IMPACT OF MOBILE LEARNING ON ACADEMIC MOTIVATION: UNIVERSITY STUDENTS' PERSPECTIVE

Nabeela Sulaiman, University of Education, Lahore
Raheela Shahid, Bahauddin Zakariya University, Multan

ABSTRACT

This cross-sectional study administered a questionnaire on mobile learning experiences and academic motivation to students from three public universities in Pakistan. Descriptive and path analysis was used to explore mobile learning, level of academic motivation, and their inter-relationships. Partial least squares algorithm was used to measure the model. The results highlighted that 78% of smartphone users utilized their device for learning purposes. Furthermore, path analysis revealed that smartphone use for nonacademic purposes negatively affected students' academic motivation, while educational use of smartphones had a significant positive impact on their academic motivation. This study contributes to the literature of self-directed, technology-based learning among university students.

Keywords: mobile learning, university students, technology acceptance, smartphone, academic motivation, self-directed learning

INTRODUCTION

The 21st century has seen tremendous development in the use of mobile technologies for the process of teaching and learning (Chung et al., 2015; Shaikh & Karjaluoto, 2015; Turban et al., & Turban, 2015). This growth can be attributed to a rapid decrease in the cost of such technologies and a considerable increase in research on mobile-device based learning. Easy access to mobile technology has driven millions of users to use smartphones. Having grown up with this technology, the students are ideal candidates for mobile-based learning due to their remarkable familiarity with tablets and smartphones (Cheon et al., 2012). University students worldwide are now utilizing this facility to improve the quality of their learning (Alfawareh & Jusoh, 2014). Furthermore, it seems that the students are motivated by using mobile devices in an educational context, which is vital, as student motivation is necessary for quality education (Vero & Puka, 2017). Therefore, this study explores the impact of mobile learning on university students' motivation in Pakistan.

CONCEPTUAL FRAMEWORK

Concept of Mobile Learning

Learning has been mobile since the beginning of formal instruction. Prior to the technology age, the term mobile learning referred to the ability to exchange learning material (Guy, 2010). The potential for mobile learning changed in the 1960s with the invention of laptops. Since the 1960s, technological advances have continued to make learning through mobile devices easier. It first appeared in 2000 (Quinn, 2011).

Several formal definitions of mobile learning have appeared in the literature over the last 20 years. Some early studies described it as a kind of learning that is associated with devices, particularly new technologies. Attewell and Savill-Smith (2004) examined the utilization of mobile devices for instruction and teaching purposes. Their research was considered the introductory research for learning through technology. O'Malley et al. (2005) described mobile learning as learning activity that can occur using a mobile device. It has also been defined as learning using

a mobile phone and smart technologies such as tablets and smart phones (El-Hussein & Cronje, 2010) or handheld or palm devices (Traxler, 2009). Keegan (2005) more restrictively defined mobile learning as learning tied specifically to a device carried within a student's pocket. Khaddage and Lattenman (2013) added another restriction by defining mobile learning as situational; occurring through the learner's content; and social communications by incorporating personal, smart or electronic devices. What were formerly known as handheld or palm devices eventually became known as mobile or smartphone devices. Specifically, a smartphone is an internet and app-enabled phone such as an iPhone, BlackBerry, or an Android phone (Global Web Index, 2017).

The definition of mobile learning differs depending on who is providing the definition and the scenario they are in (El-Hussein & Cronje, 2010). The definition of mobile learning has evolved with the evolution of technology. This study has adopted the emerging concept of mobile learning described by Keegan (2005), Khaddage and Lattenman (2013), and Traxler (2009). Based on these definitions, mobile learning can be self-directed; planned or spontaneous; occur in an academic, nonacademic or natural environment; and take place through internet and app-enabled mobile devices; and it is based on the theory of self-directed learning.

Theory of Self-Directed Learning

Self-directed learning theory (Garrison, 1997) postulates that learning is widespread, occurs during the normal course of an adult's daily life, and is systematic but not dependent on a classroom setting or an instructor. Gabrielle (2016) emphasized the need to determine a learner's readiness and confidence in self-directed learning through a formal learning experience. Lee et al. (2014) suggested that self-directed learning occurs when a learner proactively takes personal responsibility for learning.

Mobile learning may facilitate self-directed learning in this digital era, as personal devices provide opportunities for individuals to gather information, communicate with each other, and set and accomplish learning goals (Karakas & Manisaligil, 2012). Mobile learning has the potential to provide learners with just-in-time training that is available anytime and anywhere (Karakas & Manisaligil, 2012). Modern self-directed learning allows for virtual interactions and the development of social communities to enhance the learning experience. Postulating the theory of self-directed learning, related studies are reviewed in the next section.

RELATED STUDIES

The use of mobile devices among university students is ubiquitous worldwide in both developed countries and developing ones like Pakistan. For example, studies in the last decade found that 65% of students reported smartphone use at Hallam University, UK (Woodcock et al., 2012), 85% at a university in the Philippines (Alson & Misagal, 2016), 94% at a Saudi Arabian university (Alfawareh & Jusoh, 2014), and 99.9% in the United States (Cheon et al., 2012). In Pakistan, 77% people, aged 21–30 years, reported using smart mobile devices (Android, iPhone, Symbian, Blackberry, and Windows Phone) in 2014 (Laar, 2014). Another study conducted at a public sector medical college in the province of Khyber Pakhtoon Khwa, Pakistan, found that 97% of students utilized mobile devices; of those students, 10% reported using them for more than 10 hours a day (Aman et al., 2015). Given the high rate of mobile device usage among university students, the utilization of such devices for educational or learning purposes may be hypothesized.

Learning through mobile device is reported to have been adopted and researched within the universities of developed countries. For example, approximately 92% of university students have adopted mobile learning in Saudi Arabia (Alfawareh & Jusoh, 2014), 76% in a Ukrainian university (Woodcock et al., 2012), and 87.2% in the United States (Cheon et al., 2012). Subsequent studies have also been carried out to explore the potential for mobile learning in some developing countries (Hwang & Tsai, 2011; Kim et al., 2013). In the case of Pakistan, a study was conducted on mobile learning by Shah et al. (2016) at the university level, which found that 41% science students engaged with mobile learning applications. The adoption of mobile learning gives rise to the question of its impact on students' learning motivation.

There is a rigorous debate in the literature to assess the impact of mobile learning on students.

Some, such as Yamamoto (2014), have argued that students' academic motivation may increase when they use mobile devices for learning purposes. Likewise, Wang et al. (2009) reported increased concentration on learning when students were aided by mobile learning in their classrooms. Hwang and Wu (2014) reviewed publications of mobile learning trends in six international journals and concluded that students' motivation is improved by the adoption of mobile learning.

Increased learning motivation among mobile users has also been highlighted when used for language learning. A study by Liu and Chu (2010) reported enhanced motivation among language-learning students when they used a game application for listening and speaking in a language course. Another study found that the use of mobile devices for learning purposes may positively affect students' academic life, as most users of mobile learning at a Korean university agreed on the educational usefulness of language application and internet browser application (Kim et al., 2013).

However, the reported effects of a mobile internet browser and other mobile applications are mixed in the literature. Kim et al. (2013) found that language students ranked a Language & Translation app first and an internet browser as the second most common application students were using in their smartphones—and the students in this study were motivated to learn. On the other hand, studies by Alosaimi et al. (2016) and Aman et al. (2015) of university students in Saudi Arabia and Pakistan, respectively, reported negative impacts of mobile application usage on students' academic performance. Similarly, a study in California revealed negative impacts of general smartphone consumption on students' academic attainment (Sarraf et al., 2014).

It seems that the findings of the studies of this issue are bidirectional. Where some researhers revealed mobile learning to be a motivation enhancing dynamic, some have also warned that it is a negative factor for students' academic lives. Thedifference may be the population context or the variables under study. It is also noted that this issue is highlighted more by developed countries, and in contrast, ignored by some of developing countries like Pakistan. Moreover, the trend of mobile device usage among science students is reported to be higher, whereas the trend among social science students in Pakistan is arrested. An exploration of mobile device usage in the developing world is a dire need right now because, to meet global challenges, university students must be motivated for technology based learning. This study aims to measure social science students' academic motivation after they have adopted mobile learning. The results of this study may become a course for authorities and autonomous bodies interested in higher education development.

OBJECTIVES OF THE STUDY

Based on the concept of mobile learning and the theory of self-directed learning, the following objectives were formed in this study:

- To determine the extent of mobile device usage (both mobile applications and internet browser) among university students;
- To explore students' inclination toward mobile learning; and
- To assess students' motivation to use mobile devices for education after spending time using smartphones for other purposes.

METHODOLOGY

This was a cross-sectional study conducted via survey. A questionnaire was distributed to collect the perspectives of social science students about their usage of mobile devices and its potential impact on their academic motivation.

Participants

The participants of this quantitative study were from three universities in Punjab, Pakistan. Six social science departments (two from each university) participated in the study. The students' identity numbers were retrieved by permission of the departmental authority. The students' identity numbers were entered in SPSS software and a total of 180 were chosen using the random sampling command. An inventory of attitude towards mobile learning was given to 30 randomly selected students in each department. The response rate was 88% (N = 158).

Instrument

A 15-item, agree/disagree, four-point Likert scale was used to explore the motivation level of students toward mobile learning. The face and content validity of the tool was established by

experts' judgement and pilot testing. Three items from the initial instrument were omitted following the collection of expert opinions. The Cronbach's alpha value (0.76) of the scale approached the acceptable range defined by Gay et al. (2011). The final scale comprised 12 statements and seven items to gather participant information (gender, smartphone ownership, internet access at home and at university, hours spent using the smartphone for general and educational purposes daily, and types of applications installed on that device). Principal component analysis (PCA) with varimax rotation extracted four dimensions from the scale: Intention, Preference, Replacement, and Disadvantage. The resulting scree plot is shown in Figure 1. All items were loaded on their factor above 0.500 (Table 1).

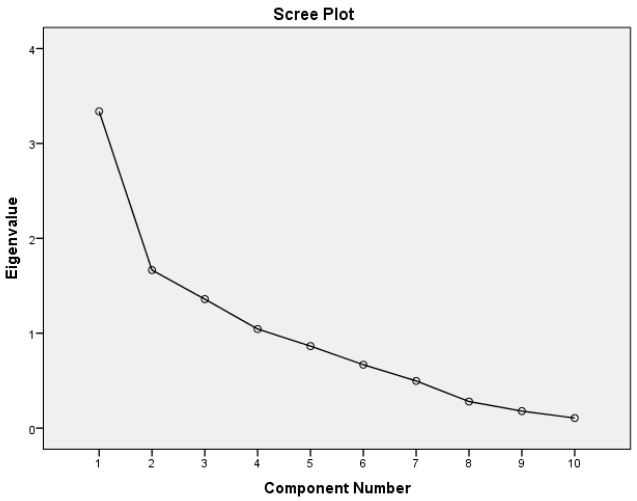

Figure 1. Scree Plot of the PCA Extraction of Scale

Table 1. Rotated Component Matrix of the Scale through PCA[a]

First Course	First Course	First Course	First Course	First Course
Intention	Intention	Intention	Intention	Intention
1. It is fun for me to discover new learning material through mobile	1. It is fun for me to discover new learning material through mobile	1. It is fun for me to discover new learning material through mobile	1. It is fun for me to discover new learning material through mobile	1. It is fun for me to discover new learning material through mobile

Data Collection and Analysis

The students were visited individually and asked to complete a questionnaire that collected demographic information and responses to a series of questions using a four-point scale (absolutely true, somewhat true, somewhat not true, and absolutely not true). The data collected was coded and entered in SPSS v. 23. After cleaning and screening, the extent of internet access and smartphone usage (for both general and educational purposes) was identified by calculating percentages. The level of motivation was measured by descriptive analysis (i.e., mean and standard deviation). The impact of mobile learning was estimated by developing a model in SmartPLS 3. Path analysis was completed after running the PLS algorithm and bootstrapping.

RESULT S

The sample comprised 69.2% female and 30.8% male participants. A total of 66.0% had internet access at their homes, and 86.2% had internet access at their educational institutions. Most students (88.7%) reported owning a smartphone, and only 11.3% had simpler, "nonsmart" phones. The duration of the use of this technology for noneducational purposes was also collected from the respondents. The data indicated that 62.3% of students used their mobile device for fewer than five hours a day, 29.6% for 5–10 hours, while only 8.18% of study participants reported using their smartphone for more than 10 hours a day (Figure 2).

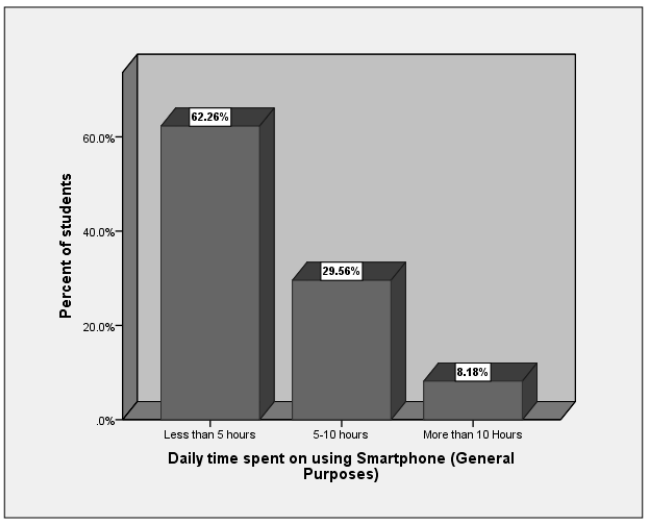

Figure 2. Daily Time Spent Using Smartphone for General Purposes

The results revealed that almost half of the students (49.7%) were spending one to three hours a day using their smartphone for educational purposes, while only 12.0% were using mobile learning for more than three hours a day (Figure 3).

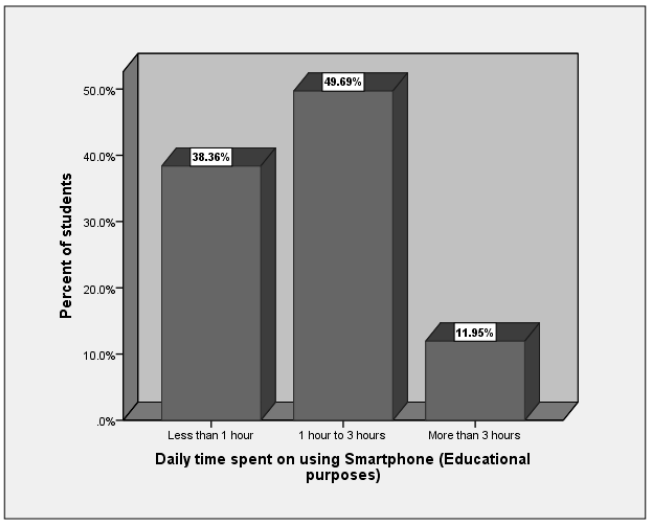

Figure 3. Daily Time Spent Using Smartphone for Educational Purposes

The students were asked to mark the types of applications they mostly used for learning. It was found that 78% of the students had installed and used mobile applications for different educational purposes; approximately 55% of these students used language learning applications like Easy English Dictionary, Oxford Dictionary of English, Urdu to English & English to Urdu Translator, English to Urdu Dictionary, Duolingo: Learn Languages Free, Thesaurus.com, and Dictionary.com. Almost 20% had brainstorming and art-related mobile applications (e.g., IQ test, Logical Reasoning, Dr. Sudoku, Aptitude Test and Preparation, Dr. Unblock, Dr. Link, Sketchbook, Pencil Sketch Art, Coloring Book, Art Drawing Ideas, Creative Typography Design), while less than 5% had installed applications for mathematical and science learning (e.g., Math Master, Math Workout, Book of Science, Math and Science Tutor) (Figure 4). All reported mobile applications are enlisted with their accessible web links in Table 2.

Table 2. List of Mobile Apps Utilized by Students

Mobile App	Web Link
Easy English Dictionary	https://play.google.com/store/apps/details?id=com.sachi.easy.english.dictionary&hl=en_IE
Oxford Dictionary of English	https://play.google.com/store/apps/details?id=com.mobisystems.msdict.embedded.wireless.oxford.dictionaryofenglish&hl=en_IE
Urdu to English & English to Urdu Translator	https://play.google.com/store/apps/details?id=com.dictionaryworld.englishurdutranslator&hl=en_IE
English to Urdu Dictionary	https://play.google.com/store/apps/details?id=com.appscourt.english.urdu.roman.dictionary.offline&hl=en_IE
Duolingo: Learn Languages Free	https://play.google.com/store/apps/details?id=com.duolingo&hl=en_IE
Thesaurus.com	https://www.thesaurus.com/
Dictionary.com	https://www.dictionary.com/
IQ test	https://play.google.com/store/apps/details?id=cz.digerati.iqtest&hl=en_IE
Logical Reasoning	https://play.google.com/store/apps/details?id=nithra.math.logicalreasoning&hl=en_IE
Dr. Sudoku	https://play.google.com/store/apps/details?id=com.ansangha.drsudoku&hl=en_IE
Aptitude Test and Preparation	https://play.google.com/store/apps/details?id=nithra.math.aptitude&hl=en_IE
Dr. Unblock	https://play.google.com/store/apps/details?id=com.ansangha.drunblock&hl=en_IE
Dr. Link	https://play.google.com/store/apps/details?id=com.ansangha.drlink&hl=en_IE
Sketchbook	https://play.google.com/store/apps/details?id=com.adsk.sketchbook&hl=en_IE
Pencil Sketch Art	https://play.google.com/store/apps/details?id=com.apptrends.pencilsketch.art.pencil.sketch.art.photo.editor&hl=en_IE
Coloring Book	https://play.google.com/store/apps/details?id=com.iceors.colorbook.release&hl=en_IE
Art Drawing Ideas	https://play.google.com/store/apps/details?id=id.akusantri.artdrawingideas&hl=en_IE
Creative Typography Design	https://play.google.com/store/apps/details?id=com.a_superlab.typingdesigner&hl=en_IE
Math Master	https://play.google.com/store/apps/details?id=net.chokolovka.sonic.mathmaster.android&hl=en_IE
Math Workout	https://play.google.com/store/apps/details?id=io.ts.mathworkout&hl=en_IE
Book of Science	https://play.google.com/store/apps/details?id=com.stamford.app.game.education.learn.physics.fragment.masterdetailflow&hl=en_IE
Math and Science Tutor	https://play.google.com/store/apps/details?id=com.mathtutordvd.mathtutor.mathtutor&hl=en_IE

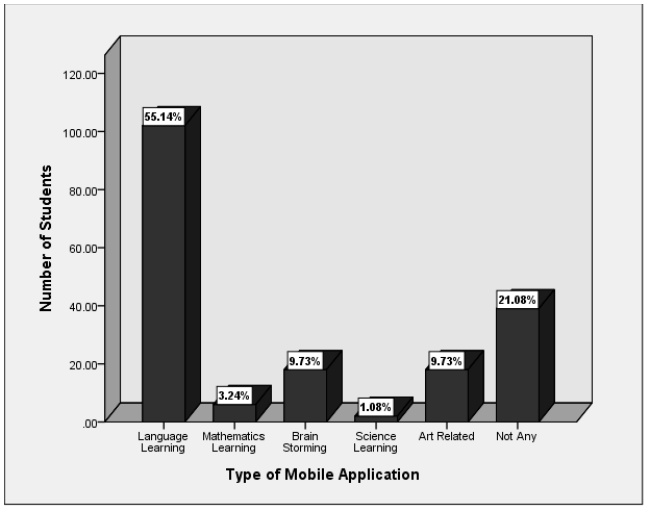

Figure 4. Types of Mobile Application Used by Students

The extent of the motivation with mobile learning among university students is given in Table 3. The mean value shows that students' intention to pursue mobile learning was small. Students considered it fun to discover new learning material using mobile devices (mean = 2.11) and reported that doing so increased their desire to learn (mean = 2.10) and their concentration on learning (mean = 2.17). Moreover, students prefer to be taught through mobile devices (mean = 2.34) and receive notes through mobile devices (mean = 2.33). Mobile learning consumers exhibited minor intention and preference for mobile learning; they did not intend to replace their teacher and library resources with mobile learning resources. Along with an increased motivation level from mobile learning, students also agreed that mobile devices have disadvantages when they are utilized for purposes other than studying (mean = 2.66). Students learning through mobile means take less of an interest in classroom discussions (mean = 2.19).

Table 3. Extent of Motivation with Mobile Learning Among University Students

Statement	Mean	Std. Deviation
Intention		
1. It is fun for me to discover new learning material through mobile	2.11	.683
9. Mobile learning increase my desire for learning	2.10	.749
8. Mobile learning increase my concentration on learning	2.17	.756
Preference		
3. I would like it, if teachers would teach through mobile	2.34	.847
11. I would like it, if teachers would give notes through mobile	2.33	.833
Replacement		
10. By adopting mobile learning, I feel less need to consult my teacher	1.83	.770
2. Mobile learning saves my energy to go to library	1.84	.765
Disadvantage		
4. Mobile learning cannot give me any advantage	2.66	.835
7. Mobile learning causes decline in learners' achievement results.	2.15	.719
5. When students learn through mobile, they take less interest in classroom discussions	2.19	.853

The impact of mobile learning on motivation level among university students was measured by developing a path model in SmartPLS 3. An algorithm was calculated to measure construct reliability and validity of the developed model. Cronbach's alpha, rho_A, and composite reliability were all above .70, and average variance extracted (AVE) was above .50, meeting the quality criteria of Hair et. al. (2010) (Table 4). Discriminant validity was also determined using the PLS algorithm. All the components were highly discriminated, as shown in Table 5.

Table 4. Construct Reliability and Validity of the Measurement Model

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Intention	.747	.944	.722	.598
Preference	.921	.921	.962	.926
Replacement	.816	.827	.915	.844
Disadvantage	.738	.905	.848	.665

Table 5. Discriminent Validity of the Measurement Model

	Disadvantage	Intention	Preference	Replacement
Disadvantage	.815			
Intention	.175	.774		
Preference	.140	.092	.963	
Replacement	.400	.252	.265	.919

Figure 5 describes the path analysis between mobile device usage (general purpose and study purpose) and the motivation components of Intention, Preference, Replacement, and Disadvantage. The path coefficient (β) value showed that when university

students use mobile devices for purposes other than studying, they have low intention to utilize them for educational purposes (β = .14, P = .35) but do not prefer it over other means of learning (β = −.21, P = .04) and do not intend to replace their teachers and library with mobile learning (β = −.20, P = .05). The general use of mobile devices has a negative effect on students' classroom discussion and social communication (β = −.37, P = .00). The beta values in Figure 4 indicate that university students have a high intention to utilize their mobile device for learning after using it for educational purposes (β = .50, P = .00), and they prefer it to other educational media (β = .44, P = .00). Furthermore, after using mobile devices in this context they wanted to replace their teachers and library with mobile learning (β = .24, P = .03). It was evident from the path coefficient value that academic use of mobile devices reduces classroom discussion and communication among university students (β = −.45, P = .00).

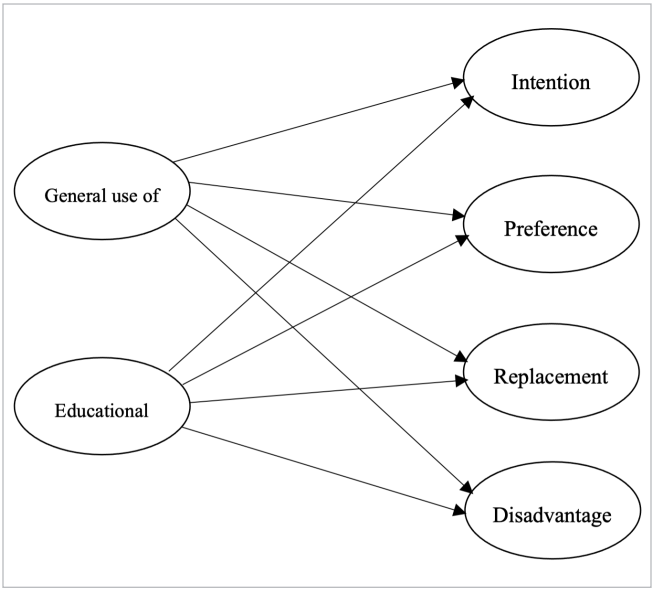

Figure 5. Scholastic Motivation Among Students after Using Mobile Device

DISCUSSION

The use of the internet and mobile learning continue to grow. The data collected in this study about students' access to mobile devices and the internet revealed that more than half of its participants have internet access at home. This finding is aligned with a progress report from the World Bank (2017) that indicated that access to internet is nearly ubiquitous. The current study found that all mobile consumers had access to internet at their educational institution. This was not a surprise, because in Pakistan, internet facilities are provided to most universities by the Higher Education Commission (2016). It seems that the rate of smartphone ownership is rapidly increasing, and it was reported to be 77% in 2014 (Laar, 2014) and found to be 88.7% in this study. Of those with mobile devices, only 8.18% were using them for more than 10 hours a day, consistent with the findings of Aman et al. (2015).

The current study revealed that access to mobile devices and the internet has pushed students toward mobile learning. Half of the study participants had adopted mobile learning, spending at least three hours a day browsing learning material from the internet and utilizing educational applications. The questionnaire revealed that 78.9% of students used some type of application for learning, a contrast with the report of Shah et al. (2016), who found that only 41% of medical students used mobile applications. This difference can be supported by a review by Al-Barashdi et al. (2015) that students in the social sciences tend to exhibit more addictive behaviour related to mobile devices than students in the physical sciences.

One of the major study objectives was to assess the level of academic motivation among students after they have used smartphones for educational and noneducational purposes. The results showed that after using a mobile device for educational purposes, university students exhibited high intention to utilize it for learning and preferred it to other educational media. These findings are supported by a literature review of six international journals by Hwang and Wu (2014), which reported that adoption of mobile learning improved students' academic motivation. Likewise, previous reports from Wang et al. (2009) and Yamamoto (2014) also postulated increased motivation and concentration among students after they used smartphones for educational purposes within and outside the classroom.

The observed increase in students' motivation may be due to the easy and fast access to information made possible by using mobile devices. Additionally, technology also supports graphics and interactive navigation, which may increase students' interest in using mobile devices for learning purposes.

The current study found some trends among the mobile applications utilized by its sample. Language learning applications (e.g., dictionaries) were the most widely installed and used by university students. This is in line with the findings of Kim et al. (2013), who

conducted a study on Korean university students and found that a mobile dictionary application provided motivation for language learning. A mobile device's ability to retrieve information regardless of time, place, and money is obviously preferable to the need to go to a bookshop or library. In a previous study, Rahman (2014) argued that no technology can take the place of a consulting teacher; however, it is evident in the current study that students who have adopted mobile learning not only wanted to replace their teachers and library with mobile learning, but in fact reduced their participation in classroom discussion and communication. This preference for self-directed learning may lead in developing nations to the replacement of the formal learning environment with digital learning.

The current study also revealed that a greater use of mobile technology for general purposes decreased its positive impacts and increased the negative effects on students' academic motivation. Students who reported using their smartphone more for personal purposes than educational purposes or for learning showed less intention to utilize it for learning and not to prefer it over other means of learning. Moreover, these students did not intend to replace their teachers and the library with learning through mobile devices. The result is aligned with the findings of Alosaimi et al. (2016), who reported that when students used smartphone devices other than for study purposes, their academic participation decreased. Likewise, the current study found overuse of mobile devices for noneducational purposes was linked to a reduction in students' participation in classroom discussion and social communication. Another study in Pakistan found similar results for the general usage of mobile devices on students' academic participation. The effects on students' academic life were also revealed by Sarraf et al. (2014), who found that increased smartphone use hindered students' academic performance.

Taken together, these results indicate that the nature of mobile device use determines its impact. If the use is for educational or learning purposes, it not only fosters students' academic motivation but also their will to move their formal learning environment into the digital world. The negative effects of general consumption of smartphone devices on students' academic life are widely reported.

The strength of this study is that students' academic motivation was assessed by differentiating mobile learning from general smartphone use. This distinction highlighted technology-based learning motivation, an emerging trend in developing nations. The results suggest that self-directed learning theory is supported by Pakistani university students' use of smartphone technology for educational purposes.

IMPLICATIONS

The results of this study can be used by teachers in higher education to encourage a technology-based interchange of lectures and notes. Furthermore, teachers can introduce students to digital libraries, dictionaries, and other online learning materials that may foster students' interest in adopting mobile learning. Workshops and seminars can also be held to raise awareness among students about how to utilize their mobile devices for educational purposes.

This study was based on a survey of students' perspectives. Studies of other stakeholders in higher education (e.g., teachers and administrators) should also be conducted. Future studies could also examine the impacts of mobile learning on students' academic performance.

CONCLUSION

Mobile learning has been adapted to some extent by 78% of university students in Pakistan. They reported spending up to three hours browsing learning material from the mobile internet and using educational applications, especially for language learning, brainstorming, and art/creativity purposes. More educational use of mobile devices has increased these students' academic motivation; however, the use of smartphones for general purposes has negative effects on students' academic life, including a decline in academic involvement and participation in classroom discussions. Thus, owning a mobile device alone is not sufficient to support learning—the device must be properly utilized for educational purposes to have an effect on the student's motivation.

COMPLIANCE WITH ETHICAL STANDARDS:

This project was self-funded, and the research was undertaken for educational purposes only. There is no affiliated institution or corporation.

The Authors Nabeela Sulaiman and Raheela Shahid declare that there is no conflict of interest.

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