure 2. Informal learning activities. Reprinted from *Mobile Learning: Transforming the Delivery of Education and Training,* p. 104, by M. Ally, 2009. Edmonton, Alberta, Canada: AU Press. Copyright 2009 by the author. Reprinted with permission.

The majority of users indicated that the most favorable factors were portability, storage, computing power, and convenience. One hundred percent of smartphone users used them to

communicate, and 21% of personal digital assistant (PDA) users and 19% smartphone users used their devices for collaborative learning. However, in the subsequent follow up section of his study, additional users indicated that they did collaborate but just did not recognize it as such. Ninety percent used their devices for taking notes to support informal learning. Voice recorders were the most commonly reported used feature of their devices, web access - while away from the computer, and 90% synced their devices with their computer. However, since 2009, cloud storage has made synchronization much easier and minimized the necessity of doing so manually. Forty-five percent accessed the web daily or weekly and 30% stated that they accessed the web occasionally. Users indicated that they often used Wikipedia for informal learning. Some indicated that they used the camera in informal learning activities, but not exclusively for informal learning. Lack of use of the mobile devices' camera could be attributed to its low quality and or lack thereof on mobile devices at the time of that study. A few users noted the use of audiobooks and podcasts, and 84% reported using administrative features daily such as the calendar and contacts. Although the participants did not explicitly recognize it as such, collaboration was a key theme and knowledge sharing was also commonplace. Based on the findings of this study, the researcher believes that digital natives in undergraduate educational settings today are utilizing these informal learning applications as well as many more that were not yet developed in 2009 or were been mentioned by the participants in Ally's (2009) study.

The National Association of Independent Schools' (NAIS) 2012 Mobile Survey Report found that 75% of independent K-12 schools were using mobile technologies and 12% were actively planning to use them. There are obstacles to implementing mobile devices in the K-12 setting, such acceptable use policies and school owned devices versus student owned. In light of those obstacles, 75% of schools still reported using mobile technologies. It can be assumed that

today's undergraduate students are accustomed to using mobile devices in their past educational experiences. Undergraduates likely have encountered academic uses of mobile devices that can be shared with their current instructors. If 75% of K-12 schools are using mobile devices for learning in spite of many obstacles, the percentage should be higher in the university setting. Theses students are growing up with technologies used in their K-12 classes every day, but then find such technologies practically absent from the college classroom (Thuermer, 2012).

Smith (2010) found that, in 2010, two in five adults used their mobile devices for Internet, e-mail, or instant messaging, which an increase to 40% from 32% in 2009. There has also been growth in use of non-voice applications in recent years, especially among young adults and 30-49 year olds. Additionally, 95% of cell phone owning 18-29 year olds reported using text-messaging and were significantly more likely to use their cell phones over other technologies for other mobile data applications, such as taking pictures, sending e-mail, or accessing the Internet. Collaborating through e-mail, text message, or use of non-voice applications and pictures may be current academic uses both in and outside of class. Since this study is 4 years old, it can be assumed that those learning applications have been taken further and new applications have emerged since its publication.

Importance of Studying Undergraduate Students and Educators

Undergraduate education is currently suffering from a standstill in technology integration in the formal academic setting. These students are young adults who are digital natives with not just one device, but also several. They see their devices as extensions of themselves because mobile devices offer anytime, anywhere learning (Terras & Ramsay, 2012). Students use their devices to communicate with each other constantly, and yet when they get to class, they are told to put their devices away. They grew up in their primary educational settings where many of

their schools had one device to every student, robust Wi-Fi on their campuses, interactive whiteboards, etc. Now when they step foot on a college campus it is as if they take a time machine to a place where these devices do not exist. Based on the researcher's observations, it seems many undergraduates are using their devices to assist with their academic coursework. Many studies have been done with K-12 students; however, there is a lack of information regarding the undergraduate population's academic usage of mobile devices. The Joint Information Systems Committee (JISC) e-learning program in the UK set out to research understudied topics related to today's learners, one of which was mobile device usage. Yet, one study conducted on the topic of mobile device usage found a mismatch of experiences and expectations of learners and academic staff in regard to mobile devices usage (Kukulska-Hulme, 2010). It is known that students are connected, but it is unknown to what extent they use their devices to further support their learning.

In addition to uncovering how undergraduate students use their devices academically both in and outside of class, researching to what extent the undergraduate educators utilize mobile devices academically both in and outside of their courses will help provide a direction for better educational mobile device implementation. Through gathering data from both undergraduates and educators, the data can inform both groups of academic users of mobile devices to enhance learning.

Omnipresence on Campuses

Thousands of devices are arriving on campuses each year, presenting challenging the speed of and congesting college wireless networks. Empty a college student's backpack and one is likely to find several devices: laptop, tablet, and/or smartphone. This phenomenon is called *device explosion.* Armstrong Atlantic State University took an inventory of devices in 2012,

finding it to increase by 260% the following year. This growth is a demonstration of students' demand to be connected at all times (Straumsheim, 2013).

Early adopting campus like Robeson Community College (RCC) in North Carolina are working diligently to keep up when it comes to meeting needs and demands of their students, who expect to use mobile devices for everything and are comfortable using so. RCC has created mobile apps to allow students to register, log into the school's learning management system, check grades, access course materials, and connect with teachers or classmates. Their goal is to accommodate learning anytime, anywhere, and on any device. They have increased the wireless access points to 128 across their 127-acre campus. Additionally, RCC is requiring their educators to have an online presence to enhance the teaching and learning educational experience (Wong, 2012).

Timeliness of this Study

Today, higher education is under the microscope and being investigated more closely to reform the educational stage and make changes. The working world demands that today's students create and research, not just consume information. The Higher Education Academy (HEA) challenges universities to work harder to make connections between teaching and researching (Kukulska-Hulme, 2012). With the rise in popularity of MOOCs, questions have been raised about the need for or purpose of funding a traditional 4-year education. Mobile devices have been evolving quickly; however, the instructional strategies in higher education have not been evolving as fast (Cruz-Flores & Lopez-Morteo, 2010). Many K-12 institutions are working diligently to create technology rich learning environments for their students; however, as mentioned previously, once students graduate and go to college, they go back in time with regard to technology integration. Traditional higher education institutions are falling behind with

regard to progressive education, and now they must be forced to make changes or they will lose students to more innovative forms of education like MOOCs. Mobile device integration is one progressive change that higher education institutions must begin to recognize that students are demanding.

Although students use their devices on their own, they could benefit more if their instructors would find deliberate uses for these powerful technologies. Ally (2004, 2009) found that students used their mobile devices for both simulation and explorative information retrieval. However, students required some assistance from instructors to guide them away from misconceptions while searching the web for answers during information retrieval using devices. Additionally, when students were given devices rather than using their own technology, students experienced more difficultly because they were using unfamiliar technologies and instructional time was lost (Chang et al., 2012). If students have devices, they know how to use them; teachers merely need to ask them to do a task and the students will know what tool to use to accomplish it. Educators do not need to be experts in devices; however, getting involved in the learning process with those tools will create better learning environment where both student and teacher will benefit. With mobile device implementation educators will not feel as though they are fighting the potential distraction of mobile devices and students will feel empowered and guided to use these powerful devices. Traxler (2010) discussed the attitudes of today's undergraduate students, noting that mobile devices:

> Affect people's sense of time, space, place and locations their affiliations and loyalties to groups and communities, the ways in which they relate to other individuals and to groups, their sense of their identity, and their ethics, that is their sense of what is right, what is

wrong, what is approved of and what is inappropriate. They bring these attitudes into the universities. (p. 2)

How students connect and learn with others has changed dramatically. What students know and how they know it is no longer something that is only obtained from sitting in a classroom or reading out of a textbook. The gathering of information has become more attainable and immediate. Rather than going to class or to the library, students can get answers within seconds on their own devices. Students no longer require the assistance of a professor or personally known expert in order to ask questions or make connections. Rather, students can now send a tweet into the Twitterverse and receive answers within minutes. These answers can be validated by the masses since they are posted publicly. Students can utilize a variety of other resources within communities or other like-minded learners (Kukulska-Hulme, 2010). Learning is now experienced and supported in digitally mediated environments (Bell, 2011). This immediacy and ease of access to information is changing the landscape of higher education. Learning no longer needs to be confined to four walls and a professor; rather it is social, interactive, 24/7, and immediate.

Learning is more than just processing content; social learning theory emphasizes the importance of the context in which information is received (Bandura, 1971). Students need to learn through observations, direct instruction, and social experiences. A variety of experiences to reinforce the content are needed for students to conditionalize that information. Mobile devices afford students opportunities to engage in the content socially as often as needed. Mobile devices provide more mobility to learning, providing students with necessary social learning experiences.

This study is timely due to the high pressure on higher education intuitions to offer something relevant to today's mobile learners. With the rise in MOOCs that provide

opportunities for free education to the masses, higher education institutions must work hard to provide a unique and personalized learning experience. K-12 schools are setting the standards for rich technology environments, yet when students arrive on college campuses their use of technologies diminishes drastically. Using TPACK will provide a sound framework to take the focus off of the particular devices and focus on an equal blend of all the important components of learning to meet the digital demands of today's students.

Attitudes

It is important to look at the attitudes held by faculty and students toward using mobile devices for academics. Attitudes contribute to the diffusion rate at which these devices will be integrated into academic courses. As students have traditionally been early adopters of new technologies, educators have typically been the laggards. Looking closer at some of these attitudes may offer potential opportunities to overcome some of the negative beliefs held regarding mobile device usage for academic purposes.

Student demands. Even though instructors may not be promoting mobile device use, students are still demanding it and use them when possible. Students want to have control of what they learn and how they learn it. Some instructors use mobile learning via clickers or polling, like Socrative or Poll Everywhere,. Instructors also use mobile devices to enable students to access course materials like presentations, videos, or learning management systems. For these purposes, students use their own devices (also known as Bring Your Own Device or BYOD); however, the experiences are not usually shared or collaborative between teacher and student (Cruz-Flores & Lopez-Morteo, 2010). Rather, those technology uses are no different than passing out worksheets. Meeting the students' demand for dynamic device inclusion is an

important factor when considering motivation and empowerment of students by educators (Ally, 2004, 2009).

Sung and Mayer (2013) conducted an experimental, comparative study on learning with desktop computers and handheld devices. Their results study showed that students reported more satisfaction with learning on mobile devices than the desktop users. This finding was attributed to the portability and capability of the informal learning environments afforded by mobile devices. Many of today's students are constantly on the go, running from class to class, job, and home; additionally, many have long commutes. With mobile technologies, students no longer need to feel strapped for time to study. Their studying can take place anytime, anywhere. Interacting with a desktop computer takes place in a bubble. "Desktop technologies operate in their own little world; mobile devices operate in *the* world" (Traxler, 2010, p. 2). Sung and Mayer compared attitudes of American and South Korean students, finding that the delivery medium, whether via mobile or desktop/laptop means, was more important to American students than South Korean students. American students felt that learning with mobile devices was fundamentally different than learning with computers. American students felt that the portability and easy access of mobile devices did not restrict their learning. They were not confined to a particular space and time; rather, they were in control or what and when they learned. South Koreans saw the learning on both computers and mobile devices as the same; however, when asked which they preferred, both South Koreans and Americans preferred mobile devices.

Ting (2012) studied the pitfalls of mobile learning, and when polled, most learners had an unfavorable impression of learning with mobile technologies; however, when the learning experience was contextualized with real life examples, their perception became more favorable. Some of the negative perceptions may have been related to the type of device the students were

using. If students were provided with mobile devices, school owned or otherwise, student perceptions were negative. When the students were not familiar with the devices, they spent more time trying to figure out how to use the device than accomplishing the given academic task. In this study, the mobile technologies hindered the learning process. By allowing students to use their own devices this obstacle could be overcome, as well as allowing the instructor to focus on the educational context of the lesson, helping create clear connections for the students.

Additionally, Connaway and Dickey's (2010) polled students, finding that the majority of students preferred mobile devices to laptop or desktop computers. Speed and convenience were the main attractions of these devices. Mobile devices offer convenience and efficiency, which are of high value, especially among today's learners (Barnhart & Pierce, 2011). In terms of the mobile learning environment, students reported liking both synchronous and asynchronous communication, rather than preferring one to the other (Chang et al., 2012). Today's students like a variety of mediums and methods of communication regarding their course work. Above all, choice is important to their educational journey. Flexibility, immediacy, and efficacy are most important when selecting their device and learning environment. These needs and learning preferences contradict the traditional notion of higher educational environments where classrooms are rigid, predictable, and not adaptive. Today's traditional classes feature synchronous lectures with little to no inclusion of technologies, let alone mobile technologies.

Ifenthaler and Schweinbenz (2013) studied teachers and their attitudes toward integrating tablets into their instruction. They found that, overall, teachers' attitudes varied when integrating tablets; however, when working with disabled children, teachers were more likely to use tablets. Special education teachers have been more accustomed to using adaptive technologies and they feel tablet computers are merely an additional adaptive technology to use with that demographic

group. The limitations of mobile technologies that educators described were the small screens, limited input, and low computational power, all of which damper their use thereof in classrooms (Ting, 2012). However, it is important to note that screens are getting bigger today, devices are getting lighter, and more powerful for productivity. However informed educators are regarding mobile devices, many choose not to use mobile devices in the formal setting due to concerns about information overload, privacy breaches, or that students would not follow the rules (Kukulska-Hulme, 2010). According to a study in 2013, teachers who resisted the use of mobile technologies stated that there are too many obstacles to overcome to integrate tablets into the classroom successfully (Ifenthaler & Schweinbenz, 2013). These teachers felt the learning curve was too steep and they would rather focus on their craft: the pedagogy and the content knowledge. Yet, the world is changing and technology is ubiquitous; it cannot be avoided. Teaching without technology is no longer an acceptable practice. Using TPACK will engage students with the current technologies that are demanded in today's workplace. This resistance to mobile device integration has literally left students to their own devices, in and outside of the classrooms (Koehler & Mishra, 2008).

In a study by Terras and Ramsay (2012), educators expressed concerns regarding mobile learning, describing the potentially "significant psychological risk in terms of user engagement and concentration" (p. 823). For example, Terras and Ramsay stated:

> When the learner moves from context to context, the environmental stimuli change and there is an associated greater risk of interruption, distraction and reduced concentration. These interruptions come in many forms: attentional distractions, noise, changing audio-visual stimuli, changing temperature, differing comfort levels, differing visibility levels,

etc. All of these factors have the potential to disrupt the engagement of the mobile learner. (p. 823)

Educators managing these distractions and engaging with the information rather than managing the interruptions becomes the challenge. Many instructors do not want to deal with the added obstacles that come with mobile device integration. Managing a classroom of students is difficult enough, let alone needing to manage the infinite unknown other distractions that are so easily obtained through mobile devices. Students in these types of classrooms either hide their devices during class or choose to follow the rules and not use them at all. More information and data are necessary to provide professors with mobile device uses and applications to accommodate both parties' concerns.

Obstacles to adoption. There are many reasons why educators choose not to integrate technology into their classrooms. One, and perhaps the biggest reason, is *time*. Technological knowledge is never fixed, which contributes to the amount of time spent learning technological tools. Teachers like to create lessons that they know they can use for many years to come with small adjustments or updates. If they create a technology lesson and that technology changes drastically from year to year, they may feel that their time is not spent wisely. Additionally, there are many different versions of software, hardware, and web 2.0 tools that all require different knowledge to use; moreover, some of that knowledge may be incompatible with the other tools. These factors require educators to become lifelong technology learners. Educators need to be willing to accept that educational technology is always changing and make a concerted effort to keep up with those changes (Koehler & Mishra, 2008). Everyone feels they need more time; however, accepting the direction of today's education and embracing the need to be a lifelong technology learner will have positive effects on today's students.

Secondly, a lack in basic technological knowledge deters educators from technology integration. Especially at the collegiate level, most educators are experts in content knowledge, but not in technological knowledge. Also, many informational technology (IT) support personnel are experts in the technologies but not experts in the pedagogy or the content areas, making it difficult for them to support educators adequately. Many higher education professors went to school before modern technologies were used in the classrooms at a basic level. This lack of exposure can be a contributing factor as to why those instructors do not feel appropriately prepared to use technologies in their classrooms (Koehler & Mishra 2008). Additionally, exploring a new teaching method is daunting because many veteran teachers have already solidified their pedagogical knowledge (Mishra & Koehler, 2006). Changing mindsets and taking on a new task is difficult and may seem unnecessary to seasoned educators. Educators must feel that technology integration and content inclusion is consistent with their pedagogical beliefs in order to use those skills in their classrooms (Koehler & Mishra 2008). They may have excellent student evaluations and not see a need to change their pedagogy. Yet, the world outside of their classrooms is changing, and in order to capture students' attention, they would be well served to consider using relevant content related technologies.

Finally, fear is a common reason to avoid including technology applications into classroom instruction (Koehler & Mishra 2008). Many educators fear that if technology does not work correctly, they will lose their credibility, or they will not teach as well. Accepting that educators do not need to be technology experts is important. Rather, students are experts on their own devices. By embracing the use of mobile devices in the classroom, students will be inspired to use them more often and they can uncover new educational uses of the devices together. Additionally, by uncovering previously unknown student mobile uses, educators can use an

informed place of reference to begin to suggest academic uses of mobile devices in formal classes.

Learning In and Outside of Class

Learning happens all the time; not just in class, but also outside of class. People are curious beings who seek knowledge and learning. Mobile devices have afforded individuals the ability to seek enlightenment at any time, in any place. Students no longer need to be physically situated in a formal learning place like a classroom or a library in order to learn.

Formal classroom learning. Since teens today use mobile devices largely in social settings, it is important to build a teacher-student relationship so that educators can bring informal learning uses of mobile devices into the formal setting. Educators can help bridge informal and formal learning with students (Bull, Thompson, Searson, Garofalo, Park, Young, & Lee, 2008). By opening the doors for communication about the mobile device uses of students and educators, the gap can begin to be bridged. As mentioned earlier, some minor uses of technology are slowly beginning to be implemented into the classroom, but there is still a long way to go. Educators are the content and pedagogical experts and students may be the technology experts on their own devices, but the students are not technological and pedagogical knowledge experts. Together, combining students' knowledge with the instructors' knowledge will build a more technologically rich, motivating, relevant classroom.

Informal learning. Informal learning is done on one's own; the need to learn is not imposed by work, university, or school, and individuals can use a variety of techniques, personal preferences, or learning styles to obtain information (Ally, 2004, 2009). Informal learning is not always *work*; rather, it can be self-motivated and serendipitous (Traxler, 2010; Vavoula, 2003). Bell (2011) defined informal learning with regard to mobile learning as "Internet users learning

whilst surfing and acquiring information to enrich other learning activities, such as face-to-face discussion" (p. 99). Through one's daily activities, there may be a point when a learning opportunity presents itself; it is then classified as unintentional informal learning (Ally, 2004, 2009). Open educational resources, like MOOCs, uncover widespread online public education that acknowledges:

> The informal learning that has always taken place outside the classroom, in the workplace and at home. Web-enabled learning is undertaken by individuals as independent, informal learners, often within a social setting: This may occur in places of formal education, in workplaces, and in society in general. (Bell, 2011, p. 100)

A study by Ally (2009) found that Canadian adults reported spending more time on informal learning activities (an average of 15 hours per week) than on formal learning activities. However, this study did not denote whether or not the participants were enrolled in school. Based on this finding and the researcher's observations on college campuses, the researcher believes that students enrolled in a formal undergraduate educational settings would engage in at least, if not more than, 15 hours per week on informal learning activities. Informal learning activities take the form of innovative connective and collaborative activities that are only possible with mobile devices. Since learning may be unintentional, individuals may be unaware that the learning is taking place (Ally, 2004, 2009). In the current study, participants were not asked to recall instances of using devices for formal or informal learning; rather they were asked to tell a time when they used a device for academic purposes in and outside of class. This minimized the potential for students to misinterpret what the researcher defined as formal or informal learning. The data collected were coded as formal or informal learning activities.

Ally (2009) defined informal learning as "a deliberate effort to gain new knowledge or skills or obtain improved insights or understandings" (p. 100). Livingston (as cited in Ally, 2009) defined informal learning as "any activity that involved learning which occurred outside the formal curricula of an educational institution" (p. 100). Livingston distinguished between explicit informal learning and implied informal learning that occurs in social or other types of activities. Both explicit and implied informal learning have the same results of acquiring new knowledge or skills. However, Livingston noted, "only the explicit informal learning project is motivated by some immediate problem or need" (Ally, 2009, p. 100), which Tough's (1979) definition emphasized as well. Vavoula, Scanlon, Lonsdale, Sharples, and Jones (2005) partnered with Ally (2009) developed the classification of informal learning by separating the goals of learning from the processes of learning, as illustrated in Figure 3.

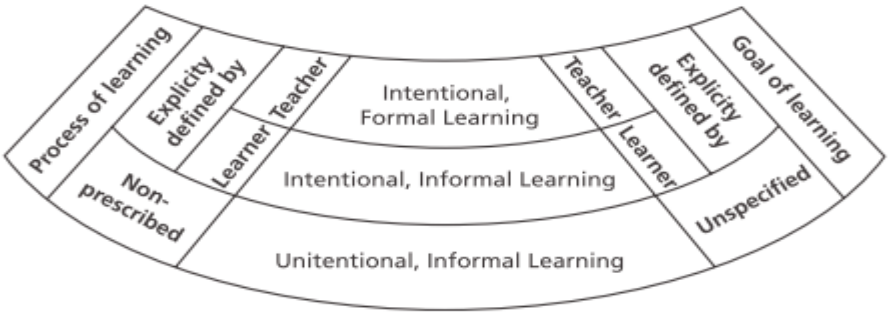

Figure 3. Informal learning. Reprinted from *Mobile Learning: Transforming the Delivery of Education and Training,* p. 100. by M. Ally, 2009. Edmonton, Alberta, Canada: AU Press. Copyright 2009 by the author. Reprinted with permission.

With the ubiquity of mobile devices, informal learning has become more frequent and available. The benefit of mobile devices to informal learners is the freedom and potential to explore knowledge unconstrained by formal learning goals (Ally, 2004, 2009). Groups or communities on the web form around topics of interest that are easily accessed at any time. Informal learning groups behave as smart mobs, "self-organizing technology-mediated social groups such as flash mobs" (Traxler, 2009, p. 12), where groups of people form to collect

intelligence in this mobile age. Informal learning environments create more of a social learning environment, or a community of practice, surrounding participants' interest in a desired topic (Lave & Wenger, 1991).

Students are able to use their mobile devices to gain additional insight and background knowledge on the topics taught in class and build upon those topics outside of class, which is an example of informal learning (Chang et al., 2012). Students can use mobile devices to access data to add depth to their partially formed ideas and understandings and integrate new information gained from their devices with their understanding and observations to make generalizations about new material (Rogers et al., 2010). Students are able to use the power of their devices and the web to maximize knowledge and collaboration that impacts the education and lives of students (GSMA & A. T. Kearney, 2013). Since informal learning is based on the learner's preferences and learning styles, the motivation for informal learning is different than it is for formal learning (Ally, 2004, 2009). These informal learning practices related to mobile device usage, when and if uncovered, can be used to differentiate teaching in order to motivate students.

For the purpose of the current study, informal learning was defined as learning in which a student engages that is not teacher directed. Students are self-motivated to engage in informal learning in order to obtain new or deepen current knowledge, and it can be either unintentional or intentional. Formal learning or in class learning describes learning that is teacher directed and done within the course setting (Ally, 2004, 2009).

Mobile learning. One is naturally led to mobile learning theory when studying the learning that takes place with mobile devices. Sharples, Taylor, and Vavoula (2007) defined mobile learning as "the processes of coming to know through conversations across multiple

contexts amongst people and personal interactive technologies" (p. 225). Ally (2009) asserted that "mobile learning is essentially personal, contextual, and situated; this means it is 'noisy,' which is problematic both for definition and for evaluation" (p. 10). Through the dissection of mobile learning, informal learning emerges and requires a definition. Ally merged the notion of mobile learning into a definition of informal learning where individuals "access additional and personalized learning materials from the Internet or from the host organization" (p. 1). In this study, mobile learning was defined as the act of using one's mobile device to connect with others and gather information to communicate or collaborate with others or in a community.

Mobile device studies. In a meta-analysis of trend from mobile learning studies by Wu et al. (2012), the authors set out to answer the following four research questions:

1. What are the major research purposes, methodologies, and outcomes addressed in mobile learning studies?
2. What types of mobile devices are mainly used in assisted learning and what are the general types of mobile learners?
3. How are different categories of disciplines and courses represented among mobile learning studies?
4. What are the highly cited articles in studies of mobile learning? (p. 818)

Of the 164 studies conducted from 2003 to 2010, most focused on the effectiveness and mobile learning system designs. Mobile device effectiveness and mobile learning designs systems were also the most commonly cited articles in the research. The most common research methods used were surveys and experiments to gather data. The most common devices were mobile phones and PDAs for mobile learning, but as the technologies change from using PDAs to smartphones the researcher projected that those PDAs and mobile phones may be replaced with emerging

technologies. Overall, according to the research, students have responded positively to mobile device effectiveness; however, they feel that mobile devices cannot replace conventional computers. Additionally, 86% of all the studies on mobile learning reported a positive research outcome, and only 4% and 1% reported neutral or negative outcomes, respectively (Wu et al., 2012).

In 2003, very few articles were published on mobile learning: only eight. However, in 2008, the number rose to 36. From 2001 to 2010, of the 154 articles on mobile and ubiquitous learning, higher education students were most commonly studied, following elementary school students, and finally high school students. These studies focused on motivation, perceptions, and attitudes toward ubiquitous learning (Wu et al., 2012).

The authors of this meta-analysis distributed research methods into two purposes, reflected in Table 2: (a) evaluation-dominant with application-minor or (b) design-dominant with evaluation-minor. Table 2 denotes the research methods used and the number of studies that used the corresponding method (Wu et al., 2012).

Table 2

Wu et al.'s (2012) Two Research Method Purposes

Evaluating the effects of mobile learning	Number of studies
Evaluation-dominant with application-minor	
Surveys	26
Experimental Research Methods	20
Descriptive Methods	7
Investigating the affective domain during mobile learning	
Surveys	6
Interviews	1
Evaluating the influence of learner characteristics in the mobile learning process	
Surveys	16
Experimental Research Methods	14
Descriptive Methods	8
Case Studies	2
Observation	1
Design-dominant with evaluation-minor	
Experimental Research methods	4
Surveys	2
Descriptive Methods	1
Observations	1

Overall, higher education institutions favored mobile phones (51.98%) and most dominantly in non-formal education contexts; the frequency of use was somewhat lower in formal education in higher educational institutions. Of those who used mobile phones for learning, elementary students made up 17.51% of the total population, adult learners comprised 12.43% of the total population, secondary comprised 8.47% of the total population, and disabled students comprised .056% of the total population. Table 3 presents a breakdown of the mobile learning usage for educational purposes in higher educational institutions (Wu et al., 2012).

Table 3

Mobile Learning Usage for Educational Purposes in Higher Educational Institutions

Area of Study	Percentage
Disciplines	
Professions and Applied Sciences	29%
Humanities	20%
Formal Sciences	16%
Social Sciences	4%
Natural Sciences	3%
Sub-Disciplines	
Languages and Linguistic Courses	17.05%
Computer Science	13.07%
Health Sciences	10.23%
Environmental Studies and Forestry	10.23%
Physics	2.27%
Business	2.27%

This meta-analysis had seven findings:

1. Most studies have focused on effectiveness followed by mobile learning design.
2. Surveys and experimental methods were most commonly used regardless of whether the purpose was focused on evaluation or design.
3. Research outcomes in mobile learning studies are significantly positive.
4. Mobile phones and PDAs are the most commonly used devices; however, it is projected that both will be replaced by emerging technologies.
5. Mobile learning is most common in higher education institutions, followed by elementary schools.
6. Students in the professional studies and applied sciences were found to best support student learning, although mobile learning can be used in any course.
7. Mobile learning system design followed by effectiveness articles were most highly cited. Since mobile learning is most commonly done in higher educational institutions,

it lends itself well to study the ways in which informal learning happens (Wu et al., 2012).

At the UCF, Chen and deNoyelles (2013) found that among undergraduate students, tablets are the most popular devices used for academic purposes. Students reported that they use these devices in a self-directed manner with little or no guidance from instructors: informal learning. This study investigated undergraduate students' mobile learning practices; however, this study did not study instructor mobile device usage. The current study not only explored how undergraduate students are using mobile devices for academic purposes, but also undergraduate instructors' mobile learning practices.

The purpose of the present quantitative research study was to describe the effects of mobile devices for academics purposes in and outside of formal class settings for undergraduate students and professors at two small faith-based Universities in Southern California. The following research questions were explored:

1. In what ways, if any, do undergraduate students use mobile devices in class for academic purposes?
2. In what ways, if any, do undergraduate students use mobile devices out of class for academic purposes?
3. In what ways, if any, do higher educational instructors use mobile devices for academic purposes?
4. In what ways, if any, do higher educational instructors use mobile devices out of class for academic purposes?

This research study surveyed two similar universities in Southern California and conducted descriptive analysis and cross-tabulation analysis on the data. The data surveyed

categorical and frequency data from undergraduate students and instructors. Profiles of uses and frequencies were completed through the descriptive analysis and cross-tabulation. The ways in which undergraduate students and instructors used mobile devices for academic purposes in and outside of formal class was not studied before the time of this study.

Chapter Three: Methodology

The ubiquity of mobile devices and their uses in education has been increasing over the last decade, 2004 -2014. The ways in which those devices are being used by undergraduate students and instructors has not been studied sufficiently. This survey research study investigated the ways in which these mobile devices have been used for academics purposes in and outside of formal class settings by faculty and students at two small faith based Universities in Southern California to answer the following questions:

1. In what ways, if any, do undergraduate students use mobile devices in class for academic purposes?
2. In what ways, if any, do undergraduate students use mobile devices out of class for academic purposes?
3. In what ways, if any, do higher educational instructors use mobile devices in class for academic purposes?
4. In what ways, if any, do higher educational instructors use mobile devices out of class for academic purposes?

Rationale for Research Approach

Since it is known that many adults use mobile devices, an exploratory study was determined to be the best way to uncover how those devices were being used. In this exploratory study, survey research was deemed the best way to uncover those actual uses of mobile devices for academics in and outside of class. This exploratory study combined checkbox answers as well as open-ended text boxes, as to not restrict the participants' answers regarding the researcher's preconceived notions of mobile device usage. By answering these open-ended questions, the participants had the opportunity to report the actual ways in which they have used

those devices, whether academic or not. Mobile devices are ubiquitous, and one can observe both students' and instructors' constant connection to those mobile devices. The survey allowed participants to think about their usage in ways that related to the literature as well as report unique, new, and/or unreported uses in the current literature.

For the purpose of this study, mobile devices were defined as handheld devices that are Wi-Fi enabled, application based, lightweight (typically less than 2 pounds). Devices had to have a small display screen and a small keyboard or touch screen. These devices included, but were not limited to: iPads, iPod touches, Kindles, smartphones, and other tablet computers. Mobile devices had the following capabilities: text messaging, emailing, Internet, and or applications. For the purpose of this study laptops, netbooks, or Chromebooks were not considered mobile devices.

Since mobile learning was a major component of this study, it was important to define it. In this study, mobile learning was defined as the act of using one's mobile device to connect with others and gather information to communicate or collaborate with others or in a community (Ally, 2009; Sharples et al., 2007).

Additionally, informal and formal learning were considered in this study. Informal learning was defined as learning that happened outside of direct teacher instruction or just in time information that contributes to one's body of knowledge. Informal learning is student directed and includes personal and social aspects that contribute to their knowledge. Formal or classroom learning is teacher directed and done in class. It includes suggested application usage or classroom activities (Ally, 2004, 2009).

Sample and Sampling Procedure

The researcher chose two similar research sites to triangulate the data. Students and faculty were recruited from two small religiously affiliated liberal arts universities in Southern California. Both locations had undergraduate and graduate programs. For this study, the researcher only investigated traditional undergraduate students and instructors who taught at least one class a semester. A convenience sample was taken from the two universities due to the researcher's accessibility and ties to those university sites. According to University A statistics gathered in the Fall of 2014, University A had 1,592 traditional undergraduate students, 373 of whom were new freshman (first-time first-year degree seeking students). Of those 373 freshmen, 40 were part-time. Males made up 40.7% of the population and females made up 59.3%. Demographically, the traditional undergraduate population included 54 (3.39%) non-resident aliens, 307 (19.28%) Hispanics/Latinos, 3 (0.19%) American Indians/Alaska Natives, 85 (5.34%) Asians, 49 (3.08%) Blacks/African Americans 6 (0.38%) Native Hawaiians/Other Pacific Islanders, and 807 (50.69%) White. The population included 71 (4.46%) students identifying with two or more races, and 210 (13.19%) students of unknown race. Seventy-one percent of undergraduate students required financial aid assistance.

University B had 3,474 traditional undergraduate students. Males made up 42.8% of the population and the females made up 57.2%. Demographically, the traditional undergraduate population included: 16.5% Hispanics/Latinos, 0.6% American Indians/Alaska Natives, 13.5% Asians, 7.4% Blacks/African Americans, 0.5% Native Hawaiians/Other Pacific Islanders, and 49.2%) White students. The population included 5.3% students identifying with two or more races, and 6.9% students of unknown race. Eighty-one percent of students utilized financial aid.

Students and faculty from University A and B were sampled with the assistance of campus Institutional Research (IR) administrators to ensure a random selection. To ensure maximum participation, the principal researcher asked the two universities' IR administrators to pull a random sample of 100 students and 50 faculty members for each of the two stages of data collection. The researcher sent an email to each campus's IR administrators seeking the samples from each institution. The IR administrators provided the researcher with a password protected Microsoft Excel spreadsheet containing the names and email addresses of those who were selected. Those individuals were then sent an email (Bcc'd to maintain privacy) requesting participation in the study. Participants self-selected through the email request (see Appendix A) for participation that was sent to students and faculty at both research sites. The email explained the study and provided a link to the surveys for those who chose to participate. The surveys were hosted online through the Qualtrics website (see Appendix B, Student Survey and Appendix C, Instructor Survey). Phase one of data collection was 1 month long and phase two of data collection was open for 2 weeks.

The sample of undergraduate students over the age of 18 and instructors at both universities had an opportunity to participate in this study. The questions were nonthreatening and the participants were not treated unfairly in any way. There may have been some bias in that students self-selected and self-reported in the survey. However, participants were encouraged to answer in a truthful and honest manner.

Participants gave consent to use their responses in the research by clicking *agree* on the first page of the survey; all subjects participated in the study on a voluntary basis. Before participating in the survey, participants reviewed a written informed consent form (see Appendix D) explaining the risks, terms, and conditions of participating in the study, and what agreeing to

participate meant. The informed consent also provided key definitions of mobile devices, formal learning (in class or teacher directed), and informal learning (student directed). By agreeing to the terms and conditions the research subjects gained access to the survey questions. Participants acknowledged the privacy statement and limited potential risks and clicked *agree* to proceed into the survey. The consent was written on the first page of the survey, which allowed them access to the survey questions upon agreement. Participants were told they could withdraw from the study or quit answering questions at any time during the survey, and their responses would be deleted. Participants who withdrew before the end of the survey did not encounter negative consequences. The sole researcher was the only person with access to the data. Personal information, email address and IP addresses that were collected in connection to the survey were stripped from the rest of the data to maintain privacy and confidentiality when the data were analyzed. Participants had the option to provide their school affiliated email address to enter in the drawing to win one of two $50 Amazon gift cards. Those winners were randomly selected and the two gift cards, one for a student and one for an instructor, were awarded at the closeout of data collection. Winners were notified through the email addresses that they provided that they had received an electronic gift card from Amazon.

All other demographic information has been kept private and only accessible to the sole researcher. There was no risk of harm to any of the participants and they had minimal chance of experiencing mental distress as a result of participating. Participants gave about 10-15 minutes of their time to participate in this study. The requirements put into place by Pepperdine University and the additional researched universities' Institutional Review Boards (IRBs) were followed strictly.

Thirty-eight undergraduate students between the ages of 18-27 years of age participated in this study. The average age of the participants was 21.05 years of age with a standard deviation of 2.3 years. Due to the difficulty of obtaining parental consent, minors were not allowed to participate in this study. Table 4 presents the majors of the students participants.

Table 4

Students: What Is Your Major?

Major	*n*
Professional Studies	18
Humanities/Social Sciences	14
Hard Sciences	6

Note. $N = 38$.

Nineteen instructors participated in this study, ranging from 6 months to 37 years of teaching experience in higher education. The average years teaching in higher education was 15.98 years with a standard deviation of 11.68 years. Table 5 presents the departments in which the participating instructors teach.

Table 5

Instructors: In What Department Do You Teach?

Department	*n*
Professional Studies	11
Humanities/Social Sciences	6
Hard Sciences	2

Note. $N = 19$.

Data Collection Methods

There were two phases of data collection. In the first stage of data collection, a random sample of students and faculty member received an email with access to an online survey. The

participants responded anonymously through the survey tool, Qualtrics. The first round of survey dissemination occurred in the summer term and was open for participation for 1 month; a reminder email (see Appendix E) was sent to participants encouraging them to complete the survey 2 weeks after the initial email was sent. First round surveys and reminder emails (see Appendix E) were sent out on Mondays, as statistics have shown that participants are most likely to respond to a survey received on a Monday than any other day of the week (Zheng, 2011). Participation in the first round was low, so a second phase of data collection was initiated a week after the Fall semester started to allow for more student and faculty participation.

A second random sample of 100 students and 50 faculty members was determined by University A's IR administrators through random sampling. The department cross-referenced participants' email addresses to ensure those emails were not duplicated from the first sample. Again, the survey was disseminated on a Monday to encourage the highest level of participation. The second round of data collection was open for 2 weeks, as the first round of data collected showed that most respondents participated within the first few days of receiving the initial email (see Appendix A) and reminder emails (see Appendix E). A reminder email (see Appendix E) was sent out 1 week later. This quantitative study surveyed a total of 38 undergraduate student participants and 19 instructors.

Upon completion of the data collection phase, descriptive and cross tabulation data analysis were conducted. These analyses described ways undergraduate students and instructors use mobile devices in and outside of class, the frequency of use between the devices and applications of the two groups, and determined any significant differences between device usage amongst students and instructors.

Instrumentation

The quantitative student and instructor surveys (see Appendix B & C) were adapted from the UCF student survey on student mobile device usage (Chen & deNoyelles, 2013). The UCF survey was used as a baseline for the survey that was used in this study. Several modifications were made to access more specific data that could be correlated between students and instructors.

Unlike the UCF survey, the current survey asked demographic questions like age, major, department, and years teaching to uncover connections between those variables. The UCF survey asked what specific devices the students owned. This question was deemed too narrow because many students/faculty may use more than one device regularly that they may not own, yet to which they may have regular access. Also, many devices vary in features; for instance the iPad 1 does not have a camera, whereas the later generations do. In addition to asking about a specific device, this study also asked about features of their device/s. The UCF survey made the assumption that students used mobile devices for assignments, whereas the current study's survey first asked if they used mobile devices to complete assignments, and then asked what specific applications were used to complete assignments. This survey also asked about specific applications used outside and inside of class. The UCF survey mainly focused on academic uses. This study's survey asked about uses in and outside of class, as well as both personal and academic uses. These changes were made to obtain insight on how educators can implement such uses for academic purposes. Additionally, the UCF survey used a Likert scale of agreement asking about the reason for using applications; this survey asked participants to check all that applied regarding apps that they use. Rather than openly agreeing on a Likert scale about general desire to use apps or mobile devices, this study's survey asked participants to check all that applied regarding the devices the participants would like to use in class. Finally, the last UCF

question provided examples of desired university applications and to check all that applied; this survey left that question open ended as to not limit participants' creativity. The survey from the present study also asked on what device they accessed the survey to potentially further the hypothesis of ubiquitous mobile device usage. Although the UCF survey provided a good baseline of survey questions, the researcher thought it would be more valuable to obtain a deeper level of data with more specific applications and open-ended questions.

To build upon the UCF survey, current studies have provided updated student mobile device uses. The PEW (Rainie & Smith, 2013; Smith, 2010) and PBS Frontline (Wexler, 2014) surveys were used to provide updated and relevant examples of applications used by students on their mobile devices. The PEW study of smartphone users showed that users rely on their devices to access the Internet rather than laptop or desktop computers (Smith, 2010). Those data were used to inform questions in this survey regarding reading and researching on their devices.

Similarities between the two studies included similar categories of applications and examples of uses through open-ended questions. Both surveys asked about frequency of use regarding each type of device. However, this survey changed the frequency options to an even number of options to make participants choose one side or the other rather than choose the middle option (i.e., 1 = almost constantly, 2 = several times a day, 3 = daily, 4 = several times a week, 5 = several times a month, 6 = never).

Many of the same questions that were asked of the students were used for the faculty survey. The instructors were asked about reasons for not including mobile devices; that question was based on research done by Terras and Ramsay's (2012), which found that many faculty members abstain from mobile device usage due to potential student distractions. Ifenthaler and Schweinbenz's (2013) work informed this survey's option of *too many obstacles to overcome to*

integrate tablets. Koehler and Mishra's (2008) research informed the survey's option of *too much time spent needing to learn the technological knowledge*. Unlike the UCF survey, this survey used current research on educators' reluctance to integrate technology to inform its available options.

Data Analysis Methods

Multiple-choice data were analyzed with descriptive statistics; answers to open-ended items and comment boxes were coded using rubrics that went through several iterations.

Rubric creation for open-ended items. Eight of the 12 questions had open-ended comment sections. Rubrics were used to make sense of those. The following sections list the questions asked of the participants followed by the rubrics to code those responses. Students' questions and answers are listed first followed by the questions asked of the instructors and their answers.

Students' questions and responses. In these sections the questions that were asked of the students will be listed along with the corresponding coded answers.

Do you ever use mobile apps to complete assignments? If yes, how often? Students were asked if they ever use mobile applications to complete assignments. Twenty of the 38 respondents said *no* and 18 of the 38 responded with *yes*. For those who answered *yes*, responses were coded into nine categories of applications. Finding or Searching for Information, Collaboration, Special Purpose Applications, Campus Applications/LMS, Photography, Productivity, Reading, Communication, and Quizzes were the codes used to group the responses, listed from most commonly used to least commonly used. The rubric in Table 6 reflects the applications instructor reported asking students to use with their mobile devices. Some responses fit into multiple categories. Those who responded *yes* were asked a follow up question regarding

the frequency with which they used mobile applications to complete assignments. The frequency chart is listed in Chapter 4 in the data analysis section, Table 35.

Table 6

Students: Do You Ever Use Mobile Apps to Complete Assignments? If Yes, How Often?

Types of Applications	Written Responses
Campus App/LMS	BlackBoard application and mobile site and turn in online homework
Finding Information	Internet to find an answer, Google unknown information, and internet to define terms
Special Purpose Applications	StudyBlue App (make my own flashcards), use an app to scan my labs to submit them online, and dictionary app
Communication	Gmail to work on debate homework, write brief paragraphs in an email, and email photos of labs
Productivity	Google Docs and write an essay and email it to myself
Photography	Email photos of labs
Reading	Read PDF files
Collaboration	Peer reading another student's research paper
Quizzes	Taken quizzes in Safari

Name a few mobile apps that you use outside of class. Students were asked to name a few mobile applications that they used outside of class. Thirty-seven students responded to this open text question. The responses fit into 11 different categories, Social Media, Consumption/Search, Music, Special Purpose Apps, Entertainment, Productivity, Navigation, Campus/LMS, Communication, Games, and Shopping. The responses are listed from most commonly used to least commonly used. The rubric in Table 7 reflects the types of mobile applications that respondents reported using outside of class. Some responses fit into multiple categories.

Table 7

Students: Name a Few Mobile Apps That You Use Outside of Class

Types of Applications	Written Responses
Social Media	Facebook, Instagram, Snapchat, Pinterest, Twitter, Tumblr, Foursquare, Yelp, Social Networking,
Consumption/Search	Safari, Urbanspoon, GrubHub, Adobe, Chrome, ESPN, NFL, Slate, articles, Scorecenter, BuzzFeed, Mango, AP Mobile, Uncrate, NHL, Fox News, CNN, USA Today, & E! Online
Music	Pandora, Shazam, Spotify, & music
Special Purpose Apps	Camera, Calculator, Alarm Clock, Reminders, Bank of America, Union Bank, Yahoo Fantasy Football, Wells Fargo, StudyBlue, Quizlet, & Time
Entertainment	Family Guy, Univision, Netflix, YouTube, Devour, & YouVersion
Productivity	Polaris Office 5, Evernote, Calendar, Notes, & Notepad
Navigation	Google Maps, Metro Guide, & Maps
Campus/LMS	BlackBoard & Pepperdine
Communication	Email, Tango, & Mail
Games	8-Ball Pool & Jurassic Park App
Shopping	Amazon

Name a few mobile apps that you use inside of class. Students were asked to name a few mobile applications that they use in class. Thirty-six students responded to this question; of those 36, three said *none*. One student specifically said, *I almost never use my phone in class (too distracting); if I do I use Safari or Adobe to pull up an article during class discussion or Google (for definitions or thesaurus).* The responses fit into nine different categories: Consumption, Campus/LMS, Productivity, Cloud Storage, Special Purpose Apps, Social Media, Communication, Entertainment, and Games. The responses are listed from most commonly used to least commonly used. The rubric in Table 8 reflects the types of mobile applications that respondents reported using in class. Some responses fit into multiple categories.

Table 8

Students: Name a Few Mobile Apps That You Use Inside of Class

Types of Applications	Written Responses
Consumption	Google Search, Safari, Dictionary, Adobe to pull up an article, Google for definitions, Google Chrome, CNN, Internet, webpages, iBooks, & Kindle
Campus/LMS	BlackBoard Mobile & Sakai
Productivity	Polaris Office 5, Notes, Notepad, Microsoft Word, Office, & Calendar
Social Media	Instagram, Facebook, Tumblr, SnapChat, & Pinterest
Communication	Texts, email, & Yahoo email
Cloud Storage	Evernote & Dropbox
Special Purpose Apps	StudyBlue, Quizlet, & Genus Scan
Entertainment	Family Guy, Univision, & YouVersion
Games	Games & Bejeweled

Tell me about a time when you used a mobile device in class. Students were asked to tell about a time when they used a mobile device in class. Thirty-two students responded to this question; of those 32, one said *I try to never pull my phone out during class hours. It distracts me, and the professor may think I am off-task. I only use my phone when I forget my laptop or textbook and need to pull up a homework assignment or article*. The responses fit into seven different categories: Reference/Search, Productivity, Campus/LMS, Communication, Distraction, Social Networks, and Calculate. The responses are listed from most commonly used to least commonly used. The rubric in Table 9 reflects the types of mobile device application and examples of uses reported by students. Some responses fit into multiple categories.

Table 9

Students: Tell Me About a Time When You Used a Mobile Device in Class

Types of Applications	Written Responses
Reference/Search	Look up information, quick internet search, view PowerPoint slides, pull up readings, look at class notes, look up stock prices, research, learn more about a subject, look up a PDF, look up molecular weight, pull up a homework assignment or article, if the reading is available in PDF form.
Productivity	Polaris Office App, note taking, notepad app, recording lecture, calendar, to-do list,
Campus/LMS	BlackBoard& university website
Communication	Contact a tardy group member, email, & lookup an email
Distraction	Used my smartphone to remove some boredom during lectures, used it to text or look at Instagram, not necessarily because class was boring, just couldn't resist
Social Networks	Instagram
Calculate	Calculator

Tell me about a time when you used a mobile device out of class. Students were asked to tell about a time when they used a mobile device outside of class. Thirty-two participants responded to this question. The responses fit into 11 different categories: Reference/Search, Communication, Social Networks, Campus/LMS, Productivity, Entertainment, Navigation, Other, Games, Cloud, and Shop. The responses are listed from most commonly used to least commonly used. The rubric in Table 10 reflects those uses of respondents who reported engaging with those applications outside of class. Some responses fit into multiple categories.

Table 10

Students: Tell Me About a Time When You Used a Mobile Device Out of Class

Types of Applications	Written Responses
Reference/Search	Look up sheet music, search for things on the Internet (academic and non-academic related), search addresses, global politics, check syllabus rubric for paper, research information, go on the Internet, check the weather, see what homework was assigned, reading assignments, & access my online textbook through McGraw Hill
Communication	Almost constantly texting, calling, check texts, make calls, check emails, FaceTime, Gmail, communicate with other students outside of class, & communicate with others
Social Media	Facebook, Instagram, social purposes, Social Media, & Twitter
Campus/LMS	BlackBoard, look up grades, & check for announcements
Productivity	Note taking and reviewing, organize my calendar, & complete to-do items
Entertainment	Watch Netflix
Navigation	Find directions & using it for driving directions
Other	Regroup & Scanpro
Games	Play games
Cloud	Print from a cloud
Shop	Shop

Tell me about a time when an instructor has explicitly asked you to use a mobile device.

Students were asked to tell about a time when their instructors explicitly asked them to use a mobile device. Thirty-one participants responded to this question; four of those 31 said *none*. The responses fit into eight different categories: Reference/Search, Quiz/Poll, Campus/LMS, Communication, Productivity, Photography, Calculate, and Educational Streams. The responses are listed from most commonly asked to use to least commonly asked to use. The rubric in Table 11 reflects those uses and the numbers of respondents who reported using those applications outside of class. Some responses fit into multiple categories.

Table 11

Students: Tell Me About a Time When an Instructor Has Explicitly Asked You to Use a Mobile Device

Types of Applications	Written Responses
Reference/Search	Look up information, or read an assignment off my phone such as a prompt or essay, look up topics for debate in public speaking, look up articles in class, spelling, fact check, clarify understanding, look up stock, look up recent news articles, research, & open a PowerPoint
Quiz/Poll	Take a test, answer quiz polls, & text survey that viewed results real time
Campus/LMS	Grades posted in BlackBoard, Turn in assignments on BlackBoard, & complete online course evaluation
Communication	I was told to call a tardy classmate, put their information in our phones, & read essay from an email
Productivity	Write in class essay & take notes
Photography	Take a picture of an assignment that they've written on down on the board so we didn't have to hand write it and it would go faster & Scan picture to submit
Calculate	Calculator
Educational Streams	YouTube Scavenger hunt while in class

You may not want to use mobile devices for academics. Which may be reasons why?

There may be reasons why students may not want to use mobile devices in class. The participants were asked to check all reasons that applied for why they may not desire to use mobile devices in class. Table 12 reflects those responses in order from most common to least common reason. Participants were given an open text answer for *other*. Sixteen students wrote reasons that they felt were not covered in the given options. Those 16 responses have been coded and listed from most common to least common response into five different categories: Distractions, Laptop Preference, Hand Write Notes, Multitasking, and Not Allowed. Thirty students responded to this question.

Table 12

Students: You May Not Want to Use Mobile Devices for Academics. Which May Be Reasons Why?

Types of Applications	Written Responses
Distractions	It's easy to get distracted, so many apps, it gets distracting, I get distracted easily, mobile devices 100% distract me from school work, will use them for other purposes and distracts other students who handwrite notes, laptop is not as distracting s a phone, & gets easily distracted with other things on the laptop or tablet
Laptop Preference	Easier to use a computer, less ease of use for multiple tasks at a time (vs. a laptop), & laptop not as distracting as phone
Hand Write Notes	I take better-handwritten notes & Many of my classes are science based and require more exquisite note taking than could be done possible on a mobile device.
Multitasking	Less ease of use for multiple tasks at a time (vs. a laptop)
Not Allowed	Not allowed in class

What are some ways this campus could use mobile devices and apps in the future?

Students were asked some ways their campuses could use a mobile device in the future. Twenty-eight students responded to this question; of those 28, one said *I don't know*. The responses fit into 10 different categories: Campus Specific App, Events, Communication, Better LMS, Allow Use, Other, Tests, Productivity, Posting Information, and Cloud. The responses are listed in Table 13 from most commonly suggested to least commonly suggested. The rubric in Table 13 reflects the students' suggestions of better use of mobile devices and applications on campus. Some responses fit into multiple categories.

Table 13

Students: What Are Some Ways this Campus Could Use Mobile Devices and Apps in the Future?

Types of Applications	Written Responses
Campus Specific App	Create campus specific apps, make it easier to navigate the website and personal items (such as the email inbox for the student), Campus Admin App, allows easy access on the go, Campus Admin App account needs to be available in app format, for each class or each major could have their own app to talk with students on, maps, teachers' number/availability/course, it could be easier than searching for those things on the school website, all things student related, cafeteria menus etc., app just for the school, directory of school numbers, apps that can be used to record assignment due dates, and app for class schedule
Events	Campus updates lime sporting events or music events, show all on-campus events in a calendar setting, apps for orientation events, app for class schedule, advertisements instead of flyers, and integrated student involvement with mobile devices as mas integrated or made readily available through discounts
Communication	Emails, make it easier to see what the homework is and when due dates are, send alert notifications to all app users during emergency, etc., talk with students on, forum, & Students could communicate with one another
Better LMS	Create a campus specific BlackBoard, improved BlackBoard so it's easier to work off of a mobile device, & free BlackBoard app
Tests	In class polls, test on an electronic device instead of a scantron, & test taking
Allow Use	Allow the use of small devices like Tablets and readers to access articles to save paper, allow mobile devices in class for academic purposes only, & allow for dictionary and searching purposes
Other	BlackBoard app is very useful, BlackBoard is very helpful and should be encouraged, & allowing students access to iPads would be helpful
Productivity	Take clear notes
Posting Information	Post online lectures or assignments online
Cloud	Using DropBox would be very beneficial

Instructors' questions and responses. In these sections the questions that were asked of the instructors will be listed along with the corresponding coded answers.

In what department do you teach? Instructors were asked to report the departments in which they worked. Three main departments emerged: Professional Studies, Humanities and Social Sciences and Hard Sciences. Professional studies accounted for 11 of the 19 respondents and included departments such as the school of education, teacher credential program, public policy, law, nursing, professional studies, and the Master's of Coaching programs. The

Humanities and Social Sciences group, which accounted for six of the 19 respondents, included social science, theology, fine arts, history, and languages. The last group, Hard Sciences, included two of the 19 respondents, who came from natural science and math departments.

Do you ever ask your students to use mobile apps to complete assignments? Yes: Tell me about a time when you did. Instructors were asked if they ever asked students to use mobile applications to complete assignments. Fourteen of the 19 respondents said *no* and six of the 19 responded with *yes*. For those who answered *yes*, responses were coded into four categories of applications: Collaboration through Productivity, Special Purpose Applications, Campus Specific or the Campus LMS, Flipping, and Finding or searching for information. These codes used to group the responses are listed from most commonly used to least commonly used. The rubric in Table 14 reflects the reported ways instructors asked students to use mobile devices to complete assignments. Those examples are assigned to codes on the left-hand column. Some responses fit into multiple categories.

Table 14

Instructors: Do You Ever Ask Your Students to Use Mobile Apps to Complete Assignments?

Types of Applications	Written Responses
Collaboration	• Share Google Drive Writing & Survey, Virtual Notebook Logs, Journal, Discussion Board • We complete a Google doc chart in class that was previously done on a Word document and discussed in BlackBoard's Discussion forum
Special Purpose Application	• I told them to download epocrates med app and the lab values app to help with nursing homework and clinical rotations • VoiceThread to record spoken Italian
Campus App/LMS	• Share Google Drive Writing & Survey, Virtual Notebook Logs, Journal, Discussion Board • We complete a Google doc chart in class that was previously done on a Word document and discussed in BlackBoard's Discussion forum
Flipping	• To flip their classroom using their cell phone
Consumption/Reference/Search	• Finding information on US Budget

Name a few mobile apps, if any, that you use in your classes. Instructors were asked to name a few mobile applications, if any, that they used in their classes. Eighteen instructors responded to this question; of those 18, five said *none*. The responses fit into five different categories: Multimedia/Entertainment, Campus/LMS, Collaboration, Consumption/Searching, Special Purpose Applications, Social Media/Video Conferencing, Cloud Storage, and Polling (listed from most commonly used to least commonly used). The rubric in Table 15 reflects the applications that instructors used in their classes. Those examples are assigned to a code in the left-hand column. Some responses fit into multiple categories.

Table 15

Instructors: Name a Few Mobile Apps, if Any, That You Use in Your Classes

Types of Applications	Written Responses
Multimedia/Entertainment	Netflix, Spotify, iTunes, YouTube, TED talks, Vimeo, & How Stuff Works
Campus/LMS	BlackBoard & LMS mobile app
Collaboration	Google Drive/Apps & VoiceThread
Consumption/Searching	Good Reader Mail, Search Engines, Explorer, & Safari
Special Purpose Applications	CourseSmart (eTextbook), ilRagazzini (Italian dictionary), eStandards (Common Core State Standards App)
Social Media/Video Conferencing	Edublog, Facebook & Adobe Connect mobile app
Cloud Storage	Dropbox & Google Drive
Polling	Text the Mob

Name a few mobile apps, if any, that you ask your students to use in your classes.

Instructors were asked to name a few mobile applications, if any, that they asked students to use in their classes. Seventeen instructors responded to this question; of those 17, five said *none*. The responses fit into eight different categories: Consumption/Searching, Multimedia/Entertainment, Social Media/Video Conferencing/Communicating, Campus/LMS, Special Purpose Applications, Collaboration, Cloud Storage, and Polling (listed from most commonly used to least commonly used). The rubric in Table 16 reflects the applications that instructors asked students to use in their classes. Those examples are assigned to a code in the left-hand column. Some responses fit into multiple categories.

Table 16

Instructors: Name a Few Mobile Apps, if Any, That You Ask Your Students To Use in Your Classes

Types of Applications	Written Responses
Consumption/Searching	Search Engines, PDF Readers, Google, CourseSmart, Explorer, Internet for research articles, & How Stuff Works
Educational	Netflix, Google Sites, YouTube, How Stuff Works, Spotify, & iTunes
Streams/Entertainment	
Social Media/Video Conferencing/Communicating	Emails, text to communicate, & Google Hangout
Campus/LMS	BlackBoard
Special Purpose Applications	Reflect.me, Epocrates, lab values, e Standards (Common Core State Standards App)
Collaboration	Google Docs & VoiceThread
Cloud	Dropbox
Quiz/Poll	Poll Everywhere

Tell me about a time when, if at all, you used a mobile device in your class. Instructors were asked to tell about a time when, if at all, that they used a mobile device in their classes. Fourteen instructors responded to this question; of those 14, one said, *have not*. The responses fit into five different categories: Reference/Search, Special Purpose Applications, Campus/LMS, Communicate/Collaboration, and Presentation. The responses are listed from most commonly used to least commonly used. The rubric in Table 17 reflects the instructor reported ways they used a mobile device in their classes. Those examples are assigned to a code in the left-hand column. Some responses fit into multiple categories.

Table 17

Instructors: Tell Me About a Time When, if At All, You Used a Mobile Device in Your Class

Types of Applications	Written Responses
Reference/Search	Review notes, teach from instead of paper, check facts during lecture, look up nursing information on Google, special legal programs like TWEN and Dissomaster for demonstrations, & to search information
Special Purpose Applications	Turningpoint to quiz and poll students, post notes on TWEN, meds on Epocrates, Dictionary App, Google Maps, Timer, & Air Server
Campus/LMS	BlackBoard & online classes
Communicate/Collaboration	Turningpoint to quiz and poll students, post notes on TWEN, Google Docs, calling and/or checking email, & text
Presentation	PowerPoint, show videos, post notes on TWEN, & Taught using the iPad

Tell me about a time when, if at all, you used asked your students to use a mobile device in your class. Instructors were asked to tell when, if at all, that they asked students to use a mobile device in their classes. Sixteen instructors responded to this question; of those 16, two said *none* or *have not*. The responses fit into five different categories: Research, Collaboration/Communication, Polling, Special Purpose Applications, and Campus/LMS. The responses are listed from most commonly used to least commonly used. The rubric in Table 18 reflects the instructor reported ways they asked students to use mobile devices in their classes. Those examples are assigned to a code in the left-hand column. Some responses fit into multiple categories.

Table 18

Instructors: Tell Me About a Time When, if At All, You Asked Your Students to Use a Mobile Device in Your Class

Types of Applications	Written Responses
Research	Cultural research, look up something on the internet or on legal research tool, Google, check facts, access materials, look up nursing information on Google, & Internet for research
Collaboration/Communication	Virtual notebook with research articles & commentary for all to have access, discuss and collaborate by compiling information on a Google Doc, calling or texting, accessing campus email, VoiceThread, & Prezi
Polling	Poll everywhere, texting to answer a poll question, & TurningPoint
Special Purpose Applications	Dictionary apps & VoiceThread/Prezi/and similar
Campus/LMS	BlackBoard

You may not want to have your students use mobile devices in your classes. Which may be reasons why? (check all that apply). There may be reasons why instructors may not want to use mobile devices in their classrooms. The participants were asked to check all reasons that applied why they may not desire to use mobile devices in their classrooms. The following table reflect those responses in order from most common to least common. Participants were given an open text answer for *other*. Five instructors wrote reasons that they felt were not covered in the given options. Those five responses have been coded into two different categories of inappropriate pedagogical strategy and cost (see Table 19). Two of the write in responses were *students on Facebook or texting during class activities*, which would fit under Student Distractions. The other write in response was, *I encourage use of mobile devices*, which did not answer the question as to why the participant would not want to include mobile devices. Fifteen instructors responded to this question.

Table 19

Instructors: You May Not Want to Have Your Students Use Mobile Devices in Your Classes. Which May Be Reasons Why? (Check All That Apply)

Types of Applications	Written Responses
Inappropriate pedagogical strategy	Lack of appropriate apps. Generally there are better modes of instruction & Not sure it is really applicable in lesson design?
Cost	Cost of tablet as smartphone may not be practical

What are some ways this campus could use mobile devices and apps in the future?

Instructors were asked some ways their campuses could use a mobile device in the future. Fifteen instructors responded to this question; of those 15, two said, *I don't know*. The responses fit into five different categories: Communication, Subject Specific Applications, Polling, Collaboration, and Video Conferencing. The responses are listed from most common suggestions to least common suggestions (see Table 20). Some responses fit into multiple categories.

Table 20
Instructors: What Are Some Ways this Campus Could Use Mobile Devices and Apps in the Future?

Types of Applications	Written Responses
Communication	Open communication between student and instructor domains, address emergent problems, communicate in a timely manner, instant connection & feedback, calendar events easily, & info sharing
Subject Specific Applications	Have apps that are subject matter specific and train faculty on to use them, use them to do their assignments, specific educational apps for School of Education students to use to improve teaching techniques, educationally enriching games, GPS-enabled research, & research
Polling	Live polls & polls
Collaboration	Collaboration on projects & Most of our faculty and students use "Dropbox" to access music and recordings, since they are too big to send in emails
Video Conferencing	Video conferencing & Adobe Connect or Skype or Virtual Meetings

Survey connected to the research questions. This section takes the four research questions and aligns them with the questions asked in the surveys. Student survey questions are presented first in Table 21 and instructor survey questions are presented in Table 22. The survey questions are listed in the first column and the number of the corresponding research question is listed in the second column. Numbers in Tables 21 and 22 reference the following four research questions.

1. In what ways, if any, do undergraduate students use mobile devices in class for academic purposes?
2. In what ways, if any, do undergraduate students use mobile devices out of class for academic purposes?
3. In what ways, if any, do higher education instructors use mobile devices in class for academic purposes?
4. In what ways, if any, do higher education instructors use mobile devices out of class for academic purposes?

Table 21

Representation of the Student Survey Questions Connected to the Answered Research Questions

Student Survey Questions	Research Questions Answered
7. What do you read on your device/s? (check all that apply)	1 & 2
8. Which categories of apps do you use most frequently for personal use? (check as many as apply)	1 & 2
9. Do you ever use mobile apps to complete assignments?	1 & 2
Yes: Tell me about a time when you did.	1 & 2
10. If yes, how often?	1 & 2
11. Name a few mobile apps that you use outside of class.	2
12. Name a few mobile apps that you use inside of class.	1
13. What are some reasons you are using mobile devices? (check as many as apply)	1 & 2
14. For the next question, please indicate how often you use the following devices for academic purposes in class.	1

Student Survey Questions	Research Questions Answered
	(continued)
15. For the next questions, please indicate how often you use the following devices for academic purposes out of class.	2
16. Tell me about a time when you used a mobile device in class.	1
17. Tell me about a time when you used a mobile device out of class.	2
18. Tell me about a time when an instructor has explicitly asked you to use a mobile device.	1 & 2
19. Which, if any, of the following would you like to be able to use in class? (check all that apply)	1
20. You may not want to use mobile devices for academics. Which may be reasons why?	1 & 2
21. What are some ways this campus could use mobile devices and apps in the future?	1 & 2

Table 22

Representation of the Instructor Survey Questions Connected to the Answered Research Questions

Instructor Survey Questions	Research Questions Answered
7. What do you read on your device/s? (check all that apply)	3 & 4
8. Which categories of apps do you use most frequently for personal use? (check as many as apply)	3 & 4
9. Do you ever ask your students to use mobile apps to complete assignments?	3 & 4
Yes: Tell me about a time when you did	3 & 4
10. Name a few mobile apps, if any, that you use in your classes.	3
11. Name a few mobile apps, if any, that you ask your students to use in your classes.	3
12. What are some reasons, if any, you are using mobile devices? (check as many as apply)	3 & 4
13. For the next question, please indicate how often, if at all, you use the following devices in your class.	3 & 4
14. For the next questions, please indicate how often, if at all, you ask your students to use the following devices in your class.	3
15. Tell me about a time when, if at all, you used a mobile device in your class.	3
16. Tell me about a time when, if at all, you used asked your students to use a mobile device in your class.	3
17. You may not want to have your students use mobile devices in your classes. Which may be reasons why? (check all that apply)	3
18. What are some ways this campus could use mobile devices and apps in the future?	3 & 4

Table 23 takes the four research questions and aligns them with the coded answers from the survey questions listed in Tables 21 and 22.

Table 23

Linking Research Questions and Codes

Research Question	Codes
In what ways, if any, do undergraduate students use mobile devices in class for academic purposes?	• Campus App/LMS • Finding Information • Special Purpose Apps • Communication • Productivity • Photography • Reading • Collaboration • Quiz/Poll • Consumption/Reference/Search • Social Media • Cloud Storage • Entertainment • Games • Distraction • Calculate • Educational Streams
In what ways, if any, do undergraduate students use mobile devices out of class for academic purposes?	• Social Media • Consumption/Reference/Search • Music • Special Purpose Apps • Entertainment • Productivity • Navigation • Campus App/LMS • Communication • Games • Shopping • Cloud Computing/Storage
In what ways, if any, do instructors use mobile devices in class for academic purposes?	• Collaboration • Special Purpose Apps • Campus App/LMS • Flipping • Consumption/Reference/Search • Educational Streams/Entertainment • Social Media/Video Conferencing/Communicating • Cloud • Quiz/Poll • Presentation

Research Question	Codes
	(continued)
In what ways, if any, do undergraduate instructors use mobile devices out of class for academic purposes?	• Communication • Navigation • Reference • Social Networking • Books • Educational streams • Games • Music • Cloud Based Apps • Campus App/LMS • News • Productivity • Photography

Issues of Trustworthiness

This survey asked questions regarding personal use of mobile devices inside and outside of class. It contained questions regarding participant perceptions and the extent of their academic learning or teaching using their devices. The surveys were adapted from the student survey that was validated by researchers at UCF; additionally, they were pilot tested for their validity and reliability (Chen & deNoyelles, 2013). An expert review panel assessed the quality of questions for clarity and succinctness. The panel ensured that the questions accurately measured what the researcher intended to measure. The participants were asked how they used their devices for academic purposes in and outside of the classroom, both intentionally and unintentionally (Ally, 2004, 2009). Internal validity was calculated and reflected the assertion that significant mobile device usage can reflect increased usage for academic purposes.

The quantitative surveys were hosted online using Qualtrics. Upon completion of the data collection, the data were transferred to the researcher's computer hard drive and were only available to the researcher for the sole purpose of this study. The sole researcher had exclusive access to the data, which were also stored in password-protected files. All contents of the files

have remained confidential and will be erased permanently 3 years after the data collection period.

The surveys were pilot tested, debriefed, and validated by a team of the sole researcher and six experts in the educational technology field. The experts had all completed doctoral coursework in learning technologies; worked in the educational field as professors, educators, or instructional designers; and or were technology directors. The surveys used Bryman's (2008) suggestions to ensure survey validity. The expert team considered measurement, internal, external, and ecological validity. Measurement validity determined that the questions on mobile device usage in and outside of the classroom reflected actual mobile device usage. Internal validity reflected that overall significant mobile device usage could contribute to usage for academic purposes. External validity determined that the results of the study could be generalized beyond the two research sites that were used. Finally, ecological validity determined that the findings of mobile device usage could be applied to people's everyday, natural social settings.

Limitations and Delimitations

There were no immediate benefits to the research subjects who took part in this study. However, the results of this study have been made available to both university communities. This data can help instructors better utilize technology tools and applications in their courses to enable a more deliberate instructional approach. Instructors can gain insight on how their students are already using these tools and provide the instructors with better ways to communicate the course material to their students in and outside of the classroom's four walls.

It was assumed that the research subjects who participated in this study did so honestly and accurately. The quantitative surveys were hosted online in a structured manner. The research

gathered from the two universities is best applied to other universities with similar size and demographic make up.

The delimitations of this study were as follows:

1. Only undergraduate students and instructors participated in the study. Several studies on uses of mobile devices have been conducted within the K-12 setting, and the undergraduate student and instructor population was lacking in research. Additionally, current undergraduate students were classified as digital natives, according to Prensky (2010) and the purpose of this research was to describe the uses of mobile devices for academic purposes by digital natives and instructors in and outside of class.
2. The research sites were due to the researcher's access, experience, and observations of the aforementioned students and instructors utilizing their devices for academic purposes.
3. Mobile devices were investigated over general computer technologies (laptops or desktops) due to the growing popularity and ease of access with university populations and in educational settings.

These delimitations have made the study stronger and built on the existing research.

The following limitations affected this study: (a) the participants selected for data collection were from two universities in Southern California, (b) the participants who participated in the study were pulled from random samples and then self-selected, and (c) the perceptions and tools used are tied to the time of the research. With respect to time and limited resources for this study, only two research sites were utilized. However, additional universities may be studied in future research. For ethical purposes, a random sample and then self-selection was deemed the most appropriate method of participant selection. As technologies change

rapidly, it cannot be predicted what new applications will emerge, contributing to the perceptions tied to the time of the research.

Chapter Four: Findings

Following the release of the iPod touch in 2007, learning on the go has grown in popularity (Apple, n.d.). As of May 2013, 56% of all American adults owned a smartphone. As of September 2013, 24% of all Americans 16 and older owned an eReader, and 35% owned a tablet computer. Of the 56% of American adults who owned a smartphone, 80% were between the ages of 18-29 (Rainie & Smith, 2013). This age group encompasses the typical makeup of the traditional undergraduate student population and all respondents in the current study (i.e., 18-27). People who love to use their smartphones for talking, text, and social networking also enjoy using them for academic purposes (Ally, 2004, 2009). However, many educators struggle to use mobile devices deliberately for academic purposes. Additionally, 34% of cell phone Internet users report mainly using their phones to access the Internet, rather than using a desktop or laptop computer (Rainie & Smith, 2013). The aforementioned statistics indicate that there is much to learn about how students and instructors use mobile devices academically. By understanding students' mobile device usage, educators can begin to use mobile devices purposefully and strategically in their courses to enhance the learning experience. This study set out to uncover the ways in which students and instructors use mobile devices for learning in and outside of formal class. It also asked questions about personal use to try to understand the depth of mobile device usage within those two groups to suggest future academic connections.

This study relied on two surveys—one administered to faculty and one administered to students—at two different small private liberal arts universities. Both surveys shared a core set of items about mobile device use and each had an additional set of items specific to the audience (student/faculty). Eight identical questions were asked of both groups. The rest of the survey questions asked similar questions on mobile device usage of students and instructors. The student

survey focused on personal mobile device usage in and outside of the classroom, and the instructors' survey focused on ways they used or asked students to use mobile devices in and outside of the classroom. The student survey asked 22 questions and the instructor survey asked 19 questions. This chapter reports the findings of the four research questions of the study:

1. In what ways, if any, do undergraduate students use mobile devices in class for academic purposes?
2. In what ways, if any, do undergraduate students use mobile devices out of class for academic purposes?
3. In what ways, if any, do instructors use mobile devices in class for academic purposes?
4. In what ways, if any, do instructors use mobile devices out of class for academic purposes?

Part 1: Descriptive Analysis Results

This first section of this chapter will review descriptive analysis results from the survey questions. The second section of the chapter will use those analyses to answer the research study questions.

This section will first report the survey questions and the responses of the student participants and follow up with correlated instructor questions and responses. Connections between the two groups will be made and analyzed following the stated results. As indicated in Chapter 3, six core questions appeared on both surveys. They are presented subsequently and the results will be discussed first, with the exception of the last two questions, as it made the most sense to discuss these at the end.

1. Do you own or have regular access to a mobile, web-enabled, device (smartphone, tablet, or dedicated e-reader)? Yes, What is it? (list all mobile devices you use regularly)
2. What are the features of your device/s? (check all that apply)
3. What do you read on your device/s?(check all that apply)
4. Which categories of apps do you use most frequently for personal use? (check as many as apply)
5. What are some ways this campus could use mobile devices and apps in the future?
6. On what device did you use to access this survey?

General questions. In this section, the general questions regarding the participants' devices and features of those devices are presented. These questions were asked of both the students and the instructors.

Students & instructors: Do you own or have regular access to a mobile, web-enabled, device (smartphone, tablet, or dedicated e-reader)? Yes, What is it? (list all mobile devices you use regularly). Student and instructor participants both received this exact question and were asked to fill in the type of devices in which they had frequency access to. Those responses to the open-ended question were coded according to the procedures listed in Chapter Three. Student participant responses will be reported first, followed by the instructors' responses.

Student participants were asked to only consider mobile devices for this survey; laptops were not considered mobile devices. All student participants reported having access to and frequently using a mobile device. Table 22 reflects the devices to which the students and faculty reported they had regular access. Fourteen of the 38 participants reported using multiple devices, 12 of 38 used tablets, two of 38 reported using an eReader, two of 38 reported using an iPod

Touch, and five of 38 reported using a laptop (even though the survey explicitly stated that laptops would not be considered mobile devices for this study; the five that responded either did not read or understand that distinction). The responses were categorized into four groups based on the devices that were reported: smartphones, tablets, eReaders, and iPod Touches. Smartphones users included all participants but two; 36 of the 38 of participants reported using, iOS, Android, and HTC devices. In terms of tablets, which 14 of the 38 respondents reported using, all but one described them as iPads; the other just wrote *tablet*. Tablets could include both mini and regular iPads, Androids, Windows, and Kindle Fires. EReaders, which two of the 38 respondents reported using, were both reported as Kindles; however, eReaders could also include Nooks or other reading designated devices. Two participants reported having regular access to iPod Touches.

Instructor participants were asked to fill in the type of devices to which they had frequent access. Participants were asked to only consider mobile devices for this survey and were advised that laptops would not be considered mobile devices. However, one participant did respond with *laptop*; either he/she did not read that section of the directions or did not understand that portion of the directions. All instructor participants reported having access to and frequently using a mobile device as well as a smartphone. Those responses were categorized into four groups: smartphones, tablets, eReaders, and iPod Touches. Smartphones, to which all participants reported having access, included iOS, Android, and HTC devices. Tablets, to which 15 of the respondents reported having access, included iPads, both mini and regular, Androids, Windows, and Kindle Fires. EReaders, to which four of the 19 respondents reported having access, were all Kindles, but could also include Nooks or other reading designated devices as well. One participant reported having regular access to an iPod Touch. Fourteen of 19 reported using

multiple devices. Table 24 denotes the most popular devices reported by students and instructors, listed in order from the most popular device to the least popular device (with the exception of laptops since they were not categorized as mobile devices for this study).

Table 24

Do You Own or Have Regular Access to a Mobile, Web-Enabled, Device (Smartphone, Tablet, or Dedicated E-Reader)? Yes, What is It? (List All Mobile Devices You Use Regularly)

Device	Students	Instructors
Smartphones	36 (94%)	19 (100%)
Multiple Devices	14 (37%)	14 (73%)
Tablets	12 (31%)	15 (79%)
eReaders	2 (5%)	4 (21%)
iPod Touch	2 (5%)	1 (5%)
(Laptops) Although not characterized as a mobile device for this study	5 (13%)	1 (5%)

Note. Students, $N = 38$; Instructors, $N = 19$.

The popularity of devices was similar in both groups, beginning with smartphones, tablet, eReaders, and iPod Touches. Multiple devices are quite popular as well, although a greater percentage of instructors reported using multiple devices than students. This finding could be attributed to additional institutional issued devices or more disposable income among instructors.

Students & instructors: What are the features of your device/s? (check all that apply). The student and instructor participants were both asked this question and asked to check all that applied for the features of their devices that they use or to which they have access most frequently. Student participant responses will be reported first, followed by the instructors' responses. Table 25 reflects those responses from students in order from most common to least common features of the aforementioned devices. Table 26 reflects the instructor participants' responses in order from most common to least common features of the aforementioned devices.

Table 25

Students: What Are the Features of Your Device/s? (Check All That Apply)

Feature	*n*
Web searching, Camera, Email, and Streaming Videos	38 (100%)
Applications, Texting, and Streaming Music	36 (95%)
PDF viewer	35 (92%)
Digital Books	28 (74%)

Note. $N = 38$.

Table 26

Instructors: What Are the Features of Your Device/s? (Check All That Apply)

Feature	*n*
Web searching, camera, PDF viewer, email, and texting	19 (100%)
Streaming Videos	18 (95%)
Digital Books, Applications, Streaming Music	18 (95%)

Note. $N = 19$.

All participants reported having devices that were web searching enabled, had a camera, and offered email access. All instructor participants reported having all these capabilities but one respondent. In contrast, the students' device capabilities were a bit more spread out. This could reflect the higher percentage of instructors who had multiple devices and therefore had different devices with alternate features. This finding could also imply that the users may not be aware of certain features on their devices. For instance, more students responded that they have applications available on their devices than those who responded that they use PDF viewers or digital books; however, there are applications to view PDFs and read digital books on most mobile devices. Therefore, those responses should have been the same. This discrepancy points up an opportunity for instructors to provide direction or suggestions in this area of technology integration.

Students & instructors: What do you read on your device/s? (check all that apply). The student and instructor participants were both asked this question and to check all that applied in terms of what they read on their devices. Student participant responses will be reported first, followed by the instructors' responses.

Table 27 reflects the student responses in order from most common content they read on their devices to the least common. The *Other* category had a fill in option; respondents replied with answers such as *Sheet Music, Course Online Content, as a Clock,* and *Tweets.*

Table 27

Students: What Do You Read on Your Device/s? (Check All that Apply)

Material read	*n*
Webpages/content	36 (95%)
PDFs	34 (89%)
Newspapers, magazines, journals	23 (60%)
School books	17 (45%)
Textbooks	13 (34%)
Other	4 (11%)

Note. $N = 38$.

Table 28 reflects the instructors' responses of what they read on their devices in order from most common to least common. The *Other* category had a fill in option; respondents replied with answers such as *articles* and *my own documents*.

Table 28

Instructors: What Do You Read on Your Device/s? (Check All that Apply)

Material read	*n*
PDFs	19 (100%)
Webpages/content	18 (95%)
Other books	15 (79%)
Newspapers, magazines, journals	11 (58%)
Textbooks	8 (42%)
School books	6 (32%)
Other	3 (16%)

Note. $N = 19$.

The highest response rates in both groups were for both webpages and PDFs. Textbooks and School Books could have be confusing for respondents and they may have interchanged them. It is interesting to note that no students chose *Other Books*, whereas instructors chose that option more commonly over *school books* and *textbooks*. This could imply that students do not have time, or choose not to read for enjoyment while they are in school.

Students: What are some reasons you are using mobile devices? (check as many as apply). The student participants were asked to check all that apply for the reasons they were using mobile devices. Table 29 reflects those responses in order from most common the least common reasons for using mobile devices. Thirty-seven participants responded to this question. Four student participants checked *other* and wrote answers such as *check the time, GPS, to communicate when I'm away on debate or internship trips,* and *for distraction in class*!

Table 29

Students: What Are Some Reasons You Are Using Mobile Devices? (Check as Many as Apply)

Reason	*n*
Make it easier to access my work	31 (84%)
Increase my communication with other students	29 (78%)

Increase my communication with my instructor	23 (62%)
Increase my efficiency with tasks	20 (54%)
Collaborate with others	20 (54%)
Increase my knowledge in my field of study	17 (46%)
Make it easier to complete my course work	16 (43%)
Turn in assignments	11 (30%)
Improve my quality of work	10 (27%)
Quiz or Poll	9 (24%)
Increase my motivation toward completing my coursework	8 (22%)
Other	4 (11%)

Note. $N = 37$.

Instructors: What are some reasons, if any, you are using mobile devices? (check as many as apply). Table 30 reflects responses to this question in order from most common to least common reasons for using mobile devices. Seventeen participants responded to this question. One participant checked *other* and wrote, *Still learning!*

Table 30

Instructors: What Are Some Reasons You Are Using Mobile Devices? (Check as Many as Apply)

Reason	*n*
Increase my communication with students	12 (71%)
Make it easier to access my instructional materials	11 (65%)
Increase my efficiency with tasks	10 (59%)
Increase my motivation in students	9 (53%)
Increase my communication with colleagues	9 (53%)
Improve my quality of instruction	6 (35%)
Increase my knowledge in my field of expertise	5 (29%)
Increase collaboration for my students	4 (24%)
Quiz or Poll	4 (24%)
Podcasts/Vidcasts	3 (18%)
Give assignments	3 (18%)
Other	1 (6%)

Note. $N = 17$.

The most common responses between students and instructors for using mobile devices were to increase communication, easier access to school materials or information, and efficiency

with tasks. This finding indicates that both students and instructors have the same goals for using mobile devices and these could be shared with other students and instructors.

Students & instructors: What are some ways this campus could use mobile devices and apps in the future? The student and instructor participants were both asked this question. Student participant responses will be reported first, followed by the instructors' responses.

Twenty-eight students responded to this question, of those 28, one said *I don't know*. The responses that were coded and described in Chapter Three, Table 12, fit into 10 different categories: Campus Specific App, Events, Communication, Better LMS, Allow Use, Other, Tests, Productivity, Posting Information, and Cloud. The responses are listed in Table 31 using the codes in order from the most common ways devices could be used to the least common ways devices could be used on campus.

Table 31

Students: What Are Some Ways This Campus Could Use Mobile Devices and Apps in the Future?

Way to use Mobile Devices and Apps	*n*
Campus Specific App	10 (36%)
Events	8 (29%)
Communication	6 (21%)
Better LMS	4 (14%)
Tests	4 (14%)
Allow Use	3 (11%)
Other	3 (11%)
Productivity	2 (7%)
Posting Information	1 (4%)
Cloud	1 (4%)

Note. $N = 28$.

Fifteen instructors responded to this question; of those 15, two said *I don't know*. The responses were coded as described in Chapter Three and listed in Table 19. Those responses fit

into five different coded categories: Communication, Subject Specific Applications, Polling, Collaboration, and Video Conferencing. The coded responses are listed in Table 32 from the most common ways devices could be used to the least common ways devices could be used on campus.

Table 32

Instructors: What Are Some Ways This Campus Could Use Mobile Devices and Apps in the Future?

Way to use Mobile Devices and Apps	*n*
Communication	6 (40%)
Subject Specific Applications	5 (33%)
Polling	2 (13%)
Collaboration	2 (13%)
Video Conferencing	2 (13%)

Note. $N = 15$.

The common answer between the two groups was Communication. Both students and instructors expressed a desire for an easier way to communicate with each other. Many group SMS applications could be utilized for this purpose without students or instructors needing to give out their personal phone numbers. Additionally, students reported wanting to be able to use devices and not being allowed to do so. Perhaps those instructors who do not allow them could begin to integrate devices deliberately and guide students by using polls or collaboration tools. Those deliberate integration techniques may also minimize the potential distractions of using mobile devices for learning.

Students & instructors: What device did you use to access this survey? For final survey question student and instructor participants, were asked on what device they accessed the survey. Both groups' responses are listed in Table 33. The table reflects the student responses in order from most common the least common types of devices used to access the survey. Thirty-four

students responded to this question. The instructors' responses are matched up with the students' most common responses. The discrepancy between the two groups is italicized. Eighteen instructors responded to this question.

Table 33

Students & Instructors: What Device Did You Use to Access This Survey?

Device	Student Responses	Instructor Responses
Laptop Computer	19 (50%)	9 (50%)
Smartphone	*9 (24%)*	*2 (11%)*
Desktop Computer	*4 (11%)*	*6 (33%)*
Tablet	2 (5%)	1 (6%)
Total	34	18

Note. Students, $N = 34$; Instructors, $N = 18$.

The most common device used to access the survey was a Laptop, which possibly indicates that when individuals choose to complete a task that may take some time or requires some text responses, respondents still prefer a Laptop. Smartphones was the students' next highest response, which indicates their connectivity and easy access to their smaller mobile devices. Desktop computers were second highest for instructors, yet lower ranked for students. Low desktop numbers for students can be attributed the possibility that many students do not own desktops due to their lack of portability. Tablets were the least common devices used to access the survey. This could be attributed to the lower numbers of individuals possessing tablet devices.

Student and instructor uses in class. This section presents the questions asked of students and instructors regarding the way in which the participants used mobile devices in class.

Students: Do you ever use mobile apps to complete assignments? If yes, how often? Students were asked if they ever use mobile applications to complete assignments. Twenty of the

38 respondents said *no* and 18 of the 38 responded with *yes*. For those who answered *yes*, responses were coded into nine categories of applications that were listed and detailed in Chapter Three, Table 6. Finding or Searching for Information, Collaboration, Special Purpose Applications, Campus Applications/LMS, Photography, Productivity, Reading, Communication, and Quizzes were the codes used to group the responses. The number of students who responded engaging in those uses is reflected in Table 34, from most commonly used to least commonly used. Those who responded *yes* were asked a follow up question of the frequency with which they did use mobile applications to complete assignments. The frequency chart is listed in Table 35. The frequencies are listed from highest to lowest.

Table 34

Students: Do You Ever Use Mobile Apps to Complete Assignments? If Yes, How Often?

Feature	*n*
Campus App/LMS	6 (33%)
Finding information	3 (17%)
Special Purpose Applications	3 (17%)
Communication	3 (17%)
Productivity	2 (11%)
Photography	1 (6%)
Reading	1 (6%)
Collaboration	1 (6%)
Quizzes	1 (6%)

Note. $N = 18$.

Table 35

Students: Do You Ever Use Mobile Apps to Complete Assignments? If Yes, How Often?

Frequency	*n*
Several times a week	6 (35%)
About once each week	6 (35%)
Several times a day	3 (18%)
About once each day	1 (6%)

Less than once a week	1 (6%)
Total	17 (100%)

Note. $N = 17$.

Instructors: Do you ever ask your students to use mobile apps to complete assignments? Yes: Tell me about a time when you did. Fourteen of the 19 respondents said *no* and six of the 19 responded with *yes*. Those who answered *yes*, responses were coded into four categories of applications outlined in Chapter Three, Table 13. Collaboration, Special Purpose Applications, Campus App/LMS, Flipping, and Consumption/Reference/Search were the codes used to group the responses, which are listed from most commonly used to least commonly used in Table 36.

Table 36

Instructor: Do You Ever Ask Your Students To Use Mobile Apps to Complete Assignments?

Response	*n*
Collaboration	2 (33%)
Special Purpose Application	2 (33%)
Campus App/LMS	2 (33%)
Flipping	1 (17%)
Consumption/Reference/Search	1 (17%)

Note. $N = 6$.

It is interesting that there was a disparity between the student and the instructor responses. The common themes between the two groups are Collaboration, Special Purpose Apps, and Campus Applications/LMS. The other responses that students gave were more student-centered, like taking notes, which fit into productivity and reading. However, students reported taking quizzes on their devices, yet no instructors reported asking students to take quizzes online. Perhaps instructors see those quizzes as part of the LMS and not an outside application.

Students: Name a few mobile apps that you use inside of class. Thirty-six students responded to this question; of those 36, three said *none*. One student specifically said, *I almost never use my phone in class (too distracting), if I do I use Safari or Adobe to pull up an article during class discussion or Google (for definitions or thesaurus).* The responses fit into nine different categories—Consumption, Campus/LMS, Productivity, Cloud Storage, Special Purpose Apps, Social Media, Communication, Entertainment, and Games—which were coded in a rubric in Chapter Three, Table 7. Table 37 reflects the number of student participants who reported using the corresponding category of mobile app in class.

Table 37

Students: Name a Few Mobile Apps That You Use Inside of Class

App	*n*
Consumption	16 (44%)
Campus/LMS	10 (28%)
Productivity	9 (25%)
Social Media	6 (17%)
Communication	6 (17%)
Cloud Storage	5 (14%)
Special Purpose Apps	5 (14%)
Entertainment	2 (5%)
Games	2 (6%)

Note. $N = 36$.

Instructors: Name a few mobile apps, if any, that you ask your students to use in your classes. Seventeen instructors responded to this question; of those 17, five said *none* (or they do not ask students to use mobile apps). The responses fit into eight different categories: Consumption/Searching, Educational Streams/Entertainment, Social Media/Video Conferencing/Communicating, Campus/LMS, Special Purpose Applications, Collaboration, Cloud, and Quizzing/Polling. The rubric, described in Chapter Three, Table 15, describes the

coding procedures. Table 38 lists the responses in order of most commonly requested applications to least commonly requested applications.

Table 38

Instructors: Name a Few Mobile Apps, If Any, That You Ask Your Students to Use in Your Classes

App	*n*
Consumption/Searching	6 (35%)
Educational Streams/Entertainment	5 (11%)
Social Media/Video Conferencing/Communicating	3 (18%)
Campus/LMS	3 (18%)
Special Purpose Applications	3 (18%)
Collaboration	3 (18%)
Cloud	1 (6%)
Quiz/Poll	1 (6%)

Note. $N = 17$.

Common uses between students and instructors were Consumption/Searching, Social Media, and Campus/LMS uses, which indicates and supports the earlier claims that instructors ask students to use mobile devices to look up information or check for references. Social media may be used as a means to connect with other students or experts in the field. Finally, many students and instructors are utilizing their schools' LMSs. Some students are aware of Cloud storage applications, yet instructors are not asking their students to utilize them for easier access to course materials. Additionally, instructors reported asking students to use applications for collaboration, but students are not reporting using those. Collaboration applications such as Google Drive, which could double as Cloud storage, could help students communicate with each other, aid productivity, and well as increase engagement, addressing the concern of the student who mentioned the potential distraction of using mobile devices for learning. If these uses are encouraged and directed by instructors, students may have less chances to be distracted.

Students: For the next question, please indicate how often you use the following devices for academic purposes in class. The student participants were asked to indicate the

frequency with which they used their devices for academic purposes in class. Table 39 denotes the devices in order from most commonly used to least commonly used. There was an *other* option with a write in response; however, no one chose that option. Thirty-six participants responded to this question.

Table 39

Students: For the Next Question, Please Indicate How Often You Use the Following Devices for Academic Purposes in Class

Device	Laptop	Smartphone (e.g., iPhone, Android phone)	Tablet (e.g., iPad/iPad mini, iPod Touch, Kindle Fire, Android Tablet, Nook Color)	EBook Reader (e.g., Kindle, Nook, Sony Reader)
Almost Constantly	8 (22%)	5 (14%)	0 (0%)	0 (0%)
Several times a day	6 (17%)	3 (8%)	3 (8%)	0 (0%)
Daily	4 (11%)	6 (17%)	2 (6%)	0 (0%)
Several times a week	6 (17%)	11 (31%)	3 (8%)	2 (6%)
Several times a month	10 (28%)	5 (14%)	6 (17%)	3 (8%)
Never	2 (6%)	6 (17%)	7 (19%)	11 (31%)

Note. $N = 36$.

Instructors: For the next question, please indicate how often, if at all, you use the following devices in your class. The instructor participants were asked to indicate the frequency with which they used their devices in their classes. Table 40 presents the devices in order from most commonly used to least commonly used. Participants who answered other wrote in responses of *course meets weekly* and *I only see my students 2 times a month...alternate weeks are online*. Nineteen participants responded to this question. There was also an *other* option where participants were asked to write in what that device was; however, the only participant who selected this option did not write in that *other* device. Additionally, 12 participants selected

never for frequency of use, which indicates participants may have chosen that option even if they did not have that type of device.

Table 40

Instructors: For the Next Question, Please Indicate How Often, If At All, You Use the Following Devices in Your Class

Device	Laptop	Smartphone (e.g., iPhone, Android phone)	Tablet (e.g., iPad/iPad mini, iPod Touch, Kindle Fire, Android Tablet, Nook Color)	EBook Reader (e.g., Kindle, Nook, Sony Reader)
Almost Constantly	7 (37%)	0 (0%)	0 (0%)	0 (0%)
Several times a day	1 (5%)	1 (5%)	0 (0%)	0 (0%)
Daily	3 (16%)	1 (5%)	3 (16%)	0 (0%)
Several times a week	5 (26%)	1 (5%)	1 (5%)	1 (5%)
Several times a month	1 (5%)	5 (26%)	7 (37%)	1 (5%)
Never	2 (11%)	10 (53%)	8 (42%)	12 (63%)

Note. $N = 19$.

The most common device usage between both groups *almost constantly* was laptops, followed by smartphones by students, whereas instructors reported almost never using smartphones in class for academic purposes. This indicates that the most participants are still heavily tied to traditional uses of computers. Students' responses of using smartphones *several times a week* indicates the easy accessibility and comfort of using those devices.

Instructors: For the next questions, please indicate how often, if at all, you ask your students to use the following devices in your class. Table 41 presents the devices in order from most commonly used to least commonly used. Participants who answered *other* wrote in responses of *course meets weekly* and *not sure how to answer this based on the fact the students can choose to use whatever handheld they prefer*. Nineteen participants responded to this question. The responses of frequency were quite low in this section; the last option of *never* had very high numbers. It can be inferred that instructors may not specify the devices that they ask

their students to use; rather they leave the choice of device up to the students to decide. Since universities are typically BYOD, instructors may find it difficult to ask students to use their iPads to collaborate on a Google Doc, for example. Rather than being device centric, instructors may simply ask their students to collaborate using Google Drive, rather than requiring use a specific device to collaborate. The instructors may ask students to perform a task, and the students choose the tool to accomplish that task.

Table 41

Instructors: For the Next Question, Please Indicate How Often, if at All, You Use the Following Devices in Your Class

Device	Laptop	Smartphone (e.g., iPhone, Android phone)	Tablet (e.g., iPad/iPad mini, iPod Touch, Kindle Fire, Android Tablet, Nook Color)	EBook Reader (e.g., Kindle, Nook, Sony Reader)
Almost Constantly	2 (11%)	0 (0%)	0 (0%)	0 (0%)
Several times a day	0 (0%)	1 (5%)	0 (0%)	0 (0%)
Daily	0 (0%)	1 (5%)	2 (11%)	1 (5%)
Several times a week	5 (26%)	1 (5%)	3 (16%)	0 (0%)
Several times a month	5 (26%)	7 (37%)	4 (21%)	1 (5%)
Never	7 (37%)	8 (42%)	9 (47%)	14 (48%)

Note. $N = 19$.

Students: Tell me about a time when you used a mobile device in class. Thirty-two students responded to this question; of those 32, one said *I try to never pull my phone out during class hours. It distracts me, and the professor may think I am off-task. I only use my phone when I forget my laptop or textbook and need to pull up a homework assignment or article*. The responses fit into seven different categories: Reference/Search, Productivity, Campus/LMS, Communication, Distraction, Social Networks, and Calculate. The responses are listed in Table 42, from most commonly used to least commonly used. Table 8 reflects the coded ways students

reported using mobile devices in class in. Examples of those coded responses were discussed in Chapter 3.

Table 42

Students: Tell Me About a Time When You Used a Mobile Device in Class

Purpose	*n*
Reference/Search	14 (44%)
Productivity	9 (28%)
Campus/LMS	6 (19%)
Communication	4 (13%)
Distraction	2 (6%)
Social Networks	1 (3%)
Calculate	1 (3%)

Note. $N = 32$.

Instructors: Tell me about a time when, if at all, you used a mobile device in your class.

Fourteen instructors responded to this question; of those 14, one said *have not* (used a mobile device in class). The responses fit into five different categories: Reference/Search, Special Purpose Applications, Campus/LMS, Communicate/Collaboration, and Presentation. The responses were coded using the rubric denoted in Chapter Three, Table 17. The number of instructors who responded using those coded responses is reflected in Table 43. Answers are listed from most common type of use to least common type of use.

Table 43

Instructors: Tell Me About a Time When, if at All, You Used a Mobile Device in Class

Purpose	*n*
Reference/Search	6 (43%)
Special Purpose Applications	4 (29%)
Campus/LMS	4 (29%)
Communicate/Collaboration	3 (21%)
Presentation	2 (14%)

Note. $N = 14$.

The common responses between the two groups were Reference/Search, Campus/LMS, and Communication. There is some potential for students to be more exposed to the Special Purpose applications like TWEN and Epocrates that the instructors responded as using. These applications are content specific, yet meet the technological and pedagogical needs of the students. Students also have the potential to use collaboration tools in class. Students listed earlier in the survey that they are familiar with them, but indicated that they are not using them in class, which means that those mobile device uses need to be teacher initiated.

Instructors: Name a few mobile apps, if any, that you use in your classes. Eighteen instructors responded to this question; of those 18, five said *none*. The responses fit into five different categories: Multimedia/Entertainment, Campus/LMS, Collaboration, Consumption/Searching, Special Purpose Applications, Social Media/Video Conferencing, Cloud Storage, and Polling, as denoted in Chapter Three, Table 14. The number of respondents who reported asking students to use mobile applications in those ways are listed in Table 44, listed from most commonly used to least commonly used. Most of these uses imply uses as a tool to disseminate or present information. There are a few cases where advanced technological and pedagogical uses were invoked, like polling and video conferencing. Students never mentioned video conferencing, which implies they were unaware of these academic capabilities.

Table 44

Instructors: Name a Few Mobile Apps, if any, that You Use in Your Classes

App type	*n*
Multimedia/Entertainment	5 (28%)
Campus/LMS	4 (22%)
Collaboration	4 (22%)
Consumption/Searching	3 (17%)

Special Purpose Applications	2 (11%)
Social Media/Video Conferencing	2 (11%)
Cloud Storage	2 (11%)
Polling	1 (6%)

Note. $N = 18$.

Students: Tell me about a time when an instructor has explicitly asked you to use a mobile device. Thirty-one responded to this question; four of those 31 said *none,* which means that instructors have not asked the students to use a mobile device. The responses fit into eight different categories and were coded as outlined in Chapter Three in Table 10. The coded responses fit into the following categories: Reference/Search, Quiz/Poll, Campus/LMS, Communication, Productivity, Photography, Calculate, and Educational Streams. The responses are listed in Table 45 in the coded categories from most commonly asked to use to least commonly asked to use.

Table 45

Students: Tell Me about a Time When an Instructor Has Explicitly Asked You to Use a Mobile Device

Purpose	*n*
Reference/Search	14 (45%)
Quiz/Poll	7 (23%)
Campus/LMS	3 (10%)
Communication	3 (10%)
Productivity	2 (6%)
Photography	2 (6%)
Calculate	1 (3%)
Educational Streams	1 (3%)

Note. $N = 31$.

Instructors: Tell me about a time when, if at all, you used asked your students to use a mobile device in your class. Sixteen instructors responded to this question; of those 14, two said *none* or *have not* (asked students to use a mobile device in class). The responses fit into five

different categories: Research, Collaboration/Communication, Polling, Special Purpose Applications, and Campus/LMS, as coded in a rubric outlined in Chapter Three, Table 17. The number of instructors who responded within those coded responses are reflected in Table 46, from most commonly asked to least commonly asked. Referencing was rated the highest among both groups, which indicates a very basic use of a mobile device as a reference tool, no different than asking students to look in their book for an answer. Campus/LMS uses and Communication were also rated highly.

Table 46

Instructors: Tell Me About a Time When, if at All, You Used Asked Your Students to use a Mobile Device in Your Class

Purpose	*n*
Research	7 (44%)
Collaboration/Communication	5 (31%)
Polling	3 (19%)
Special Purpose Applications	3 (19%)
Campus/LMS	1 (6%)

Note. $N = 16$.

Students: Which, if any, of the following would you like to be able to use in class? (check all that apply). The students were asked what devices, if any, would they like to be able to use in class. Thirty-three students responded to this question. Respondents could choose *other* and write in their responses. Two participants chose *other* and wrote in *audio recorder* and *none.* Table 47 denotes the devices that they reported desiring to use from the most common to the least common.

Table 47

Students: Which, if any, of the Following Would You Like To Be Able to Use in Class? (Check All That Apply)

Device	*n*
Laptop	28 (85%)
Smartphone (e.g., iPhone, Android phone, iPod Touch)	19 (57%)
Tablet (e.g., iPad/iPad mini, Kindle Fire, Android Tablet, Nook Color)	17 (51%)
EBook Reader (e.g., Kindle, Nook, Sony Reader)	8 (24%)
Other: Name	2 (6%)

Note. N = 33.

Students: You may not want to use mobile devices for academics. Which may be reasons why? There may be reasons why students may not want to use mobile devices in class. The participants were asked to check all that apply for the reasons why they may not desire to use mobile devices in class. Table 48 reflects those responses in order from most common to least common.

Table 48

Students: You May Not Want to Use Mobile Devices for Academics. Which May Be Reasons Why?

Reason	*n*
Other	16 (53%)
Limited access to the Internet	13 (43%)
Limited access to a device	7 (23%)
Limited funds	7 (23%)
Lack of technical support	5 (17%)
Limited or no access to training resources (websites, tutorials, handouts)	5 (17%)

Note. N = 30.

Participants were given an open text answer for the *other* option. Sixteen students wrote reasons that they felt were not covered in the given options. Those 16 responses were coded and listed in Chapter Three, Table 11. In Table 49 the coded responses are reflected from most

common response to least common response in five different categories: Distractions, Laptop Preference, Hand Write Notes, Multitasking, and Not Allowed. Thirty total students responded to this checkbox and open text question.

Table 49

Instructors: You May Not Want to Use Mobile Devices for Academics. Which May Be Reasons Why?

Reason	*n*
Distractions	11 (69%)
Laptop Preference	3 (19%)
Hand Write Notes	2 (13%)
Multitasking	1 (6%)
Not Allowed	1 (6%)

Note. $N = 16$.

Instructors: You may not want to have your students use mobile devices in your classes. Which may be reasons why? (check all that apply). There may be reason why instructors may not want to use mobile devices in their classrooms. The participants were given potential reasons for not wanting to have students use mobile devices in their classes and were asked to check all that apply. Those responses are listed in Table 50 in order from the most common response to the least common response.

Table 50

Instructors: You May Not Want to Have Your Students Use Mobile Devices in Your Classes. Which May Be Reasons Why? (Check All That Apply)

Reason	*n*
Student distractions	10 (67%)
Concerns about cheating or the quality of student work	5 (33%)
Other	5 (33%)
Lack of technical support	2 (13%)
Lack of technology knowledge	2 (13%)
Too big of a time investment	1 (7%)
Limited or no access to training resources (websites, tutorials, handouts)	1 (7%)
Lack of dependability	1 (7%)

Note. $N = 15$.

Participants were given an open text answer for *other*. Five instructors wrote reasons that they felt were not covered in the given options. Those five responses have been coded in a rubric described in Chapter Three, Table 18. Those codes fall into two different categories of inappropriate pedagogical strategy and Cost. Two of the write in responses were *students on Facebook* or *texting during class activities*, which would fit under Student Distractions. The other write in response was *I encourage use of mobile devices*, which did not answer the question as to why they would not want to include mobile devices. Fifteen total instructors responded to this question. Table 51 reflects the instructor reported reasons for not wanting to include mobile devices in their classes.

Table 51

Instructors: You May Not Want to Have Your Students Use Mobile Devices in Your Classes. Which May Be Reasons Why? (Check All That Apply)

Reason	*n*
Inappropriate pedagogical strategy	2 (40%)
Cost	2 (40%)
Other	1 (20%)

Note. $N = 5$.

The common concern between the two groups again was the potential distraction. Some students deliberately use mobile devices to distract themselves, which indicates a lack of engagement. Other students are aware of the potential distraction and choose not to use their devices; however, with specific instructor direction, utilization of mobile devices could overcome this obstacle. In history courses, instructors could direct students to primary sources, or in the sciences, students could use the photography or video features of their devices to more accurately notate procedures for later reflection.

Student and instructor uses out of class. The following section addresses the survey questions that were asked of the students and the instructors regarding mobile device usage outside of class.

Students & instructors: Which categories of apps do you use most frequently for personal use? (check as many as apply). The student and instructor participants were both asked this question and requested to check all that applied for the types of applications that they use most frequently on their devices for personal use. Student participant responses are reported first, followed by the instructors' responses. Table 52 reflects the students' responses in order from most common to least common types of applications that they reported using for personal use on their devices.

Table 52

Students: Which Categories of Apps Do You Use Most Frequently for Personal Use? (Check as Many as Apply)

App Category	*n*
Communication (Email, Chat, Messaging, Skype, FaceTime)	38 (100%)
Social Networking (Facebook, Twitter, Pinterest, Instagram, Snapchat)	36 (95%)
Music (Pandora, TuneIn Radio, Spotify, iTunes)	34 (89%)
Navigation (Maps, Google Maps, MapQuest)	27 (71%)
Photography (Instagram, iPhoto, Hipstamatic)	26 (68%)
Access campus LMS (Blackboard, Sakai, Collaborate, Go to Meeting) &	22 (58%)
Entertainment (Netflix, Hulu+, Flixster, Amazon Prime, Other TV apps)	
Games (Angry Birds, Farm Hero Saga, Candy Crush, Flappy Birds	20 (53%)
Educational streams (iTunes U, Vimeo, YouTube)	16 (24%)
Reference (Wikipedia, WolframAlpha, Dictionary)	15 (39%)
Productivity (Pages, Keynote, Shared Calendar)	13 (34%)
News (CNN, New York Times, Instapaper)	12 (32%)
Cloud Based Apps (Google Apps, Evernote, Dropbox)	8 (21%)
Campus Specific Applications	7 (10%)
Books (CourseSmart, Inkling, iBooks, Kindle app) & Educational packages (Flash Cards, Test Prep, Khan Academy)	5 (14%)

Note. $N = 38$.

Table 53 reflects the instructor responses in order from most common types of applications to least common types of applications that they reported using on their devices.

Table 53

Students & Instructors: Which Categories of Apps Do You Use Most Frequently for Personal Use? (Check as Many as Apply)

App Category	*n*
Communication (Email, Chat, Messaging, Skype, FaceTime)	18 (95%)
Navigation (Maps, Google Maps, MapQuest)	17 (89%)
Reference (Wikipedia, WolframAlpha, Dictionary) & Social Networking (Facebook, Twitter, Pinterest, Instagram, Snapchat)	12 (63%)
Books (CourseSmart, Inkling, iBooks, Kindle app) & Educational streams (iTunes U, Vimeo, YouTube)	11 (58%)
Games (Angry Birds, Farm Hero Saga, Candy Crush, Flappy Birds) & Music (Pandora, TuneIn Radio, Spotify, iTunes)	10 (53%)
Cloud Based Apps (Google Apps, Evernote, Dropbox)	9 (47%)
Access campus LMS (Blackboard, Sakai, Collaborate, Go to Meeting), Entertainment (Netflix, Hulu+, Flixster, Amazon Prime, Other TV apps), News (CNN, New York Times, Instapaper), & Productivity (Pages, Keynote, Shared Calendar, Grade book)	7 (37%)
Photography (Instagram, iPhoto, Hipstamatic)	6 (32%)
Campus Specific Applications	4 (21%)
Educational packages (Flash Cards, Test Prep, Khan Academy)	3 (16%)

Note. $N = 19$.

Nearly all participants in both groups reported using mobile devices for communicating, including Email, Chat, Messaging, Skype, and FaceTime. This reflects the most common type of mobile device (smartphone) use that was reported by both groups. Both groups reported educational packages as the least commonly used application. This denotes a potential area to be developed for both students and instructors. It is interesting that less than half of students reported utilizing reference applications on their devices, yet that was the highest reported area when asked about what they read on their devices. This could be attributed to the portion of the question that asked about personal use, as students may not consider reading as a personal use activity.

Students: Name a few mobile apps that you use outside of class. Thirty-seven students responded to this open text question. The responses fit into 11 different categories that were coded in a rubric outlined in Chapter Three, Table 6. Table 54 reflects those codes listed from most frequently selected to least: Social Media, Consumption/Search, Music, Special Purpose Apps, Entertainment, Productivity, Navigation, Campus/LMS, Communication, Games, and Shopping. Most of these responses related to nonacademic uses, which implies that students are most likely to use their mobile devices for social and entertainment uses when they are not in formal classes. With social media garnering the highest percentage, instructors could use those means to convey course materials to reach students outside of class.

Table 54

Students: Name a Few Mobile Apps That You Use Outside of Class

App	*n*
Social Media	27 (72%)
Consumption/Search	15 (41%)
Music	12 (32%)
Special Purpose Apps	10 (27%)
Entertainment	9 (24%)
Productivity	6 (16%)
Navigation	4 (11%)
Campus/LMS	3 (8%)
Communication	3 (8%)
Games	2 (6%)
Shopping	1 (3%)

Note. $N = 37$.

Students: For the next questions, please indicate how often you use the following devices for academic purposes out of class. The student participants were asked to indicate the frequency with which they use their devices for academic purposes outside of class. Table 55 denotes the devices in order from most commonly used to least commonly used. One participant

selected *other* and wrote *YouTube Lectures/Netflix Documentaries.* This question asked about the frequency of specific device usage, and not the ways in which devices are used. This open response indicates that the participant was confused on this question. A total of 36 participants responded to this question.

Table 55

Students: For the Next Questions, Please Indicate How Often You Use the Following Devices for Academic Purposes out of Class

Device	Laptop	Smartphone (e.g., iPhone, Android phone)	Tablet (e.g., iPad/iPad mini, iPod Touch, Kindle Fire, Android Tablet, Nook Color)	EBook Reader (e.g., Kindle, Nook, Sony Reader)	Other
Almost Constantly	17 (47%)	11 (31%)	1 (3%)	1 (3%)	0 (0%)
Several times a day	10 (28%)	10 (28%)	7 (19%)	0 (0%)	0 (0%)
Daily	6 (17%)	7 (19%)	2 (6%)	1 (3%)	0 (0%)
Several times a week	3 (8%)	5 (14%)	1 (3%)	0 (0%)	1 (3%)
Several times a month	0 (0%)	2 (6%)	3 (8%)	0 (0%)	4 (12%)
Never	1 (3%)	1 (3%)	6 (17%)	0 (0%)	9 (25%)

Note. $N = 36$.

Both laptops and smartphones received high frequency scores. A total of 27 of the 36 students reported using both laptops and smartphones *almost constantly* for academic purposes. Students could check all that applied, so some of the students who replied using a laptop almost constantly could have also reported using smartphones just as often. This is interesting because students could be using the two devices simultaneously. Laptops are typically used for productivity and mobile devices have been reported as being used more as quick reference or communication tools. This finding could indicate that students are producing papers or projects while using the smartphones to read, reference resources, and or connect or communicate with

others. It indicates that one device cannot take the place of the other at the time of this study; each tool serves its specific purpose.

Students: Tell me about a time when you used a mobile device out of class. Thirty-two participants responded to this question. The responses fit into 11 different categories: Reference/Search, Communication, Social Networks, Campus/LMS, Productivity, Entertainment, Navigation, Other, Games, Cloud, and Shop. The responses are listed from most commonly used to least commonly used. The rubric used for coding was presented in Chapter Three, Table 9. Table 56 reflects those coded uses and the numbers of respondents who reported using those applications outside of class.

Table 56

Students: Tell Me About a Time When You Used a Mobile Device out of Class

App Category	*n*
Reference/Search	13 (40%)
Communication	12 (38%)
Social Media	11 (34%)
Campus/LMS	4 (13%)
Productivity	3 (9%)
Entertainment	2 (6%)
Navigation	2 (6%)
Other	2 (6%)
Games	1 (3%)
Cloud	1 (3%)
Shop	1 (3%)

Note. $N = 32$.

These results show that even when students are not directed to use mobile devices outside of class for academics, they are still using their devices for many academic purposes. Referencing and communicating had the highest response rates, which shows that the students

are seekers of information and knowledge, and desire to connect with others through communication as well as social networks.

Part 2: Research Questions Answered

This section of the chapter will use the aforementioned analyses to answer the research questions.

Research question 1: In what ways, if any, do undergraduate students use mobile devices in class for academic purposes? This study showed that students and instructors are at very basic use of mobile devices. Those mobile technology uses do not utilize technology specific uses. The mobile device uses that students reported could just as easily be done with analog tools such as books or papers, students reported using their devices in class for *finding information, reading, consumption, reference, search,* and *distraction.* Before the digital age students would have referenced encyclopedias. Nowadays, they reference Wikipedia. They could have referenced their textbooks; today they may have that textbook digitally. The benefit of the mobile device for these basic uses is the speed with which the information can be obtained. Using the search feature within an eBook application like iBooks or Kindle, students can quickly pull up the desired information, whereas before, students would have had to rely on their memory of where the information was, bookmarks, or notes. Mobile devices allow users to more quickly and efficiently gather the information that in the past would have taken more time. Students noted *distractions* as well. They stated that they were not bored, but got distracted while looking up content. Other students in the study specifically stated that they were aware of the potential for distraction and chose not to use their devices for that reason.

Communication, collaboration, social media, and *Cloud storage* can be accomplished in a unique with mobile devices. The first smartphones' main purpose was to communicate via text,

call, or email. Today, smartphones have the power and the enhanced ability to communicate beyond those basic uses and open doors to collaboration, cloud storage, and social media, which can add tremendously to the learning experience. Students can edit a document or project simultaneously using Google Drive. They can share it with each other via the same means or store and share files to be accessed easily at any time through cloud storage tools like Dropbox or Evernote. Social media allows students to crowd source information, connect with experts, and obtain data, facts, or resources within seconds. The power of information through social media in real time is unique through the easy access of mobile devices.

Finally, tools like *campus apps/LMSs, special purpose apps, photography, entertainment, games, calculating,* and *educational streams* put mobile device usage a cut above laptop or analog tools. Application developers specifically design apps for users to create, collaborate, share, and explore. When students or educators use these advanced features or applications of mobile devices it reflects a deeper knowledge of the TPACK framework. Students can take photos of notes on a whiteboard to reference later quickly and easily. They no longer have to diligently copy everything down and worry that they got it right; they have the exact image to reference. Calculating apps can perform the most advanced calculations without needing a specific type of graphing calculator; students can buy a graphic calculator app for much less than what they would spend on such a device. Campus applications or LMSs allow students to access necessary and pertinent course content at any time, anywhere. That content is personalized to their course needs. Educational streams and entertainment apps allow students to access lectures, podcasts, vidcasts, and related multimedia content without ever having to leave their seats. Finally, games, although initially thought of as a distraction by many, have academic qualities if connected correctly to the content. For example, Angry Birds can be connected to physics and

Clash of the Clans can be used to develop problem solving and team building strategies. All of these applications can be done best with mobile devices, due to their ease of portability and specific application features, taking learning to the next level.

Research question 2: In what ways, if any, do undergraduate students use mobile devices out of class for academic purposes? Similar to the ways students used devices in class, Consumption, Reference, Search, and Productivity were used outside of class for academic purposes. Reading was not listed as an activity done outside of class on mobile devices. This is interesting because it could mean that students also buy the physical books but do not carry them to class, hence referencing their mobile devices in class. Productivity was a surprising finding here because many students stated that it was easier to produce work on a computer rather than a mobile device.

Music, Entertainment, Social Media, Communication (email, text messaging, and/or chats), Shopping, Cloud Computing and/or cloud, and Storage were some of the uses students noted outside of class. Music and entertainment was also reported; students reported listening to or watching music/ entertainment while doing schoolwork. Social media and communication were reported as means to connect with classmates regarding what assignment due dates or to collaborate on assignments including cloud storage and computing applications. Students indicated that they shop on sites like Amazon to purchase textbooks or other school resources.

Games, Special Purpose Apps, Navigation, and Campus App/LMSs, again are unique to mobile devices. Some of these uses, like games, were noted as a means to *regroup* between homework sessions. Special Purpose Apps, like Epocrates, allow medical students to make informed medical decisions by referencing studies or experts in the field. Campus App/LMSs are used both in and outside of formal class for different purposes. Students simply reference those

apps in class, whereas outside of class students use them to hand in assignments and participate in discussion forums.

Research question 3: In what ways, if any, do instructors use mobile devices in class for academic purposes? Many instructors reported using mobile devices for Presentation, Consumption, Reference, Search, Educational Streams, and Entertainment. Again, these are very basic uses of the devices that can be accomplished on a computer or even through the use of a TV, DVD player, etc. These methods do not encourage TPACK usage; rather, they are just another way of doing what they have already been doing. The ease of access can be argued here for searching and referencing as well as timely access to educational streams if a situation arises, but generally, these uses are not mobile device specific.

Some faculty noted using mobile devices in class for Collaboration, Cloud access, Conferencing/Communicating, and Quizzing/Polling. These uses are taking mobile learning to the next level. Instructors are not necessarily utilizing the mobile devices to their fullest potential, yet they are well on their way to doing so. Some of these functions can be performed on laptop devices; however, with their increased ease of access, mobile devices make these uses timely. Collaboration through tools such as Google Drive or Prezi allows creation of dynamic content in seconds while including all students. Cloud access allows instructors to provide all students access to electronic documents without ever having to make a photocopy or leave the room. Conferencing and communicating could that were once done solely via telephone can now be done with smartphones, Skype, FaceTime, or Google Hangout. Viewers can not only hear but also see the other person in real time. This affordance opens many doors to connect with experts in the field across great distances without ever leaving the campus. Finally, quizzing or polling allows teachers to get obtain time formative assessment data from every student to ensure

everyone is learning. Since every student in this study had access to a smartphone, mobile devices have the potential to allow instructors to require every student to participate in the means they see appropriate.

Special Purpose Apps, Campus App/LMS, Flipping the classroom, Social Media/Videos utilize the unique features of mobile devices. Professors are able to find content specific applications like the TWEN application, which allows law students to access archives and law specific information; an activity that would have had to be done in a library only years ago. Flipping the classroom can be done easily through the use of the video camera on a mobile device so that class time can be used in more collaborative and interactive ways. Social media and videos allow instructors to access current content within seconds and connect it with what is being taught or discussed. It allows instructors to personalize each class, rather than teach from a script. Finally, campus apps or LMSs allow instructors to personalize learning for their students, make changes as necessary, and meet the diverse needs of each student through posting a variety of content.

Research question 4: In what ways, if any, do undergraduate instructors use mobile devices out of class for academic purposes? It is evident that faculty do more research with their mobile devices outside of class than in class, whereas students used their devices in class for researching more often than outside of class. Faculty reported using mobile devices to access Books, Educational Streams, News, and to Communicate, Produce documents etc., and Reference. Mobile devices make it easier to accomplish these tasks; however, mobile devices are not essential to the accomplishment of these tasks.

Social Networking, Music, and Cloud Based Apps are beginning to use the full capabilities of mobile devices. Faculty can use social networks to connect with their students

outside of class to answer questions or provide resources. Mobile devices allow this to happen outside of the office or home. Cloud Based Apps allow documents to be shared easily and accessed from any device, providing the most up to date information. Music was noted as more of a form of entertainment while working on academic content.

Campus App/LMS, Photography, Games, Navigation are uses that take advantage of the advanced features of mobile devices. The Campus Apps/LMSs allow for rich content to be shared and personalized for students to access at any time. Photography allows faculty to capture specific examples of course connected content. Games can be created to make learning more dynamic and potentially connecting and capturing the interest of their students. Navigation can be used to connect a setting to the context of course materials. These advances mobile devices uses seem to be more for instructors' personalized learning rather than for their students; however, these uses can be developed and encouraged use in class with their students as well.

Chapter Five: Discussion of Findings

As mobile devices have become ubiquitous, students have found ways to use them for academic uses. The rate at which adults are obtaining mobile devices has been climbing steadily, and providing pedagogical approaches to use such devices in education is necessary. To provide suggestions for mobile device usage among undergraduates and instructors, it was beneficial to explore how these populations were currently using these tools. Those uses were later used to inform suggestions for successful learning experiences. The current research study addressed the tools to which students and instructors had access and how they used their devices to facilitate their education in and outside of class. The survey instruments gathered data to describe the uses of such tools for academic purposes by undergraduate students and instructors.

Context of the Study

Mobile devices usage is growing faster than the global population. The number of mobile devices in the world has overtaken the number of toothbrushes because many users own several devices (heathermac, 2012). Over half of the instructor respondents in this study reported having regular access to multiple devices: 14 of 19. The student respondents a slightly lower level of multiple devices: 14 of the 38. As people gain access to these devices, they are becoming like extensions of the body. Many individuals will not leave home without their devices. If a device is forgotten or lost, individuals feel incomplete. Such devices they are accessed frequently to reference materials or information, communicate quickly, and connect with the world (Traxler, 2010). With this constant connection to devices, it was anticipated that device usage would also drift into academic learning both in and outside of formal class. This study's purpose was to explore the ways in which both students and instructors used their multiple powerful mobile devices for academic purposes.

Research surrounding mobile learning has been done, but past studies have been done in the context of teacher directed mobile device use and or in K-12 schools. No exploratory research had been done on undergraduate students or connecting undergraduate student uses with the practices of higher education instructors. However, UCF (Chen & DeNoyelles, 2013) did study the mobile device uses of undergraduate students, but not instructors. The researchers concluded that those students often used their devices in their own ways with little or no direction from their instructors. The researcher saw this as an opportunity to survey instructors and triangulate the data to potentially see if there were ways that instructors were directing students to use their devices that students may have overlooked. This study not only asked the students how their instructors may have asked them to explicitly use a mobile device in class, but also asked the instructors how they may have explicitly asked students to use a mobile device to uncover both perspectives.

With higher education being scrutinized more closely in regard to technology integration, this study can provide guidance on how to integrate technological teaching practices more effectively. Universities have typically been more traditional, rather than progressive, in their teaching methods, relying heavily on lectures or direct instruction. In the past working environment when employees needed to only follow directions, give orders, or receive orders, this direct instructional method worked. However, today's jobs are more innovative, collaborative, and creative. University graduates must be able to think on their feet, problem solve, connect, and collaborate with colleagues on many different levels. Not only is using technology an expectation of college graduates, but being proficient in those technologies is also expected. However, undergraduate students have seen very few examples of technology integration in regard to today's workplace. Today's college graduates are social network experts

and can retrieve data within seconds; yet they lack adequate experience with technology tools to collaborate or create with others. Making the technological connections to today's or tomorrow's workplace is where educators have been lacking; however, a window of possibility is opened with the results of this study.

TPACK is a growing framework in education and mobile device ubiquity makes it convenient to embed those devices into classroom instruction. With the data gathered in this study, the current uses of students and instructors can be built upon, expanded, and encouraged for other educators. Merely knowing the potential of mobile devices with pedagogical strategies can provide an innovative step toward integrating technology into the classroom through the use of TPACK.

Summary of the Study

The data that gathered in this study explained: (a) participants' general information: age range/year teaching and major/department in which they taught; (b) access to devices and features of those devices; (c) ways in which the devices were used; (d) categories of applications for personal and academic usage; (e) devices usage for assignments, frequency, and examples; (f) applications used in and outside of class; (g) reasons for device usage; (h) frequency of specific devices usage in and outside of class; (i) examples of device usage for academic purpose in and outside of class; (j) examples of how devices were used to complete/give assignments in and outside of class; (k) examples of teacher directed specific devices to complete assignments; (l) desired devices to be used in class; (m) reasons for not wanting to use devices for academics; and (n) ways in which the campus could use devices in the future.

Summary of Findings

The study revealed that students use their mobile devices for a wide variety of tasks. Many of those uses were in fact academic in class; however, a few non-academic themes did emerge. Two students outright reported using their devices to distract themselves. They stated: *Used my smartphone to remove some boredom during lectures,* and *used it to text or look at Instagram, not necessarily because class was boring, just couldn't resist.* Other write-in answers of ways they used their devices in class included entertainment, social media, games, and communication. However, social media, games, and communication uses can also be academically related. Specific non-academic examples included *Family Guy, SnapChat,* and *Texts.* This distraction potential was a major concern for instructors and contributed to their apprehension about integrating mobile devices into their course. However, out of 38 students who responded, only two explicitly admitted to using it as a distraction, whereas seven other students acknowledged the potential distraction and noted the following reasons for not wanting to use a mobile device in class: (a) *It's easy to get distracted, so many apps,* (b) *it gets distracting,* (c) *I get distracted easily,* (d) *mobile devices 100% distract me from school work,* (e) *will use them for other purposes and distracts other students who handwrite notes,* (f) *laptop is not as distracting a phone,* and (g) *gets easily distracted with other things on the laptop or tablet.* However, if instructors are guiding and deliberately integrating devices into their courses, students will be less likely to get distracted.

It is important to acknowledge that distractions do not come from the devices; rather, distractions are a problem with the pedagogy. Whether a student has a device or not, if he/she is not engaged he/she will find a distraction. Students used to pass notes or talk to their neighbors; now mobile devices offer a different medium for distraction. It is not the device that is inherently

distracting. Focusing on engaging pedagogical strategies while including mobile devices may begin to utilize the TPACK framework while dispelling the notion that devices are to blame.

In terms of basic usage of mobile devices, students reported using them to find information, read, enhance productivity, and engage in consumption/referencing/searching. Generally, these tasks do not need to be performed on mobile devices; however, the devices make these tasks quicker to achieve and more accessible. Students could reference their paper textbooks or take notes on paper; however, using the search features in digital books allows students to access exact content within seconds without wasting too much time.

Students and instructors are at the emerging stages of taking advantage of mobile devices for learning. This study's results show that students and instructors are using mobile devices for academic purposes in a variety of ways both in and outside of class. The uses reported by instructors versus students vary somewhat. Students reported that they do not typically use special purpose applications like StudyBlue or Epocrates unless a teacher directs them to do so. Students are more likely to use their devices on their own to research, search, read, or produce. Instructors have also reported using mobile devices in the ways previously mentioned by students; however, instructors more commonly use mobile devices as presentation devices: for educational streams, entertainment, and presentations. These uses by instructors are simply using a mobile device to accomplish the same tasks as TVs, desktop computers, and overhead projectors. Just because current technologies are being utilized does not imply that TPACK is being applied. Rather, TPACK is at work when strong pedagogical strategies are paired with specific technology applications. For example, in a biology course, the instructor may ask students to locate the spleen in the human body. Students can utilize interactive mobile applications with diagrams of the human body, allowing instructors to share their rich content

knowledge while asking students to locate and identify organs through the use of dynamic technology tools.

Both students and instructors shared a few advanced or unique mobile device uses: collaboration, quizzing/polling, and special purpose apps. However, these uses were reported as being teacher directed, or as formal learning. These uses do not reflect the TPACK framework because the pedagogical strategy is recalling information, nor is the technological application unique to the pedagogical approach. Recalling information can be done just as easily through analog tools as it is through this technological application. The key with TPACK is to not simply substitute analog for digital; rather, it is to provide a rich technological application that supports the pedagogical strategy.

Collaboration uses reported by both students and instructors were at an emerging level passed simply consuming and/or referencing. Dropbox, Prezi, Google Drive, and virtual notebook were some examples of collaborative uses. Dropbox was noted as a place to share files. Sharing files can also be accomplished through Google Drive or Evernote as well. It is not just the sharing of files that is important, but also the ability to collaborate in real time on those files. The power of Google Drive allows collaboration to occur simultaneously with changes in real time. Additionally, each member of the group can have access to the documents. Pedagogically, instructors can have group members keep organic chemistry notes together without anyone needing to make a copy or physically get together. TPACK strategies are being utilized through encouraging students to do active learning while using technology and collaboration.

Some of the pedagogical strategies that faculty members mentioned included appropriate teaching methods regarding the PCK model. For instance, many students reported that faculty ask them to use their devices to look something up or reference material. Teachers are asking

students to learn through inquiry, discovery, or active learning. However, just because they use a mobile device instead of a book does not make this task TPCAK. In the sciences a professor may ask student to search for the symptoms of a specific disease; doing so while utilizing a mobile device's unique features would align this task with the TPACK framework. An educator could still implement the active learning model by using mobile device communication features to connect with experts, arrange interviews, harness the power of live social media to obtain public opinion on a topic, or use Instagram to search hashtags of images. Changing this way of thinking for instructors needs to happen in order to move toward true TPACK integration.

All students reported using some sort of social media, such as Twitter, Instagram, or Facebook. Capitalizing on that skill with which they are already familiar and using it in the classroom could change the way students think about using social media. Rather than only using social media to connect with people they know, they could make connections with the world that may contribute to their body of knowledge. For example, in a debate course students could use Twitter to conduct a live Twitter Chat debate. This would encourage students to think carefully about their arguments because the world can see everything they say. It may also inspire outsiders that could contribute alternative opinions to get involved. Utilizing roleplaying and the power of social media could potentially bring in and model the TPACK framework appropriately.

In history or political science courses students could use their mobile devices by locating primary sources that they would normally have to go to the library or travel to another library to obtain. For example, the National Archives and the Library of Congress have primary source material that just a short time ago individuals would have had to travel to obtain. With mobile devices, the rich content is at the fingertips within seconds. Students can view and interpret the

Constitution and also read the experts' interpretation for comparison. Students can take virtual field trips of Congress or Senate right on their handheld devices; experiences that cannot be done while sitting class without a device. With the instructor's guidance, TPACK framework would promote student engagement with rich content through the use of mobile devices, content such as primary sources, videos, images, and virtual field trips .

Both students and instructors also mentioned Quizzing/polling. Specific uses were Poll Everywhere, texting to answer a poll questions, &and Turningpoint. One application that was not mentioned was Socrative, an online polling application. There is great potential for instructors to use Socrative because they can preload quizzes, allowing for open text or multiple choice responses. Instructors can solicit anonymous feedback and also download students' answers. This tool provides formative assessment and feedback for both the instructors and the students. These types of applications allow every student to participate, rather than only the one student that may be called upon when asked questions orally: again a use of TPACK.

The biggest potential is for TPACK integration with mobile devices is the integration of special purpose applications such as VoiceThread, which allows easy collaboration while taking advantage of the presence of mobile devices. By using VoiceThread in history courses, instructors can model TPACK teaching strategies. VoiceThread connects with the New York Public library, allowing students to locate primary source materials. Students may also comment on their classmates' work via voice, type, or video. This application utilizes a variety of technological knowledge teaching strategies. Additionally, applications such as Nearpod (allows students to follow the instructor, collaborate, work at a their own pace, etc.), Notability (robust note taking through images, audio, and text as well as collaboration capabilities), or Geometer's Sketchpad (geometric drawings with hands on capabilities to measure segments, angles, etc.) are

all good examples of uses toward using the TPACK framework effectively. These are just a few more advanced mobile device applications instructors could use that participants failed to mention in the study. The aforementioned applications encourage TPACK integration into the college classroom. With instructor directed use of these tools, students may begin to use them on their own outside of class to accomplish informal learning. With teacher directed uses of mobile applications, students will be less likely to be off task or distracted as well.

Formal learning. In this study, the mobile device uses that took place within the classroom would be defined as formal learning. Formal or classroom learning was defined as teacher-directed and/or learning or mobile device usage that occurred in the classroom. Instructors reported asking students to use the campus LMSs, reference materials, and collaborative applications as mentioned earlier. This study found that special purpose applications were most commonly used in the formal learning setting; as a result, there is still a great deal of potential for special purpose applications to be used for formal learning.

Informal learning. Informal learning happens outside of direct teacher instruction and also refers to *just in time* information that contributes to students' body of knowledge. This learning is student directed and includes personal and social aspects of learning that contribute to their body of knowledge. Informal learning is student initiated for the purpose of studying and or learning. The most common mobile device usage for learning by students outside of class was reference/search applications. Students reported using the Internet often for searching, as well as looking up their syllabi on the campus LMSs, or rubrics for assignments. Based on these findings, students are not utilizing the full potential of their mobile devices for informal learning. Just in time learning is commonly done through the search features of mobile devices; however,

collaboration and connections can be made through mobile devices that students are using only minimally at this time.

Implications

This study was limited due to the fact that it was done at two small faith-based universities in Southern California. Due to the researcher's time constraints and funding limitations, a larger scale study could not be performed at this time. Data collection took place in the summer term and the beginning of the Fall term. These terms are not ideal because not all students and faculty take/teach summer courses and may not check their email regularly, as the survey was sent to their school email addresses. For instance, subject matter/major may matter in which devices/uses arise in and outside of class. Additionally, the beginning of the Fall term is a very busy time for everyone. Potential participants may not have opted to participate due to other pressing priorities. A similar study in the future should consider disseminating the survey a few weeks after the beginning of the Fall and Spring Semesters. Moreover, email may not be the best way to solicit participants, especially students, because many students claim to not read their email. Utilizing social media outlets, coming into classes, or setting up a booth in the cafeteria may be a better way to solicit student participation. Finally, a random sample limited the potential number of participants. Providing the survey for all students and faculty would allow all those who are interested to self select to potentially achieve greater participation.

As technology continues to advance, it is becoming increasingly more difficult to distinguish between functions and devices when conducting research on these topics. Many devices have a wide variety of capabilities; for instance, a Kindle that at one time was used for the sole purpose of an eReader has developed into a Kindle Fire, which is a more diverse tablet with web capabilities and applications. It is growing harder and harder to use device categories in

research since so many functions can be accomplished across a number of technology platforms. Additionally, the functions or the applications themselves can cross the coded rubric categories that were created for this study. For example, the Evernote application can be used as a productivity tool; however, notes can be shared, pictures can be inserted, and audio can also be captured within that application. Those uses cross into the collaboration and photography rubric codes as well. Collaboration and communication are also very closely related, because through collaboration, individuals are communicating. However, in this study the two categories were differentiated by the applications that were mentioned using the rubrics in Chapter Three. Through this study it has become apparent that further interviews and observations may be necessary to obtain data on the actual uses of the applications. This finding will be discussed in the section regarding recommendations for further research.

Conclusions

This study will allow for current and future instructors to better implement mobile devices with their pedagogical strategies toward utilizing the TPACK framework. This data was collected from two small faith based universities in Southern California with a traditional small undergraduate population of less than 4,000 students. These data may be beneficial to other universities in a similar setting.

Recommendations

This research could be built upon with the following recommendations. As mentioned earlier, a mixed methods study would be beneficial to include observations and interviews to pinpoint the actual uses of the applications the participants mentioned. Many of the applications can cross rubric categories, making it increasingly difficult to place one application into one coded rubric category. Interviews and observations would uncover the specific ways in which

those applications are being used to code those applications more specifically. Furthermore, students reported using applications like Netflix and YouTube in class; however, they did not specifically state whether those uses were on task or off task. Again, the observations and interviews would clarify this question.

There is also a deeper need to develop a deeper understanding of the instructors' pedagogy. Observations and interviews would help explain what faculty members are actually doing when they ask students to collaborate or use their devices to search the web. Whether the instructors ask students to use specific applications or to simply collaborate needs further explanation.

A second iteration of this study could be done on a much bigger scale. A survey could be sent out or made available nationwide to all undergraduate students and instructors to provide a broader look at mobile device usage for academics. Rather than focusing on two small faith-based universities in Southern California, a bigger study would reach more participants from different backgrounds and socioeconomic status, as well as different-sized schools. It would provide more specific examples that would contribute to a better generalization about how the traditional or average undergraduate student or instructor is using mobile devices for academics.

Researching students and faculty in the same content area and comparing them across content areas may determine that certain subject areas are more conducive to mobile learning than others. For example, this research study showed that individuals in the medical fields used several special purpose applications. It would be interesting to uncover which fields of study are more likely to use mobile devices and in what ways those devices are used. Additionally, an action research study could train instructors on effective pedagogical mobile device integrations and then study the perceptions and engagement of students after the intervention.

It would be beneficial to study higher education professional development departments and the faculty that they train. Future research could train higher education faculty in TPACK integration and then conduct an action research study to assess the implementation and the effectiveness of those TPACK strategies used by higher education faculty members. At this time, no studies have explored higher education faculty training in the area of TPACK integration. Often, higher education faculty members are considered content knowledge experts, which has been considered a strong enough criterion to grant them teaching positions. Pedagogy has not been emphasized among higher education instructors. Technology has been seen as a luxury or an added bonus if it is included in instruction. This current study offers a unique angle by targeting higher education instructors and their pedagogical and technological strategies. After studying higher education educators' implementation and effectiveness of the TPACK framework, a subsequent iteration could assess students' perceptions of the integration of TPACK strategies utilized by faculty in their courses. It would be interesting to see if students' use of mobile devices in and outside of class would become more advanced, technologically pedagogically appropriate, and or engaged.

Investigating gender, age, or socioeconomic differences and comparing the level of mobile device usage may also prove to be interesting. An exploration of gender may uncover different methods of mobile device usage for academics. Males have more traditionally been involved in technological fields, so it could be interesting to explore potential differences in mobile device usage based on gender.

Students' socioeconomic status could be compared with number of devices used and or their level of usage. Socioeconomic status may be correlated with owning/using multiple devices and students' comfort in using them for academic purposes.

Prensky (2010) classified young adults or today's students as digital natives. It has been generalized that younger students or instructors are more comfortable with current technology; however, desire may be a better determinant of mobile device integration than age for academic reasons. A future study could gauge the demand of mobile device integration with the ages of the individuals and their levels of mobile device integration in the academic setting.

REFERENCES

Ackermann, E. (2001). *Piaget's constructivism, Papert's constructionism: What's the difference?* Retrieved from http://learning.media.mit.edu/content/publications/EA.Piaget%20_%20Papert.pdf

Ally, M. (2004). Using learning theories to design instruction for mobile learning devices. In J. Attewell & C. Savill-Smith (Eds.), *Mobile learning anytime everywhere* (pp. 5-8). London, UK: MLearn.

Ally, M. (2009). *Mobile learning: Transforming the delivery of education and training*. Edmonton, Alberta, CA: AU Press.

Apple. (n.d.). *Apple press info: iPod + iTunes timeline.* Retrieved from http://www.apple.com/pr/products/ipodhistory/

Archambault, L. M., & Barnett, J. H. (2010). Revisiting technological pedagogical content knowledge: Exploring the TPACK framework. *Computers & Education*, *55*(4), 1656-1662. doi:10.1016/j.compedu.2010.07.009

Bandura, A. (1971). *Social learning theory*. New York, NY: General Learning Corporation.

Barnhart, F. D., & Pierce, J. E. (2011). Becoming mobile: Reference in the ubiquitous library. *Journal of Library Administration, 51*(3), 279-290. doi:10.1080/01930826.2011.556942

Bell, F. (2011). Connectivism: Its place in theory-informed research and innovation in technology-enabled learning. *International Review of Research in Open and Distance Learning, 12*(3), 98-118. Retrieved from http://www.irrodl.org/index.php/irrodl

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day.* Washington, D.C.: International Society for Technology in Education.

Bryman, A. (2008). *Social research methods*. New York, NY: Oxford University Press.

Bull, G., Thompson, A., Searson, M., Garofalo, J., Park, J., Young, C., & Lee, J. (2008). Connecting informal and formal learning: Experiences in the age of participatory media. *Contemporary Issues in Technology and Teacher Education, 8*(2), 100-107. Retrieved from http://www.citejournal.org/vol8/iss2/maintoc.cfm

Chai, C. S., Koh, J. H. L., & Tsai, C.-C. (2010). Facilitating preservice teachers' development of technological, pedagogical, and content knowledge (TPACK). *Journal of Educational Technology & Society, 13*(4), 63-73. Retrieved from http://www.ifets.info

Chang, C., Chatterjea, K., Goh, D., Theng, Y., Lim, E., Sun, A., & Nguyen, Q. (2012). Lessons from learner experiences in a field-based inquiry in geography using mobile devices. *International Research In Geographical & Environmental Education, 21*(1), 41-58. doi:10.1080/10382046.2012.639155

Chen, B., & deNoyelles, A. (2013, October 7). Exploring students' mobile learning practices in higher education. *Educause.* Retrieved from http://www.educause.edu/ero/article /exploring-students-mobile-learning-practices-higher-education

Connaway, L. S., & Dickey, T. J. (2010). *The digital information seeker: Report of the findings from selected OCLC, RIN, and JISC user behaviour projects*. Dublin, OH: OCLC Research.

Cruz-Flores, R., & Lopez-Morteo, G. (2010). A framework for educational collaborative activities based on mobile devices. *International Journal Of Interactive Mobile Technologies*, *4*(3), 9-18. doi:10.3991/ijim.v4i3.1268

Dewey, J. (1988). Experience and education. In J. A. Boydston (Ed.), *The later works, 1925-1953* (Vol. 13, pp. 45-49). Carbondale, IL: Southern Illinois University Press. (Original work published 1938)

Gergen, K. J. (2002). The challenge of absent presence. In J. E. Katz & M. A. Aakhus (Eds.) *Perpetual contact: Mobile communication, private talk, public performance* (pp. 227-241). Cambridge, UK: Cambridge University Press.

Greco, K. (2013). *FAA to allow airlines to expand use of personal electronics* [Press release]. Retrieved from http://www.faa.gov/news/press_releases/news_story.cfm?newsId=15254

GSMA, & A. T. Kearney. (2013). *The mobile economy 2013.* Retrieved from http://www.gsmamobileeconomy.com/GSMA%20Mobile%20Economy%202013.pdf

Harris, J., Mishra, P., & Koehler, M. J. (2009). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. *Journal of Research on Technology in Education*, *41*(4), 393-416. Retrieved from http://activitytypes.wmwikis.net/file/view /HarrisMishraKoehler-JRTESumm09.pdf/80124231/HarrisMishraKoehler-JRTESumm09.pdf

heathermac. (2012, October 1). *More mobile phone access than toothbrushes, says Google.* Retrieved from http://mobilemarketingmagazine.com/more-mobile-phone-access-toothbrushes-says-google/#YTTQKoyJMxuPPIAX.99

Ifenthaler, D., & Schweinbenz, V. (2013). The acceptance of tablet-PCs in classroom instruction: The teachers' perspectives. *Computers in Human Behavior, 29*(3), 525-534. doi:10.1016/j.chb.2012.11.004

Illinois Mathematics and Science Academy (1993). *PBL network: Collaborative inquiry in action.* Retrieved from http://pbln.imsa.edu/model/intro/differences.html

Koehler, M. J., & Mishra, P. (2008). *Handbook of technological pedagogical content knowledge (TPACK) for educators.* New York, NY: Routledge/Taylor & Francis Group for the American Association of Colleges for Teacher Education.

Kukulska-Hulme, A. (2010). Learning cultures on the move: Where are we heading? *Journal of Educational Technology & Society, 13*(4), 4-14. Retrieved from http://www.ifets.info

Kukulska-Hulme, A. (2012). How should the higher education workforce adapt to advancements in technology for teaching and learning? *Internet and Higher Education*, *15*(4), 247-254. doi:10.1016/j.iheduc.2011.12.002

Lage, M. J., Platt, G. J., & Treglia, M. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. *Journal of Economic Education, 31*(1)*,* 32-43. doi:10.1080/00220480009596759

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. New York, NY: Cambridge University Press.

Ling, R. (2004). *The mobile connection: The cell phone's impact on society*. San Francisco, CA: Morgan Kaufmann.

Merchant, G. (2012). Mobile practices in everyday life: Popular digital technologies and schooling revisited. *British Journal of Educational Technology, 43*(5), 770-782. doi:10.1111/j.1467-8535.2012.01352.x

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017-1054. doi:10.1111/j.1467-9620.2006.00684.x

Number of Android available apps. (2014). Retrieved from http://www.appbrain.com/stats /number-of-android-apps

Nyíri, K. (2007). *Mobile studies: Paradigms and perspectives*. Vienna, AT: Passagen Verlag.

Pamuk, S., Ergun, M., Cakir, R., Yilmaz, H. B., & Ayas, C. (2013). Exploring relationships among TPACK components and development of the TPACK instruments. *Educational Informational Technology, 2013,* 1-23. doi:10.1007/s10639-013-9278-4.

Plant, S. (2001). *On the mobile: The effects of mobile telephones on individual and social life*. Retrieved from http://www.momentarium.org/experiments/7a10me/sadie_plant.pdf

Polly, D., & Brantley-Dias, L. (2009). TPACK: Where do we go now? *TechTrends: Linking Research & Practice to Improve Learning, 53*(5), 46-47. doi:10.1007/s11528-009-0324-4

Prensky, M. (2010). *Teaching digital natives: Partnering for real learning*. Thousand Oaks, CA: Corwin.

Rainie, L., & Smith, A. (2013, October 18). *Tablet and e-reader ownership update.* Retrieved from http://www.pewinternet.org/2013/10/18/tablet-and-e-reader-ownership-update/

Rogers, Y., Connelly, K., Hazlewood, W., & Tedesco, L. (2010). Enhancing learning: A study of how mobile devices can facilitate sensemaking. *Personal and Ubiquitous Computing, 14*(2), 111-124. doi:10.1007/s00779-009-0250-7

Sahim, I. (2011). Development of survey of technological pedagogical and content knowledge (TPACK). *The Turkish Online Journal of Educational Technology, 10*(1), 97-105. Retrieved from http://www.tojet.net/articles/10110.pdf

Shaffer, D. W. (2006). *How computer games help children learn.* New York, NY: Palgrave Macmillian.

Sharples, M., Milrad, M., Arnedillo Sánchez, I., & Vavoula, G. (2009). Mobile learning: Small devices, big issues. In N. Balacheff, S. Ludvigsen, T. de Jong, A. Lazonder, & S. Barnes (Eds.), *Technology enhanced learning: Principles and products* (pp. 233-249). Heidelberg, DE: Springer.

Sharples, M., Taylor, J., & Vavoula, G. (2007). A theory of learning for the mobile age. In R. Andrews & C. Haythornthwaite (Eds.), *The Sage handbook of elearning research* (pp. 221-247). London, UK: Sage.

Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14. doi:10.3102/0013189X015002004

Smith, A. (2010, July 7). *Mobile access 2010.* Retrieved from http://www.pewinternet.org /Reports/2010/Mobile-Access-2010.aspx?r=1

Song, Y. (2011). Investigating undergraduate student mobile device use in context. In A. Kitchenham (Ed.), *Models for interdisciplinary mobile learning: Delivering information to students* (pp. 120-136). Hershey, PA: IGI Global.

Sørensen, C., Mathiassen, L., & Kakihara, M. (2002, May). *Mobile services: Functional diversity and overload.* Paper presented at New Perspectives On 21st-Century Communications, Budapest, HU.

Straumsheim, C. (2013, September 5). Device explosion. *Inside Higher Ed.* Retrieved from http://www.insidehighered.com/news/2013/09/05/wireless-devices-weigh-down-campus-networks

Sung, E., & Mayer, R. E. (2013). Online multimedia learning with mobile devices and desktop computers: An experimental test of Clark's methods-not-media hypothesis. *Computers in Human Behavior, 29*(3), 639-647. doi:10.1016/j.chb.2012.10.022

Terras, M. M., & Ramsay, J. (2012). The five central psychological challenges facing effective mobile learning. *British Journal of Educational Technology, 43*(5), 820-832. doi:10.1111/j.1467-8535.2012.01362.x

Thuermer, K. (2012, September 1). Do mobile devices enhance teaching and learning? *Independent School*. Retrieved from http://www.nais.org/Magazines-Newsletters/ISMagazine/Pages/Do-mobile-devices-enhance-teaching-and-learning.aspx

Timberg, C. (2013, February 25). Mobile device connections growing quickly. *The Washington Post.* Retrieved from http://articles.washingtonpost.com/2013-02-25/business/37279129_1_mobile-wallets-mobile-services-mobile-world-congress

Ting, Y. (2012). The pitfalls of mobile devices in learning: A different view and implications for pedagogical design. *Journal of Educational Computing Research, 46*(1), 119-134. doi:10.2190/EC.46.2.a

Tomak, H. S., Incikabi, L., & Ozgelen, S. (2012). An investigation of change in mathematics, science, and literacy education pre-service teachers' TPACK. *Asia-Pacific Educational Resource, 22*(4), 407-415. doi:10.1007/s40299-012-0040-2.

Tomak, H. S., Yelken, T., & Konokman, Y. G. (2013). Pre-service teachers' perceptions on development of their IMD competencies through TPACK-based activities. *Journal of Educational Technology & Society, 16*(2), 243-256. Retrieved from http://www.ifets.info

Tough, A. (1979). *The adult's learning projects* (2nd ed.). Toronto, Ontario, CA: Ontario Institute for Studies in Education.

Traxler, J. (2009). Current state of mobile learning. In M. Ally (Ed.) *Mobile learning: Transforming the delivery of education and training* (pp. 9-24). Edmonton, Alberta, CA: Athabasca University Press.

Traxler, J. (2010, January). *The "learner experience" of mobiles, mobility and connectedness.* Paper presented at ELESIG Symposium: Digital Futures, Reading, UK. Retrieved from http://cloudworks.ac.uk/cloud/view/3472

Vavoula, G. (2003). *KLeOS: A knowledge and learning system in support of lifelong learning*. Birmingham, UK: University of Birmingham.

Vavoula, G., Scanlon, E., Lonsdale, P., Sharples, M., & Jones, A. (2005). *Report on empirical work with mobile learning and literature on mobile learning in science*. Retrieved from https://telearn.archives-ouvertes.fr/hal-00190175/document

Wexler, E. (2014). *What are teens doing online?* Retrieved from http://www.pbs.org/wgbh /pages/frontline/media/generation-like/what-are-teens-doing-online/

Wong, W. (2012, August 3). College campuses embrace mobility. *Baseline*. Retrieved from http://www.baselinemag.com/c/a/IT-Management/College-Campuses-Embrace-Mobility-194636/

Wu, W. H., Jim Wu, Y. C., Chen, C. Y., Kao, H. Y., Lin, C. H., & Huang, S. H. (2012). Review of trends from mobile learning studies: A meta-analysis. *Computers & Education*, *59*(2), 817-827. doi:10.1016/j.compedu.2012.03.016

Zheng, J. (2011, August 16). What day of the week should you send your survey? [Web log post]. Retrieved from https://www.surveymonkey.com/blog/en/blog/2011/08/16/day-of-the-week/

APPENDIX A

Email to Instructors and Students for Participation

Subject: Survey on mobile device usage for academics in and out of class

Greetings,

If you are an undergraduate student or teach at least one class in higher education AND use mobile devices (smartphones, tablets, etc.) please read on. If not, this email does not pertain to you.

I am a doctoral student at Pepperdine University and an Assistant Professor of Educational Technology. I am working on my dissertation researching how undergraduate students and instructors use their mobile devices in and out of class for academic purposes. This study is a quantitative survey that should take no more than 10-15 minutes of your time. CUI's IRB as well as Pepperdine's IRB has approved this research and I will be adhering to their requirements. At the conclusion of this study, the findings will be available to you with suggestions for better implement mobile devices for academic uses.

I am requesting no more than 10-15 minutes of your time to participate in the quantitative survey. If you choose to participate and agree to the terms and conditions, you may voluntarily provide your email address for a drawing to win one of two $50 Amazon gift cards. One will be awarded to a faculty member and one to a student. This survey is hosted here (link) using Qualtrics. You may participate on your computer or your mobile device. If you are willing to support me in my research please participate in the survey by LIST DATE HERE. If you have any questions or concerns please contact me. Thank you so kindly for your consideration.

Sincerely,

Malia M. Hoffmann

[redacted], [redacted], [redacted]Cell

Assistant Professor, [redacted]

School of Education, M.A. Ed. Ed. Tech

Doctoral Student, Pepperdine University

APPENDIX B

Student Quantitative Survey

Informed Consent

Information
This study will focus on how undergraduate students and instructors use mobile devices in and out of class for academic purposes. The survey will inquire about what kinds of activities you perform, frequency of use, and types of mobile devices you use.

Your university has given me permission to request you to participate in this study and the results will be used in my dissertation at Pepperdine University. The findings will be made available to you at the conclusion of my study. My work is being supervised by Dr. Linda Polin, chair for the Learning Technologies program at the university.

People who agree to participate in this study will be entered in a drawing for one of two $50 Amazon gift cards. One student and one faculty gift card will be awarded. Those who wish to be entered in this drawing may provide their school affiliated email address after clicking agree.

The survey consists of three sections, should take no more than 10-15 minutes, and will be open for one month. Your responses will be confidential and I will not collect identifying information such as name, IP address, or email address unless you provide an email address to be entered inb the gift card drawing. You may withdraw from the study at anytime and it will not eliminate you from the pool for the gift card drawing. Participation is the study in strictly voluntary.

Confidentiality
All information provided will be kept confidential. All data is stored in a password protected electronic format. To help protect your confidentiality, if you provide your email for the drawing, it will be stripped from the rest of your responses. The survey response will not contain any information that will personally identify you. The results of this study will be used for scholarly purposes only.

Risks/Benefits
The only foreseeable risk associated with this study is the imposition on your time, 10-15 minutes. The study will be beneficial in that it may provide data to help instructors to better implement mobile devices into their academic courses.

For the purpose of this study, mobile devices will be defined as handheld devices that are wifi enabled, application based, lightweight (typically less than 2 pounds), with a small display screen, and has a small keyboard or touch screen. These devices will include, but are not limited to: iPads, iPod touches, Kindles, Smartphones, and other tablet computers. Mobile devices will have the following capabilities, text message, email, internet, or applications. For the purpose of this study laptops, netbooks, or Chromebooks will not be considered as mobile devices.

If you have any questions at any time about the study or the procedures that are being used, you may contact me: Malia Hoffmann, at [redacted]. My dissertation advisor, Dr. Linda Polin can be reached at

This research has been reviewed according to Pepperdine University IRB procedures for research involving human subjects.

ELECTRONIC CONSENT: Please select your choice below. Clicking on the *agree* button below indicates that: * you have read the above information * you voluntarily agree to participate * you are at least 18 years of age. If you do not wish to participate in the research study, please decline participation by clicking on the *disagree* button.

Thank you for your participation.

- ○ Agree
- ○ Disagree (end the survey)

If you would like to be entered in the drawing for one of two Amazon $50 gift cards, please provide your school affiliated email address below. One will be drawn for the student participants and one for the faculty.

This study is going to ask you about your use of mobile devices. For the purpose of this survey, mobile devices will be defined as handheld devices that are wifi enabled, application based, light weight (typically less than 2 pounds), with a small display screen, and has a small keyboard or touch screen. These devices will include, but are not limited to: iPads, iPod touches, Kindles, Smartphones, and other tablet computers. Mobile devices may have the following capabilities, text message, email, internet, cameras, and/or applications. For the purpose of this study laptops, netbooks, or Chromebooks will not be considered as mobile devices.

These mobile devices can be ones that you own or that you have regular access to through someone else. If you don't have regular access to a mobile device you are not eligible to take the survey, but we appreciate your volunteering.

This survey is broken into three parts, the first part asks general questions, the second part asks about the frequency and use of mobile devices, and the third part asks for examples of mobile device usage. This survey should take you no more than 30-45 to complete.

Section 1: General Questions
This section will ask you general questions about your age, major, access to mobile devices, the features of those devices, and applications you use.

What's your current age?

What is your major?

Do you own or have regular access to a mobile, web-enabled, device (smartphone, tablet, or dedicated e-reader)?

- ○ No - Don't continue on
- ○ Yes, What is it? (list all mobile devices you use regularly)

What are the features of your device/s? (check all that apply)

- ☐ digital books, e.g. Hunger Games
- ☐ web searching, e.g. Wikipedia
- ☐ camera
- ☐ view PDFs
- ☐ run applications, e.g. Twitter
- ☐ email
- ☐ texting (SMS)
- ☐ stream videos, e.g. YouTube
- ☐ stream music, e.g. Pandora

What do you read on your device/s? (check all that apply)

- ☐ school books
- ☐ textbooks
- ☐ webpages/content
- ☐ newspapers, magazines, journals
- ☐ PDFs
- ☐ other

Which categories of apps do you use most frequently for personal use? (check as many as apply)

- [ ] Books (CourseSmart, Inkling, iBooks, Kindle app)
- [ ] Campus Specific Applications
- [ ] Cloud Based Apps (Google Apps, Evernote, Dropbox)
- [ ] Communication (Email, Chat, Messaging, Skype, FaceTime)
- [ ] Access campus LMS (Blackboard, Sakai, Collaborate, Go to Meeting)
- [ ] Educational packages (Flash Cards, Test Prep, Khan Academy)
- [ ] Educational streams (iTunes U, Vimeo, YouTube)
- [ ] Entertainment (Netflix, Hulu+, Flixster, Amazon Prime, Other TV apps)
- [ ] Games (Angry Birds, Farm Hero Saga, Candy Crush, Flappy Birds)
- [ ] Music (Pandora, TuneIn Radio, Spotify, iTunes)
- [ ] Navigation (Maps, Google Maps, MapQuest)
- [ ] News (CNN, New York Times, Instapaper)
- [ ] Photography (Instagram, iPhoto, Hipstamatic)
- [ ] Productivity (Pages, Keynote, Shared Calendar)
- [ ] Reference (Wikipedia, WolframAlpha, Dictionary)
- [ ] Social Networking (Facebook, Twitter, Pinterest, Instagram, Snapchat)
- [ ] Click to write Choice 17

Section 2: Frequency and Uses of Mobile Devices
In this section questions ask about the types of apps you use in and out of class and the frequency in which you use them.

Do you ever use mobile apps to complete assignments?

- ○ No
- ○ Yes: Tell me about a time when you did

If yes, how often?

- ○ Several times a day
- ○ About once each day
- ○ Several times a week
- ○ About once each week
- ○ Less than once a week
- ○ Never

Name a few mobile apps that you use outside of class.

Name a few mobile apps that you use inside of class.

What are some reasons you are using mobile devices? (check as many as apply)

- [ ] Improve my quality of work
- [ ] Make it easier to access my work
- [ ] Make it easier to complete my course work
- [ ] Increase my knowledge in my field of study
- [ ] Increase my motivation toward completing my coursework
- [ ] Increase my communication with other students
- [ ] Increase my communication with my instructor
- [ ] Increase my efficiency with tasks
- [ ] Collaborate with others
- [ ] Turn in assignments
- [ ] Quiz or Poll
- [ ] Other

For the next question, please Indicate how often you use the following devices for academic purposes in class.

	Almost Constantly	Several times a day	Daily	Several times a week	Several times a month	Never	N/A
Smartphone (e.g. iPhone, Android phone)	○	○	○	○	○	○	○
Tablet (e.g. iPad/iPad mini, iPod Touch, Kindle Fire, Android Tablet, Nook Color)	○	○	○	○	○	○	○
Ebook Reader (e.g. Kindle, Nook, Sony Reader)	○	○	○	○	○	○	○
Laptop	○	○	○	○	○	○	○
Other: Name	○	○	○	○	○	○	○

For the next questions, please Indicate how often you use the following devices for academic purposes out of class.

	Almost Constantly	Several times a day	Daily	Several times a week	Several times a month	Never	N/A
Smartphone (e.g. iPhone, Android phone)	○	○	○	○	○	○	○
Tablet (e.g. iPad/iPad mini, iPod Touch, Kindle Fire, Android Tablet, Nook Color)	○	○	○	○	○	○	○
Ebook Reader (e.g. Kindle, Nook, Sony Reader)	○	○	○	○	○	○	○
Laptop	○	○	○	○	○	○	○
Other: Name	○	○	○	○	○	○	○

Block 2

Section 3: Examples of Mobile Device Usage
This section will ask you about examples of how you have used mobile devices in and out of class.

Tell me about a time when you used a mobile device in class.

Tell me about a time when you used a mobile device out of class.

Tell me about a time when an instructor has explicitly asked you to use a mobile device.

The last four questions asks about your personal desires or lack of desire to use mobile devices.

Which, if any, of the following would you like to be able to use in class? (check all that apply)

- [ ] Smartphone (e.g. iPhone, Android phone, iPod Touch)
- [ ] Tablet (e.g. iPad/iPad mini, Kindle Fire, Android Tablet, Nook Color)
- [ ] Ebook Reader (e.g. Kindle, Nook, Sony Reader)
- [ ] Laptop
- [ ] Other: Name

You may not want to use mobile devices for academics. Which may be reasons why?

- [ ] Limited access to a device
- [ ] Limited access to the Internet
- [ ] Limited funds
- [ ] Lack of technical support
- [ ] Limited or no access to training resources (websites, tutorials, handouts)
- [ ] Other

What are some ways this campus could use mobile devices and apps in the future?

On what device did you use to access this survey?

APPENDIX C

Instructor Quantitative Survey

Informed Consent

Information
This study will focus on how undergraduate students and instructors use mobile devices in and out of class for academic purposes. The survey will inquire about what kinds of activities you perform, frequency of use, and types of mobile devices you use.

Your university has given me permission to request you to participate in this study and the results will be used in my dissertation at Pepperdine University. The findings will be made available to you at the conclusion of my study. My work is being supervised by Dr. Linda Polin, chair for the Learning Technologies program at the university.

People who agree to participate in this study will be entered in a drawing for one of two $50 Amazon gift cards. One student and one faculty gift card will be awarded. Those who wish to be entered in this drawing may provide their school affiliated email address after clicking agree.

The survey consists of three sections, should take no more than 10-15 minutes, and will be open for one month. Your responses will be confidential and I will not collect identifying information such as name, IP address, or email address unless you provide an email address to be entered inb the gift card drawing. You may withdraw from the study at anytime and it will not eliminate you from the pool for the gift card drawing. Participation is the study in strictly voluntary.

Confidentiality
All information provided will be kept confidential. All data is stored in a password protected electronic format. To help protect your confidentiality, if you provide your email for the drawing, it will be stripped from the rest of your responses. The survey response will not contain any information that will personally identify you. The results of this study will be used for scholarly purposes only.

Risks/Benefits
The only foreseeable risk associated with this study is the imposition on your time, 10-15 minutes. The study will be beneficial in that it may provide data to help instructors to better implement mobile devices into their academic courses.

For the purpose of this study, mobile devices will be defined as handheld devices that are wifi enabled, application based, lightweight (typically less than 2 pounds), with a small display screen, and has a small keyboard or touch screen. These devices will include, but are not limited to: iPads, iPod touches, Kindles, Smartphones, and other tablet computers. Mobile devices will have the following capabilities, text message, email, internet, or applications. For the purpose of this study laptops, netbooks, or Chromebooks will not be considered as mobile devices.

If you have any questions at any time about the study or the procedures that are being used, you may contact me: Malia Hoffmann, at Malia.Hoffmann@pepperdine.edu or by cell phone 920-246-7192. My dissertation advisor, Dr. Linda Polin can be reached at Linda.Polin@pepperdine.edu.

This research has been reviewed according to Pepperdine University IRB procedures for research involving human subjects.

ELECTRONIC CONSENT: Please select your choice below. Clicking on the *agree* button below indicates that: * you have read the [redacted] at least 18 years of age. If you do not wish to participate in the [redacted] *ree* button.

Thank you for your participation.

- ○ Agree
- ○ Disagree (end the survey)

If you would like to be entered in the drawing for one of two Amazon $50 gift cards, please provide your school affiliated email address below. One will be drawn for the student participants and one for the faculty.

This study is going to ask you about your use of mobile devices. For the purpose of this survey, mobile devices will be defined as handheld devices that are wifi enabled, application based, light weight (typically less than 2 pounds), with a small display screen, and has a small keyboard or touch screen. These devices will include, but are not limited to: iPads, iPod touches, Kindles, Smartphones, and other tablet computers. Mobile devices may have the following capabilities, text message, email, internet, cameras, and/or

applications. For the purpose of this study laptops, netbooks, or Chromebooks will not be considered as mobile devices.

These mobile devices can be ones that you own or that you have regular access to through someone else. If you don't have regular access to a mobile device you are not eligible to take the survey, but we appreciate your volunteering.

This survey is broken into three parts, the first part asks general questions, the second part asks about the frequency and use of mobile devices, and the third part asks for examples of mobile device usage. This survey should take you no more than 30-45 to complete.

Section 1: General Questions
This section will ask you general questions about years of teaching experience, teaching department, access to mobile devices, the features of those devices, and applications you use.

How long have you been teaching?

In what department do you teach?

Do you own or have regular access to a mobile, web-enabled, device (smartphone, tablet, or dedicated e-reader)?

- ○ No - Don't continue on
- ○ Yes, What is it? (list all mobile devices you use regularly)

What are the features of your device/s? (check all that apply)

- ☐ digital books, e.g. Hunger Games
- ☐ web searching, e.g. Wikipedia
- ☐ camera
- ☐ view PDFs
- ☐ run applications, e.g. Twitter
- ☐ email
- ☐ texting (SMS)
- ☐ stream videos, e.g. YouTube
- ☐ stream music, e.g. Pandora

What do you read on your device/s? (check all that apply)

- ☐ school books
- ☐ textbooks
- ☐ other books
- ☐ webpages/content
- ☐ newspapers, magazines, journals

- [ ] PDFs
- [ ] other

Which categories of apps do you use most frequently for personal use? (check as many as apply)

- [ ] Books (CourseSmart, Inkling, iBooks, Kindle app)
- [ ] Campus Specific Applications
- [ ] Cloud Based Apps (Google Apps, Evernote, Dropbox)
- [ ] Communication (Email, Chat, Messaging, Skype, FaceTime)
- [ ] Access campus LMS (Blackboard, Sakai, Collaborate, Go to Meeting)
- [ ] Educational packages (Flash Cards, Test Prep, Khan Academy)
- [ ] Educational streams (iTunes U, Vimeo, YouTube)
- [ ] Entertainment (Netflix, Hulu+, Flixster, Amazon Prime, Other TV apps)
- [ ] Games (Angry Birds, Farm Hero Saga, Candy Crush, Flappy Birds)
- [ ] Music (Pandora, TuneIn Radio, Spotify, iTunes)
- [ ] Navigation (Maps, Google Maps, MapQuest)
- [ ] News (CNN, New York Times, Instapaper)
- [ ] Photography (Instagram, iPhoto, Hipstamatic)
- [ ] Productivity (Pages, Keynote, Shared Calendar, Gradebook)
- [ ] Reference (Wikipedia, WolframAlpha, Dictionary)
- [ ] Social Networking (Facebook, Twitter, Pinterest, Instagram, Snapchat)

Section 2: Frequency and Uses of Mobile Devices
In this section questions ask about the types of apps you use and ask your students to use, and the frequency of use.

Do you ever ask your students to use mobile apps to complete assignments?

- ( ) No
- ( ) Yes: Tell me about a time when you did

Name a few mobile apps, if any, that you use in your classes.

Name a few mobile apps, if any, that you ask your students to use in your classes.

What are some reasons, if any, you are using mobile devices? (check as many as apply)

- [ ] Improve my quality of instruction
- [ ] Make it easier to access my instructional materials

- [ ] Increase my knowledge in my field of expertise
- [ ] Increase my motivation in students
- [ ] Increase my communication with students
- [ ] Increase my communication with colleagues
- [ ] Increase my efficiency with tasks
- [ ] Increase collaboration for my students
- [ ] Give assignments
- [ ] Quiz or Poll
- [ ] Podcasts/Vidcasts
- [ ] Other

For the next question, please Indicate how often, if at all, you use the following devices in your class.

	Almost Constantly	Several times a day	Daily	Several times a week	Several times a month	Never	N/A
Smartphone (e.g. iPhone, Android phone)	○	○	○	○	○	○	○
Tablet (e.g. iPad/iPad mini, iPod Touch, Kindle Fire, Android Tablet, Nook Color)	○	○	○	○	○	○	○
Ebook Reader (e.g. Kindle, Nook, Sony Reader)	○	○	○	○	○	○	○
Laptop	○	○	○	○	○	○	○
Other: Name	○	○	○	○	○	○	○

For the next questions, please indicate how often, if at all, you ask your students to use the following devices in your class.

	Almost Constantly	Several times a day	Daily	Several times a week	Several times a month	Never
Smartphone (e.g. iPhone, Android phone)	○	○	○	○	○	○
Tablet (e.g. iPad/iPad mini, iPod Touch, Kindle Fire, Android Tablet, Nook Color)	○	○	○	○	○	○
Ebook Reader (e.g. Kindle, Nook, Sony Reader)	○	○	○	○	○	○
Laptop	○	○	○	○	○	○
Other: Name	○	○	○	○	○	○

Block 2

Section 3: Examples of Mobile Device Usage
This section will ask you about examples of how you have used mobile devices and how you have asked your students to use mobile devices.

Tell me about a time when, if at all, you used a mobile device in your class.

Tell me about a time when, if at all, you used asked your students to use a mobile device in your class.

The last four questions asks about your personal desires or lack of desire to use mobile devices.

You may not want to have your students use mobile devices in your classes. Which may be reasons why? (check all that apply)

- [ ] Too big of a time investment
- [ ] Lack of technology knowledge
- [ ] Lack of dependability
- [ ] Student distractions
- [ ] Lack of technical support
- [ ] Limited or no access to training resources (websites, tutorials, handouts)
- [ ] Concerns about cheating or the quality of student work
- [ ] Other

What are some ways this campus could use mobile devices and apps in the future?

On what device did you use to access this survey?

APPENDIX D

Informed Consent

Information

This study will focus on how undergraduate students and instructors use mobile devices in and out of class for academic purposes. The survey will inquire about what kinds of activities you perform, frequency of use, and types of mobile devices you use.

Your university has given me permission to request you to participate in this study and the results will be used in my dissertation at Pepperdine University. The findings will be made available to you at the conclusion of my study. Dr. Linda Polin, chair for the Learning Technologies program at the university, is supervising my work.

People who agree to participate in this study will be entered in a drawing for one of two $50 Amazon gift cards. One student and one faculty gift card will be awarded. Those who wish to be entered in this drawing may provide their school affiliated email addresses after clicking agree.

The survey consists of three sections, should take no more than 10-15 minutes, and will be open for one month. Your responses will be confidential and I will not collect identifying information such as name, IP address, or email address unless you provide an email address to be entered in the gift card drawing. You may withdraw from the study at anytime and it will not eliminate you from the pool for the gift card drawing. Participation is the study in strictly voluntary.

Confidentiality

All information provided will be kept confidential. All data is stored in a password protected electronic format. To help protect your confidentiality, if you provide your email for the drawing,

it will be stripped from the rest of your responses. The survey response will not contain any information that will personally identify you. The results of this study will be used for scholarly purposes only.

Risks/Benefits

The only foreseeable risk associated with this study is the imposition on your time, 10-15 minutes. The study will be beneficial in that it may provide data to help instructors to better implement mobile devices into their academic courses.

For the purpose of this study, mobile devices will be defined as handheld devices that are Wi-Fi enabled, application based, lightweight (typically less than 2 pounds), with a small display screen, and has a small keyboard or touch screen. These devices will include, but are not limited to: iPads, iPod touches, Kindles, Smartphones, and other tablet computers. Mobile devices will have the following capabilities, text message, email, Internet, or applications. For the purpose of this study laptops, netbooks, or Chromebooks will not be considered as mobile devices.

If you have any questions at any time about the study or the procedures that are being used, you may contact me: Malia Hoffmann, at [redacted] or by cell phone [redacted]. My dissertation advisor, Dr. Linda Polin can be reached at [redacted]. If you have questions about your rights as a research participant, you may contact Dr. Thema Bryant-Davis, Chairperson of the Graduate and Professional School Institutional Review Board, Pepperdine University (tel.: [redacted]; email: [redacted]

This research has been reviewed according to Pepperdine University IRB procedures for research involving human subjects.

ELECTRONIC CONSENT: Please select your choice below. Clicking on the *agree* button below indicates that: * you have read the above information * you voluntarily agree to participate * you are at least 18 years of age. If you do not wish to participate in the research study, please decline participation by clicking on the *disagree* button.

Thank you for your participation.

APPENDIX E

Follow Up Email for Participation

Subject: Survey on mobile device usage for academics in and out of class

Greetings,

You may recall an email from me two weeks back regarding my research needs for my doctoral dissertation. Please read on and consider helping me out with my request as I have gotten some support, but I am still in need of more participants.

If you are an undergraduate student or teach at least one class in higher education AND use mobile devices (smartphones, tablets, etc.) please read on. If not, this email does not pertain to you.

I am a doctoral student at Pepperdine University and an Assistant Professor of Educational Technology. I am working on my dissertation researching how undergraduate students and instructors use their mobile devices in and out of class for academic purposes. This study is a quantitative survey that should take no more than 10-15 minutes of your time. CUI's IRB as well as Pepperdine's IRB has approved this research and I will be adhering to their requirements. At the conclusion of this study, the findings will be available to you with suggestions for better implement mobile devices for academic uses.

I am requesting no more than 10-15 minutes of your time to participate in the quantitative survey. If you choose to participate and agree to the terms and conditions, you may voluntarily provide your email address for a drawing to win one of two $50 Amazon gift cards. One will be awarded to a faculty member and one to a student. This survey is hosted here (link) using Qualtrics. You may participate on your computer or your mobile device. I need 100 student

participants and 50 faculty participants to obtain an adequate cross section of the university population. If you are willing to support me in my research please participate in the survey by LIST DATE HERE. If you have any questions or concerns please contact me. Thank you so kindly for your consideration.

Sincerely,

Malia M. Hoffmann

[redacted], [redacted], [redacted]Cell

Assistant Professor, [redacted]

School of Education, M.A. Ed. Ed. Tech

Doctoral Student, Pepperdine University

APPENDIX F

Request for Permission to Conduct Research at Institution A

Dr. Mary S[redacted]

[redacted]

[redacted]

Dear Dr. Mary S[redacted]

My name is Malia Hoffmann, and I am an assistant professor here at Intuition A. The research I wish to conduct for my doctoral dissertation involves the explanation of how students and faculties use mobile devices for academics in and out of class. This project will be conducted under the supervision of my chair, Dr. Linda Polin, professor at Pepperdine University.

I am hereby seeking your consent to disseminate emails to the faculty and undergraduate students at Intuition A with a link to the survey instrument. If you agree, please sign this form or reply to this email indicating so at your earliest convenience so that I may move on towards the Internal Review Board process.

I have provided you with a copy of my dissertation proposal, which includes a copy of the informed consent form to be used in the research process. I will be submitting to the Internal Review Board this week and will provide you with a copy of the letter once I receive it.

If you require any further information, please do not hesitate to contact me on at [redacted] or [redacted]. Thank you for your time and consideration in this matter.

Yours sincerely,

Malia Hoffmann

Intuition A

Pepperdine University Doctoral Candidate

Sincerely,
Malia M. Hoffmann, M.A.Ed.
[redacted]

4 attachments

HoffmannChap1_3Final.docx
593K

Instructor Qualtrics Survey Software.pdf
304K

Scott letter-signed.pdf
92K

Student Qualtrics Survey Software.pdf
371K

Mary Scott <[redacted] Thu, May 15, 2014 at 5:37 AM
To: Malia Ho[redacted]

Dear Malia,

Congratulations on reaching this stage of the dissertation process! By this email, I provide my consent to move your project on to the Internal Review Board at [redacted] for their review.

Blessings,

[redacted]

APPENDIX G

Request for Permission to Conduct Research at Institution B

Dr. Lisa B[redacted]

[redacted]

[redacted]

Dear Dr. Lisa B[redacted]

My name is Malia Hoffmann, and I am an assistant professor at Institution A and a doctoral candidate at Pepperdine University. The research I wish to conduct for my doctoral dissertation involves the explanation of how students and faculties use mobile devices for academics in and out of class. This project will be conducted under the supervision of my chair, Dr. Linda Polin, professor at Pepperdine University.

I am hereby seeking your consent to disseminate emails to the faculty and undergraduate students at Institution B with a link to the survey instrument. If you agree, will you please sign this form or reply to this email indicating so at your earliest convenience so that I may move on towards the Internal Review Board process?

I have provided you with a copy of my dissertation proposal, which includes a copy of the informed consent form to be used in the research process. I will be submitting to the Internal Review Board this week and will provide you with a copy of the letter once I receive it.

If you require any further information, please do not hesitate to contact me on at [redacted] or [redacted]. Thank you for your time and consideration in this matter.

Yours sincerely,

Malia Hoffmann

Pepperdine University Doctoral Candidate

I, _____ agree/disagree to allow Malia Hoffmann, Pepperdine University doctoral candidate, to use the Institution B faculties and students as research participants.

APPENDIX H

IRB Approval

PEPPERDINE UNIVERSITY

Graduate & Professional Schools Institutional Review Board

June 16, 2014

Malia Hoffmann
[redacted]

Protocol #: E0514D03
Project Title: Mobile Devices: Undergraduate Student and Faculty use for academics in and out of class

Dear Ms. Hoffmann:

Thank you for submitting your application, *Mobile Devices: Undergraduate Student and Faculty use for academics in and out of class,* for exempt review to Pepperdine University's Graduate and Professional Schools Institutional Review Board (GPS IRB). The IRB appreciates the work you and your faculty advisor, Dr. Polin, have done on the proposal. The IRB has reviewed your submitted IRB application and all ancillary materials. Upon review, the IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations (45 CFR 46 - http://www.nihtraining.com/ohsrsite/guidelines/45cfr46.html) that govern the protections of human subjects. Specifically, section 45 CFR 46.101(b)(2) states:

> (b) Unless otherwise required by Department or Agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:
>
> **Category (2) of 45 CFR 46.101**, research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: a) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

In addition, **your application to waive documentation of informed consent has been approved.**

Your research must be conducted according to the proposal that was submitted to the IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit a **Request for Modification Form** to the GPS IRB. Because your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the GPS IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite our best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the GPS IRB as soon as possible. We will ask for a complete explanation of the event and your response. Other actions also may be required depending on the nature of the event. Details regarding the timeframe in which adverse events must be reported to the GPS IRB and the appropriate form to be used to report this information can be found in the *Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual* (see link to "policy material" at http://www.pepperdine.edu/irb/graduate/).

6100 Center Drive, Los Angeles, California 90045 ▪ 310-568-5600

Please refer to the protocol number denoted above in all further communication or correspondence related to this approval. Should you have additional questions, please contact Kevin Collins, Manager of the Institutional Review Board (IRB) at gpsirb@peppderdine.edu. On behalf of the GPS IRB, I wish you success in this scholarly pursuit.

Sincerely,

Thema Bryant-Davis, Ph.D.
Chair, Graduate and Professional Schools IRB

cc: Dr. Lee Kats, Vice Provost for Research and Strategic Initiatives
Mr. Brett Leach, Compliance Attorney
Dr. Linda Polin, Faculty Advisor