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Using Technology in Higher Education in King Khalid University

Mohammed Zaidan Almahfud

King Khalid University, College of Education, Saudi Arabia

Abstract: ***Few studies have investigated how university students in the United States or in other countries use smartphone technologies to support their learning. Much of the current research has investigated the general use mobile devices such as smartphones rather than identifying the specific applications used by university students to support their learning. In addition, there is a lack of research investigating the influence of institution, gender and culture on university students' use of smartphones to supporting their learning. The purpose of this study was to investigate how university students from Saudi Arabia used smartphones for learning in the undergraduate teacher education courses. A total 320 undergraduate students from King Kahlid University, Saudi Arabia were surveyed to assess their use of smartphone applications to support their learning. Results from the 43 item smartphone survey found that Saudi students reported their overall use of smartphones as "Never or Rarely" during class and outside of class. The most frequent uses of smartphones reported by Saudi students during and outside of class were for "communicating with others by texting and "accessing course information". Saudi students also reported that they "never or rarely" observed others using their smartphones to dishonestly to complete assignments or during quizzes and exams. Results from this study indicate that smartphone applications are under utilized as a learning tool in higher education. As university students continue to have greater access to mobile devices, university faculty should consider ways to develop courses that are accessible by smartphones and other mobile devices to increase student learning opportunities.***

Keywords: technologies, smartphones, mobile devices,King Kahlid University

1. Introduction

1.1 Smartphone Use InHigher Education

Technology is a relatively new addition to the daily lives of people around the world. More than ever, technology is affecting how people work, how they exercise, and spend leisure time, as well as how children are educated in schools. Modern lives have been revolutionized by this access to information and ease of communication. "[T]echnologies and new forms of mobile communication and collaboration have been widely adopted by young people and integrated into their everyday lives" (Milrad, 2007, p. 62). Smartphones have been a major contribution in this shift to technology-based living. They are often used by individuals who seek to work in multiple contexts including at home, during commutes to work, and on vacation (Butt & Phillips, 2008). Smartphones allow people toaccess information quickly and efficiently while taking breaks from routinework or home activities.For example, King Khalid University(KKU) has recently developed a smartphone app that can be used to access the King Khalid University website in addition to other KKU resources such as online courses, the library and course schedules. Similar results were found in most of Saudi Universities as well.

Currently, estimates that 60 percent of Saudi Arabian people use smartphones in their daily lives(Crum, 2012). The use of mobile devices has enabled seamless access to the Internet across both formal and informal learning contexts (Scanlon, Jones &Waycott, 2005). In the United States for example, sixty-eight percent of white-collar workers report doing using a mobile device (e.g., laptop, smartphone, tablet) for work purposes (Barbier, Bradley, Macauly, Medcalf&Reberger, 2012). Children in Saudi Arabia are now more likely to own a mobile phone than a book suggesting that these devices are supplanting written text for electronic text as a source of information and entertainment.

The use of mobile devices by university students has increased dramatically in recent years and has become their primary source of Internet access on campus (Keller, 2011). A study conducted by Chen &Denoyelles (2013) at the University of Central Florida found that of 1,082 students surveyed, 79% owned a smartphone. A comprehensive study of 100,000 students from 195 college campuses conducted by Dahlstrom in 2013 found that most students stilled owned laptop computers (86%). Sixty-two percent of these same students reported owning smartphones while 15% reported owning tablets. More importantly, 67% of those students who reported owning smartphones or tablets indicated that they used them for academic purposes. This percentage nearly doubled over the percent of students reporting the use of mobile devices for academic purposes in 2011.

Smartphones like table computers and other mobile devices are evolved pieces of technology that have the potential to support studentlearningthe in the classroom. Students can potentially use smartphones torecord a lecture, search for definitions, or send notes to absent students, as well as use the collaborate with other students electronically to complete homework assignments. A smartphone is basically a hand held computer that allows users to access many different forms information via the Internet from one single device. A smartphone‟s ability to be used as a classroom learning tool is what gives it greater value to both students and teachers (Cheung, 2009). Web 2.0 in particular social networking software applications allows the smartphone to become a research, note taking, recording, and entertainment device that has great potential for supporting learning formally inside the classroom and informally outside of the classroom(Solvberg&Rismark,2012).One advantage of Web 2.0 applications over programs used on with a laptop computer, for example, is that they are relatively inexpensive. A smartphone "app" for note taking or a study organizer can be free or cost less than ten dollars, but the same type of program for a computer can cost the student a

lot of money.

With a smart phone, hundreds of apps are at your fingertips, bringing total convenience to a wide variety of situations. Apps can provide you with the exact same features as some incredibly expensive items on the market, all from the portable touch screen of your phone.(Black, 2012)

Mobile devices, such as smartphones, have great potential to improve educational systems worldwide because of opportunities they offer for seamless access to learning environments across multiple contexts and personalized learning experiences. It is a vital resource to countries that hope to remain academically competitive.

The use of smartphones in higher education has been shown to enhance learning when they are used with Mobile Web 2.0 applications to access podcast lectures, streaming video, social networking sites and a host of other course resources (Cochrane & Bateman, 2009; Huang, Wu & Chen, 2012; Solberg &Rismark, 2012; Williams& Pence, 2011).

For this study, an assignment embedded with mobile QR codes that allowed students to access supplemental materials and questions more efficiently using their smartphones. Students in the experimental group accessed the assignment questions and typed the answers to questions on their smartphones prior to group discussions while control group students answered questions individually with no group collaboration. Findings from this study indicated that participants in the experimental group using smartphones to write answers and discuss them with their peers realized better learning outcomes than their control group counterparts.

The increased availability of social networking software available for mobile devices provides opportunities for student to cheat by texting answers and sending other media that provides answers during tests and quizzes. Students‟ texting during class is a common practice. For example, a survey of 269 college students conducted by Tindall and Bohlander (2011) found that the majority of students reported sending and receiving text messages from others during class time while a minority indicated that they texted during an exam at least once.Cheating has always occurred in and outside of the classroom, however, smartphones and other mobile devices have allowed students to much more easily obtain and shareinformation dishonestly during tests and quizzes(Carter, 2012).

The potential for distractions and dishonest behavior related to smartphone use has caused many US public schools to ban their use (Schacter, 2009). However, despite the negative aspects of smartphone use, universities appear to be embracing the use of smartphones in the classroom. Anectodotal studies investigating the use of smartphones in higher education suggest that learning is enhanced when these mobile devices are used with Web 2.0 applications to access podcast lectures, streaming video, social networking sites and a host of other course resources (Cochrane & Bateman, 2009; Huang, Wu & Chen, 2012; Solberg &Rismark, 2012).

However, the use of smartphones by student in higher education classrooms is not embraced internationally. There are many countries that perceive that disadvantages of smartphones related to distractions and cheating outweigh the learning benefits they have the potential to provide. For example,as of 2013, in Saudi Arabia it is not culturallyacceptable for students of any age to use smartphones during the school day or in other certain situations, such as when they arewith parents, visitors, or attendingmeetings. Such behavior is considered disrespectful because the smartphone user is not giving his full attention to the other person involved in the conversation. In addition, instructors in Saudi Arabia are also expected to refrain from using smartphones in the classroom primarily because there have been instances of teachers inappropriately using smartphone technology to record videos of students and post them on the Internet. The Saudi government has dealt harshly with theseteachers by demoting them to a low ranking secretarial position where they earn least halfof their teacher salary. The severity of this punishment has caused teachers to not allow smartphone use in their classes even when they could be used in positive ways to enhance learning. The use of Smartphones by female students in Saudi Arabia is particularly restricted because of fears of inappropriate use for taking pictures. The cultural norms in Saudi Arabia strictly forbid taking pictures of females and sharing those pictures with others outside their immediate families.

2. Problem Statement

As smartphones and other mobile device use continues to increase on college campuses, institutions and their faculties will need to develop sound strategies to leverage their use for creating a more personalized and student-centered learning environment.To date, only a handful of studies have been conducted in the USA and other in countries to investigate how university students use smartphones to support their learning. Most of this research is focused on the use of the mobile devices themselves rather than investigating how they support student learning in formal classroom settings as well as in more informal settings outside of the classroom. In addition, the research studies that have been written about benefits and limitations of smartphone report very little empirical evidence to support their claims (Merchant, 2012

3. Purpose Statement

The purpose of this study was to investigate how Saudi Arabia university students use smartphone for learning in the undergraduate teacher education courses. In particular, it analyzes how university students can use these devices to access course materials and interact with peers and the instructor within and outside the physical boundaries of the classroom. Prior to investigating the benefits of using Smartphones for learning in university classrooms, it wasimportant to first determine a baseline of current technology use in education at King Khalid University. This research was used to better understand the views of students about using smartphones in classroom settings. Further, this research provided answers to many questions such as how technology is already being used, how a student‟s learning is

currently being assessed, how students use their smartphones outside of class, and what barriers there are to the use of mobile technologies in classrooms. The results of this research will provide accurate and vital information to educators and students about how mobile technology can be used in the classroom.

4. Research Questions

1. How do university students in Saudi Arabia use their smartphones inside and outside of the classroom to support their classroom learning?
2. Do university students from Saudi Arabia differ in use their use of smartphones inside and outside of the classroom to support their learning?
3. Do male and female university students from Saudi Arabia differ in their use of smartphones inside and outside of the classroom to support their learning?

5. Limitations and Delimitations

Students‟ perceptions of how they use smartphones may not be accurate. They may over- or underestimate the different ways they use smartphones. Student perceptions of smartphone use may be based on their perceptions of how competent they feel in using smartphone technology. In addition, the prevailing attitude of the Saudi Arabian government as well as Saudi university and faculty is against the use of Smartphones by students in class. However, many Saudi students continue to covertly use their smartphones during class, ignoring the potential consequences.

6. Significance of the Study

The increased access to smartphones by university students suggest that they will dramatically change the way in which learning occurs in universities across Saudi Arabia and around the World. Outcomes from research studies investigating smartphone use in academic settings suggest that they that they have positive impacts on student learning when used appropriately. Using smart phones in education is a new idea, with potentially as much academic applicability as the use ofiPads or lap computers in a classroom setting. The responsible use of smartphones as a tool to enhance education for students is emerging as more important than regulating their use in the classroom:

For years, the conversation about mobile and social technology in schools has revolved around how to block it, but it is becoming increasingly clear that simply blocking such technologies does students a disservice. An education that fails to account for the responsible use of mobile devices and social networks prepares students for our past, but not for their future. (Stead, 2011)

In the classroom, students can use smartphones to accessan unlimited amount of information for completing both individual and collaborate group assignments that use social networking to solve problems. Smartphones can be used to access Internet resources such as both interactive websites and videos that explain concepts, define new words or terms, and serve to verify or disproveassumptions.

7. Literature Review

A sample of the major research and data acquisition methods used in the researchliterature reviewed for this study is found in Table 1. Of the twenty-eight research articles listed in Table 2, most used survey and case study data collection methods followed by interviews. Table 1 shows that there is a dearth of action research methods used to investigate the benefits and limitations of smartphone use for educational purposes. Although not reported as a separate research category, almost all of the data collected through surveys and test instruments reported descriptive statistics.

Several important articles that contribute to understanding the pedagogical affordances of smartphones for universities students were written by Park (2011) and Cochrane and Bateman (2009, 2010). Both provide a solid foundation for the use of Pedagogy 2.0 or the use of mobile applications to support student learning. There research along with that of Solvberg and Rismark (2012) also provide evidence to support their claims about how mobile technologies like smartphones can provide educational benefit students both inside and outside of the formal classroom setting. Stephens, Young and Calabrese (2010) provide a good starting point for understanding digital dishonesty and the misuse of mobile technologies in academic settings.

7.1 Technology and Education

People learn in a variety of ways. Theories as to how the brain processes and stores information are abundant. Information processing demonstrates how learners process information, remember content from the past, and solve problems. The student could have learned this informationincorrectly in the past, or information from one source may contradict other information found within the same source. Individuals handle this in different ways:
People have developed ways around [memory constraint] by organizing information, such as grouping together or „chunking“ disparate elements into sets of letters, numbers or pictures that make sense to them (Bransford, 2011, p.18).

Metacognition is thinking about the process of thinking. Its purpose is to reflect on one‟s own performance. Metacognition is as dependent on experience as on knowledge. It can include deliberately memorizing information, as well as coming up with mnemonic strategies, which use rehearsal as a technique. Rehearsal works when students repeat facts and figures to themselves multiple times to build a pattern of retrieval in their memory (Bransford, 2011). Technology in particular mobile devices, can assist learners in using metacognitive strategies to support their learning. These devices support metacognitive processes by allow learners to process information inmeaningful ways through personal and contextualized engagement.In addition, to supporting metacognition, there is evidence that demonstrates that access to multimedia information also enriches student learning. Mayer‟s (2009) research found that students who have access to information presented in both verbal and visual formats generated more creative solutions to problems than students who only received visual information from mobile devices such as iPads and smartphones. Smartphones can be used by

students to access the increasing multimedia resources available on the Internet and other information at anytime and anyplace reducing the reliance on memorizedfacts while at the same time increasing opportunities to engage in critical thought necessary to solve problems.

Mobile devices are used to increase communications andproductivity in many of today‟s occupations (Wright, 2011). Introducing k-12 and university students to the use of mobile devices and applications will provide them with job skills that may give them advantage over others when competing for jobs in the workplace.In addition, instruction related to smartphoneswould also teach students how to use mobile applications that have the potential to support their learning. This type of classroom engagementwould help to circumvent the age-old question of "Why is this topic important?"Teachers coulduse smartphones as a focal point for instruction while at the same time preparingstudents for careers requiring the use of sophisticated communication technologies (Kearney et al., 2012).

"The next step toward a truly connected youth is bridging the gap between in-school and out-of-school technology use, both in policy and practice" (Cramer& Hayes, 2010, p. 43). Cramer & Hayes‟ (2010) assertion suggests removing the barriers between education and technology use byletting students use their own mobile devices such as smart phones to support their learning. Creating learning environments that allow universitystudents to engage in classroom activities outside of the classroom in more informal settings such as in the dormitory at home, or at the coffee shop will increase their learning opportunities. Mobile technologies provide university students with access to their coursework from both on andoff campus environments. This type of ubiquitous access not only allows students to access their assignments but also provides feedback in the form of course grades and comments from both their instructors and fellow students. With multiple pressures from families, work, and other daily obstacles, university students of today need to be able to use the precious few minutes of their break, walk, or bus ride home to finish their coursework, read the next day‟s chapters, and check their grades (Solvberg&Rismark, 2012). Access to "seamless learning," (Song et.al, 2012, p. 679) through mobile technology promotes student skills, knowledge, and positive attitudes toward learning outside, as well as inside, the classroom and is an incredibly powerful tool. The level of access provided by mobile technologiesallows students to integrate learning into their lives and provides more opportunities for them to accomplishtheir educational goals as they synthesize information from multiple sources across multiple contexts (Wong, 2011).

7.2 Mobile Learning

Mobile learning (m-learning) refers to the use of mobile or wireless devices such as smartphones, tablets, PCs, and laptops while on the move (Park, 2011). Crompton (2013) further suggests that m-learning can be characterized as "learning across multiple contexts, through social and content interactions, using personal electronic devices.". Within the context of Park‟s definition, learning is no longer limited to the confines of a physical four-walled classroom during a specific period of time. Traxler (2007) suggests that the defining characteristic of mobile learning is finding information and processing it with a community of learners to create knowledge. He further suggests that the delivery model for mobile learning can be characterized as "just-in-time," "just enough," and "just for me" (Traxler, 2007, p. 5).Use of mobile devices provides learners the flexibility to make choicesabout when they engage in coursework and interactions with other learners.

There are conflicting ideas about what constitutes "mobile learning," with some experts believing it is strictly using mobile devices such as PDAs or smartphones. Some university faculty see mobile learning as an extension of e-learning (Keskin, 2011). This perspective suggests that the line between e-learning and mobile learning is not so clear. E-learning involves students taking classes or completing coursework online through an educational Learning Management System (LMS), such as Montana State University‟s Desire2Learn (D2L), while mobile learning is viewed as when a student accesses a course or coursework, whether in class or out of class, from a mobile device such as an iPad, smartphone, or tablet device.

7.3 Effects of Student Perceptions on Technology Use

Three factors need to be considered when talking about how students perceive using technology. The *perceived value* is the expectation of fulfillment of specific needs in regards to a smartphone. *Perceived Ease of Use* refers to the extent that the user can utilize the product easily and with little or no effort. *Perceived usefulness* is the degree to which a user thinks a smartphone will help him or her in daily life (Dharmabotla, 2011). This means that the perception of using a product may overshadow the actual reality of using these products. For example, when purchasing a new smartphone, a student might choose the product he or she thinks will be easy to use, help in daily life tasks, and will fulfill one‟ssmartphone needs. These expectations may not be realistic. The same principle needs to be applied to teachers when they implement mobile technology into their classrooms. They need to be aware that they might do a lot of work for little to no reward as the technology may not be easy to use, or their students might not find it as important as the teacher does. The perceived value of a smartphone is what drives most consumers, students and teachers alike, to purchase one (Dharmabotla, 2011).

7.4 Gender Differences Related to Technology Use

Much has been reported in the literature about gender differences with respect to access and use of the Internet. However, this research is somewhat conflicting. Reseach conducted in the late 1990s suggests that males were more competent in using the Internet than females and used the Internet more often. Odell, Krogen, Schumaker&Delucchi (2000) found that female college students tended to access the Internet more often for emails and school related activities while male college students used the Internet more frequently for entertainment. Joiner et al. (2005) found that although males accessed the Internet much more often for gaming, males and females did not differ Internet use for communication purposes. Other studies have suggested that

males are skilled and have more positive attitudes toward using the Internet than females (Li, Kirkup, & Hodgson, 2001; Sherman et al., 2000). Another reason suggested that may contribute to genders differences related to technology use are results from studies which indicate that females tend to evidence higher levels of anxiety related to the use of computers and the internet (Jackson et al., 2001; Ong & Lai, 2006). Higher levels of anxiety experienced by females could lead to negative attitudes toward using Internet applications thus reducing the likelihood of their accessing the Internet to complete both school-related and personal tasks.

More recent research related to gender differences in computer and Internet use suggests that these differences appear to be diminishing as children are exposed to the applications of information and communication technologies at earlier and earlier ages (Mossberger, Tolbert &Stansbury, 2003). The shrinking gender gap in computer and Internet use is further supported by results from research conducted by the UCLA Internet project which found that males and female participants did not differ in terms of Internet anxiety. Mobile devices, in particular smartphones, may serve to motivate individuals to use the Internet applications to solve problems relate to instructional and home environments. This notion may be especially true when considering the m-learning theory proposed by Crompton (2013), which suggests that users of smartphones have choices about how they interact with these hand-held devices. Individuals can personalize their interactions with Internet by choosing from a range of applications that are familiar and non-threatening. In addition, smartphone users have choices about when and where they access the Internet—thus further personalizing the context within which they choose to engage in tasks related to home and school environments. Providing individuals with choice about how and when they access the Internet is essential for motivating their access and use of the Internet in powerful ways that can improve their everyday lives. An issue related to the literature reviewed for this study is the lack of known research examining gender differences in technology use, particularly with respect to mobile devices, in Saudi Arabia.

7.5 Smartphone Use in Higher Education

Access to smartphone devices by university students continues to grow rapidly. The cost of these devices has decreased while their ease of use has increased. A study conducted by Chen &Denoyelles (2013) at the University of Central Florida found that of 1,082 students surveyed, 79% owned a smartphone. A comprehensive study of 100,000 students from 195 college campuses conducted by Dahlstrom in 2012 found that most students stilled owned laptop computers (86%). Sixty-two percent of these same students reported owning smartphones while 15% reported owning tablets. More importantly, 67% of those students who reported owning smartphones or tablets indicated that they used them for academic purposes. This percentage nearly doubled over the percent of students reporting the use of mobile devices for academic purposes in 2011.

There are many smartphone applications that university students can to support their learning. For example, Web 2.0 technologies allow students to access “Podcasts, oral quizzes and tests Mobile Geotagging sites, Digital Storybooks, photo projects, digital report systems, and research tools” (Kolb, 2011). These resources and many others provide students with a variety of ways to complete coursework in a manner that fits their learning style. The use of mobile devices such assmartphones will continue to grow in importance as not only a learning device but also as a technology that will be important for students to integrate into their repertoire of skills they prepare for 21st century careers (Kolb, 2011).

Solvberg&Rismark (2012) investigated the use of mobile learning devices with university students in Norway enrolled in an undergraduate sociology course. They created recorded video lectures that could be accessed with smartphones, tablets and other mobile devices. Three different learning environments were created for students to access course lectures.The first learning environment provided studentswith an opportunity to watch a class lecture via computer in real time from another location. During this lecture, students were able to ask questions and interact with the lecturer in real time, but felt awkward because they were in front of cameras and recorders. Most students did not attend these lectures after a while, because the lectures could also be viewed at home. The second learning environment allowed students to watchthe lecturesat different locations on campus and complete coursework and submit it to the instructor via the Internet.Students reported that they liked the flexibility of this learning environmentbecause they could access recorded lectures based on their own class and work schedules. The third learning space created allowed students to access lectures off-campus. Most students read or listened to audio for their courses from their cars or public transport. Students indicated that they enjoyed being able to multi-task and go about their daily lives without missing important class content. Although Solvberg&Rismark‟s (2012) study found that all three types of learning environments had benefits and limitations, they all offered learners a personal choice about the type of learning environment that they felt was most effective for meeting their learning needs.

8. Methods

Research related to the use of mobile devices has just begun to investigate how mobile devices such as smartphones can be used to enhance student learning. Only a handful of studies have been conducted in the US and other in countries to investigate how university students use smartphones to support their learning. Most of this research is focused on the use of the mobile devices themselves rather than the pedagogical affordances that they offer. Although there is isolated evidence about students’ use of smartphones in higher education, there is little research about the influence of institution, gender and culture on university students’ use of smartphones for learning (e.g., Cochrane & Bateman, 2009).

The purpose of this study was to investigate how Saudi Arabia university students use smartphones for learning in the undergraduate teacher education courses. In particular, the study addressed how King Khalid University students use these devices to access course materials and interact

with peers and the instructor within and outside the physical boundaries of the classroom.

8.1 Research Questions

1. How do university students in Saudi Arabia use their smartphones inside and outside of the classroom to support their classroom learning?
2. Do university students from Saudi Arabia differ in use their use of smartphones inside and outside of the classroom to support their learning?
3. Do male and female university students from Saudi Arabia differ in their use of smartphones inside and outside of the classroom to support their learning?

8.2 Design

This descriptive study used a survey design to collect data about university undergraduate education majors‟ use of smartphones. The survey focused on how university students use their smartphones inside and outside of classroom. Undergraduate teacher education students in Saudi Arabia were surveyed to determine how they use smartphone technology to support their learning both inside and informally outside of the classroom.

8.3 Participants

The participants for this study were 320 undergraduate teacher education students from King Khalid University (KKU) located in Aba, KSA. KKU is public University. The demographic information is presented in Table 3.

Table 3: KKU Student Demographics

King Khalid University	*f*	*%*
Gender		
Male	157	49.1
Female	163	50.9
Class Standing		
Freshman	39	12.2
Sophomore	225	70.5
Junior	46	14.4
Senior	9	2.9

The numbers of males and females participating in the study from KKU were almost equal. When examining class standing, the majority of undergraduates from KKU were Sophomores (70.5%). The average ages of the undergraduate teacher education students from KKU (M = 23.67, SD = 8.08).

8.4 Instruments

A survey based on research conducted by the University of Missouri (Carter, 2012)review of the Smartphone literature and classroom observations was developed to assess university students‟ perceptions of smartphone usage (DeVellis, 2003).One version of the smartphone survey items was written in English and the other version was written using Arabic language for administration to the KKU students. Once the Smartphone survey items were written, they were sent to a select group of KKU university professors and graduate students to review for clarity, understanding and bias using procedures recommended by DeVellis (2003). This expert review panelprovided comments to improve the clarity and accuracy of the survey questions used to collect data for this study. After receiving feedback from expert reviewers, items were revised where necessary and the revised items were piloted with undergraduate education students. Results from the pilot study found that the internal consistency reliability for the final 41-item scale was.91 for KKU students.

8.5 Procedures

The final version of the43-item survey was administered to gather perceptions of how university students‟ majoring in Educationused theirsmartphone use in and outside of the classroom.Students were asked to respond to each question using afive-point Likert scale consisting of the following descriptors: (1) Never (Not at all), (2) Seldom (less than weekly), (3) Sometimes (multiple times a week but not daily), (4) Often (Daily), and (5) Always (Multiple times a day).Seven multiple-choice demographic questions were included in the survey, along with four open-ended questions. The Smartphone survey was distributed to students in a face-to-face classroom setting. Once students completed the survey, it was be collected by the researcher and student responses were entered into the Statistical Package for the Social Sciences (SPSS) for analysis.

9. Results

The purpose of this study was to investigate how US university students and university students from Saudi Arabia use smartphone for learning in the undergraduate teacher education courses. In particular, how King Khalid University and Montana State University students use these devices to access course materials and interact with peers and the instructor within and outside the physical boundaries of the classroom.

The Coefficient Alphas for the 43survey items was.98 indicating satisfactoryinternal consistency reliability according to criteria proposed by Crocker &Algina (2006).

Research Questions 1 and 2 were answered by presenting the descriptive statistics for smartphone use inside and outside of the class in Tables 4 and 5. In addition, the results reported these tables also report results from institutional comparisons.

Descriptive statistics reported in Table 4 shows that KKU Generally students reported“never or only rarely” using their smartphones in class. The items with the highest average frequency of use by KKU students were “communicate with others by texting” (M = 3.01, SD = 1.33) and “accessing course information” (M = 2.55, SD = 1.31). The lowest average item rating by KKU students was for “recording a lecture” (M =1.68, SD = 1.04).KKU students reported used their smartphones in class significantly more often for “listening to a lecture (podcast)”

Table 4: Descriptive Statistics for KKU Smartphone Use Within Classrooms for Saudi Students

Item	KKU	
	M	*SD*
How often did you use your Smartphone during class to:		
1. access course information (e.g., syllabus, assignments etc.)?	2.55	1.31
2. read course materials (e.g., notes)?	2.35	1.18
3. take notes in class?	2.28	1.30
4. find the meaning words or terms used in class?	2.14	1.18
5. find reference material for class activities/assignments?	2.21	1.29
6. view pictures (e.g., diagrams, maps, etc.)?	1.99	1.16
7. view PowerPoints?	1.86	1.20
8. record a lecture?	1.68	1.04
9. listen to a lecture (e.g., podcast)?	2.25	1.41
10. view a course video?	1.87	1.17
11. communicate with others by texting?	3.01	1.33
12. communicate with others about class assignments through email?	1.96	1.22
13. participate in polls created by the instructor (vote on class issues)?	2.13	1.26

Table Note. Items were rated by students using a five-point Likert scale where 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often and 5 = Always. [a]Mean, [b]Standard Deviation,

The descriptive results from the analysis of the smartphone survey items shows thatthe average item ratings for KKU students again indicated that for the most part they "Never or Rarely" used their smartphones outside of the classroom to support their learning. The two items rated the highest on average by KKU students was for "accessing course information (M =3.00, SD = 1.35) and "communicating with others about assignments by texting" (M = 2.76, SD = 1.40). The lowest rated item was "collaborating on assignments with others by texting, emails or wikis" (M =1.50, SD = 1.09).

Table 5: Descriptive Statistics for KKU Students Smartphone Use Outside of the Classroom

	KKU	
Item	*M*	*SD*
How often did you use your Smartphone outside of class to:		
14. access course information (e.g., syllabus, assignments etc.)?	3.00	1.35
15. read course materials (e.g., notes)?	2.39	1.26
16. find the meaning words or terms used in class?	2.32	1.23
17. find reference material for class activities/assignments?	2.18	1.31
18. view pictures (e.g., diagrams, maps, etc.)?	1.94	1.25
19. view PowerPoints?	1.82	1.13
20. listen to a lecture (e.g., podcast)?	1.99	1.28
21. view a course video?	2.00	1.27
22. communicate with others about assignments by texting?	2.76	1.40
23. communicate with others about assignments through email?	2.13	1.29
24. collaborate on assignments with others by texting, emails or wikis	1.50	1.09
25. participate in polls created by the instructor (vote on class issues)?	2.19	1.27

Table Note. Items were rated by students using a five-point Likert scale where 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often and 5 = Always. [a]Mean,[b]Standard Deviation,

Research Question 3

"Do male and female university students from Saudi Arabia use their use of smartphones inside and outside of the classroom to support their learning?"

The descriptive statistics for smartphone use inside the classroom by gender are reported for KKU students in tables 6 and 7.

Items responses for KKU male and female students were found to be significantly non-normal and in many cases the group variances were also significantly different. Due to violations of the assumptions necessary to conduct parametric *t*-tests, nonparametric Mann-Whitney U tests were performed to compare average item ratings by genderfor smartphone use both inside and outside of the classroom. Family-wise error rates were corrected for by dividing the alpha level by the number of comparisons. In this case, the alpha level of .05 was divided by 13, yielding a threshold for significance of .004. Effect sizes were also calculated to eliminate the effects of sample size on thesignificance of comparisons using procedures outlined in Corder&Foreman (2009). Effect sizes based on Cohen"s (1988) work were interpreted as follows: .01 = small, .30 = moderate and .50 = large.

KKU males rated their average use of smartphones inside the classroom significantly higher than females for "communicating with others about class assignments through email," "reading course materials" and "viewing pictures." Although these differences were significant, the

effect sizes were considered very small in magnitude indicating the differences were not of practical significance.

Table 6: Results for KKU Gender Comparisons, Smartphone Use Inside the Classroom

Item	Males		Female		
	M[a]	*SD*[b]	*M*	*SD*	Effect size
How often did you use your Smartphone during class to:					
1. access course information (e.g., syllabus, assignments etc.)?	2.65	1.23	2.46	1.39	.08
2. read course materials (e.g., notes)?	2.52	1.10	2.19	1.24	.16*
3. take notes in class?	2.31	1.13	2.24	1.43	.07
4. find the meaning words or terms used in class?	2.02	.999	2.24	1.33	.04
5. find reference material for class activities/assignments?	2.12	1.10	2.31	1.44	.02
6. view pictures (e.g., diagrams, maps, etc.)?	1.94	1.02	2.04	1.29	.01*
7. view PowerPoints?	1.62	.950	2.10	1.36	.16
8. record a lecture?	1.59	.883	1.78	1.16	.03
9. listen to a lecture (e.g., podcast)?	2.13	1.29	2.38	1.52	.06
10. view a course video?	1.78	1.02	1.96	1.30	.04
11. communicate with others by texting?	3.30	1.22	2.98	1.44	.02
12. communicate with others about class assignments through email?	1.67	.957	2.25	1.36	.20*
13. participate in polls created by the instructor (vote on class issues)?	2.04	1.16	2.21	1.34	.05

Table Note. Items were rated by students using a five-point Likert scale where 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often and 5 = Always. [a]Mean, [b]Standard Deviation, *$p \leq .004$

Mann-Whitney U tests were used to compare KKU males and females bysmartphone use outside of he classroom. Results indicated that KKU females reported using their smartphones an average significantly more often than KKU males for "viewing Power Points" and "viewing Pictures." However, the effect sizes for these differences were very small in magnitude.

Table 7 Results for KKU Gender Comparisons by Smartphone Use Outside of Class

Item	Males		Female		
	M[a]	*SD*[b]	*M*	*SD*	Effect size
How often did you use your Smartphone outside of class to:					
14. access course information (e.g., syllabus, assignments etc.)?	2.93	1.25	3.08	1.45	.06
15. read course materials (e.g., notes)?	2.37	1.16	2.40	1.35	.02
16. find the meaning words or terms used in class?	2.19	1.04	2.45	1.38	.07
17. find reference material for class activities/assignments?	1.97	1.15	2.38	1.43	.13
18. view pictures (e.g., diagrams, maps, etc.)?	1.67	1.03	2.20	1.38	.20*
19. view PowerPoints?	1.47	.707	2.18	1.36	.26*
20. listen to a lecture (e.g., podcast)?	1.79	1.04	2.19	1.45	.10
21. view a course video?	1.87	1.13	2.13	1.38	.08
22. communicate with about assignments by texting?	2.53	1.22	3.00	1.53	.14
23. communicate with others about assignments through email?	1.89	1.05	2.39	1.45	.15
24. Collaborate on assignments with other by texting, email or through wikis.	1.29	.487	1.71	1.50	.01
25. participate in polls created by the instructor (vote on class issues)?	2.05	1.12	2.32	1.40	.06

Table Note. Items were rated by students using a five-point Likert scale where 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often and 5 = Always. [a]Mean, [b]Standard Deviation, $p < .004$

10. Discussion

The use of mobile devices by university students has increased dramatically in recent years and has become their primary source of Internet access on campus (Keller, 2011). Several studies have found that the majority of students attending college own a laptop in addition to a smartphone (Chen &Doyelles, 2013). More importantly, the majority of students owning smartphones and other mobile devices, such as tablets, reported using these devices for academic purposes. The use of mobile devices has provided opportunities for university students to personalize their learning to fit their individual needs (Crompton, 2013). Students can utilize the technology they have to streamline information access and learn in a way that makes sense to them. Portable laptop computers and tablets allow students to engage in learning activities in both formal and informal contexts. For example, they can complete written papers and other homework assignments in a variety of different places outside of the classroom such as the library, at home, or at the local coffee shop. Even during class, students are able to send and receive information related to concepts taught in class through texting and instant messaging (Dahlstrom,Walker&Dzuiban, 2013). Students are able to quickly take notes, record lectures, review Point Presentations, pictures and other resources that their professors have made available online.Students are afforded more opportunities to engage in personalized learning.

Smartphones, like tablet computers and other mobile devices, are powerful technologies that have the potential to support student learning within the context of multiple

learning environments. A smartphone‟s ability to be used as a classroom learning tool is what gives it greater value to both students and teachers (Cheung, 2009). Web 2.0 software applications allow the smartphone to become a research, note taking, recording, and entertainment device that has great potential for supporting learning formally inside the classroom and informally outside of the classroom (Solvberg&Rismark,2012).One advantage of Web 2.0 applications over programs used on a laptop computer, for example, is that they are inexpensive as compared to computer software programs. Mobile devices, such as smartphones, have great potential to improve educational systems worldwide because of opportunities they offer for seamless access to learning environments across multiple contexts and personalized learning experiences. It is a vital resource to countries that hope to remain academically competitive.

As smartphone and other mobile device use continues to increase on college campuses, institutions and their faculties will need to develop sound strategies to leverage their use for creating a more personalized and student-centered learning environment. However, there is research available to guide the use of mobile technologies such as smartphones for learning. Most of this research is focused on how students use mobile devices rather than relating their use to pedagogies that are in turn linked to solid learning outcomes. Little empirical evidence exists to guide faculty‟s intentional use of technology that takes advantage university students‟ access to smartphone devices.

This study was conducted to investigate how university students and university Saudi Arabia use smartphones for learning in the undergraduate teacher education courses. Specifically, this study examined how university students used these devices to access course materials and interact with peers and the instructor within and outside the physical boundaries of the classroom. The results from this research will provide universities and their faculty with a better understanding of student views about using smartphones in classroom settings. This research further provided answers to many questions about how smartphone technology is currently being used both inside and outside of the classroom, and what barriers exist relative to the use of mobile technologies in classrooms. The results of this research provide accurate and vital information to educators and students about how mobile technology can be used to support learning in both formal context of the physical classroom and in other contexts outside the walls of the physical classroom.

As smartphones and other mobile device use continues to increase on college campuses, institutions and their faculties will need to develop sound strategies to leverage their use for creating a more personalized and student-centered learning environment. However, there is research available to guide the use of mobile technologies such as smartphones for learning. Most of this research is focused on how students use mobile devices rather than relating their use to pedagogies that are in turn linked to solid learning outcomes. Little empirical evidence exists to guide faculty‟s intentional use of technology that takes advantage university students‟ access to smartphone devices.

11. Conclusions

Smartphone use both inside and outside of the classroom by preservice teachers atKing Khalid university reported using their smartphone never to rarely both In general. Students from KKU reported using their smartphones often to communicate with others about their classes through texting, also using texting applications to communicate with others during class and to gain information about course assignments. This finding is alignedwith other research reporting that texting is a common method for communicating with others. For example, recent research by Davis (2010) found that young people are using texts an average of fifty-three hours per week as compared to the seventy-seven minutes per day documented in 2004. In addition, Tindall and Bohlander (2012) survey found that university students‟ use of smartphones for texting is prevalent before and during class at the college level. The majority of students surveyed reported sending or receiving a text message in class at least once or twice while about one-third text in class every day.

Saudi university students are permitted to possess smartphones, instructors do not encourage their use as a learning tool. In addition, online learning is just beginning to emerge in Saudi universities, and the amount of online resources that could be used to access smartphones is sparse (Al-Fahad, 2009),reducing access to course information and collaboration on assignments through texting or email outside of classes. KKU students were also found to use their smartphones much lessoften for collaboration. The predominant teaching style by public schools and institutions in the Middle East is teacher-centered (Porcaro& Al Musawi, 2009).

12. Smartphone Use by Gender

There were very few and small differences were found for KKU gender comparisons. Results from this research found that females use their smartphones more often than males for accessing course information, reading course materials and viewing pictures. This outcome, however, contradicts results from research conducted by Ding (2009), who found that females tend to engage with technologies such as smartphones far more verbally and less visually than their male counterparts. For KKU students, cultural differences may play a role in smartphone use. In Saudi Arabia, universities are tolerant of male use of smartphones in the classroom while smartphone use by female university studentsis strictly prohibited due to fear that pictures of unveiled women could be distributed electronically. (Alzabn&Altruraif, 2007).

Our results also seem to confirm that there are fewer gender gaps in the use of mobile technologies between males and females evidenced by the fact that 2 of 13 items for smartphone use outside of class. (combine this paragraph with the next)KKU females were found to be more likely to use smartphone applications than their male counterparts only for viewing pictures and Power Points outside of the classroom. These differences were minor and might be explained by women‟s role in the Saudi Culture. Women spend more time in their homes than Saudi males and rely

on their smartphones more often to interact with others and access information. However, the low frequency of access for both males and females using their smartphones outside of class could also be because there are not many learning materials related to their university coursework available. E-learning in Saudi Arabia is only beginning to be used to deliver instruction and it could be that university faculty do not use many web-based resources for students to access outside of the physical boundaries of the face-to-face classroom (Hussan, 2011).

13. Conclusion

Results from this study indicate that smartphone applications are underutilized as a learning tool by universities and their faculty to support student learning. Although the m-learning research, particularly with respect to smartphone use, is fairly recent, results from this study and others suggest that faculty should consider how they can develop course materials that are accessible by smartphones and other mobile devices. Curriculum development designed with respect to mobile technologies is vitally important to increase student opportunities for students to learn as university students‟ access to mobile technologies continues to grow.

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