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An Empirical Investigation Of Digital Learning Via Mobile Phones In Higher Education Institutes

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Abstract

The phenomenon of ubiquitous computing is often considered as one of the latest transformational educational paradigms, which foster an environment of anywhere, anytime learning. The present study explores learning through implementation of mobile computing devices, such as mobile/smartphones, in higher education sector of developing countries. Therefore, in this paper higher education quality indicators proposed by Kwan and Ng (1999) have been adopted for use in the e-learning context of Higher Education Institutes (in Pakistan), mainly for investigating preference of students' on mobile phones and face to face against each indicator. In recent times, change has been observed in approaching e-learning especially through mobile phones due to proliferation of wireless electronic devices. The significance of technology does not imply that merely technology plays an imperative role in education process. However, teaching and learning strategies have also been altered majorly due to technological oriented learning setting. A quantitative survey from students was conducted in a blended learning model. Results revealed that students prefer to receive education in e-learning setting from mobile phones rather than face to face only (i.e. traditional learning). Furthermore, in teaching and learning process, technology does not only provide transparency of data but also enhances the efficacy and efficiency of students through universally available tools.

Keywords E-learning; Higher education quality indicators; Mobile phones; Blended learning; teaching/ learning strategies

1. Introduction: Technology and learning

Nowadays, significant transformations have been witnessed in education system throughout the world. The learning settings are emerging to be more "innovative, interactive, and effective" due to proliferation of portable technological devices, leading towards multiple opportunities in educational fields (Wai et al. 2018, Wurst, Smarkola and Gaffney 2008).

Over the past decade, multiple researches highlighted that how technology driven modifications have penetrated in education sector. For instance "the use of internet in giving wider access of information (Willinsky 2018, Fodje 1999), the role of weblogs in creating an excellent computer-mediated communication linkage (Sobaih et al. 2016, Huffaker 2005), and the advantage of videoconferencing in providing a diverse range of classroom setting for students' observation (Aslam 2017, Pickering and Joseph Walsh 2011)" all examples illustrate manifold advantages of technology in this domain. Furthermore, technology assists in exploration of new learning paradigms that were not possible in traditional classroom setting (Ismail, Azizan and Azman 2013). Multiple researches advocated that for significant development and growth in educational environments, mobile technologies could be one of the promising educational technologies world-wide (Hamidi and Chavoshi 2018).

2. Mobile Technologies for Education

The era of 21st century, referred as the 'Information age', triggered rapid development of computer technologies and wireless networks that also prevail extensively among entire community levels. Integration of mobile technologies is expanding globally in ever-growing educational field, which is turning out to be an emergent paradigm as shown in figure 1 in which key elements have been highlighted pertaining to technologies and their applications in educational process (Martín-Gutiérrez et al. 2017). Mobile technologies encompass a broader concept regarding devices including portable and personal handheld devices, "such as laptops, personal digital assistants (PDA), tablet, iPods, smart phones and mobile phones" (Pimmer et al. 2016, Ismail, Azizan and Azman 2013).

Martín-Gutiérrez et al. (2017) and Trifonova & Ronchetti (2003) define mobile devices as any "small, autonomous, and unobtrusive" gadget that accommodates people in their lives. Certainly, the user friendly interface of mobile devices enable people to interact freely via multiple sources, i.e. voice communication or text messages. Besides this, content for learning purposes can be easily accessed world-wide through utilization of these portable gadgets. Studies conducted by Peters (2007) and Hamidi and Chavoshi (2018) revealed that people's dependency in terms of fixed location has been reduced due to incorporation of mobile devices; thus, strategies regarding teaching and learning processes have also been revolutionized (See table 1).

Table 1. Technologies and their Application in Education

Technology	Educational Application
Class room, labs	Lectures, seminar
Print	Course unit, supplementary material
Radio, Telephone, TV	Programs, telephone tutoring, audio-conferencing, video-conferencing
Computers, world wide web	Power point, CAD, e-mail, online courses, data bases, Web Quest

In educational institutions, mobile devices can provide multiple learning opportunities to students through a significant ubiquitous feature of these devices, which differentiates them from other learning tools (So 2016). For instance, advanced communication modes have been offered by the mobility and immediacy nature of these portable devices; hence, leading towards increased cognitive capabilities (Wentzel et al. 2005). Especially in higher education institutions i.e. colleges and universities, the widespread of learning opportunities through utilization of mobile phones has been observed to be amplified at a larger rate (Seppälä and Alamäki 2002). Researches by Wai et al. (2018) and Kim, Mims and Holmes (2006) highlighted the benefits and increased adoption of advanced technologies especially mobile phones, which have been recognized by academics and practitioners in order to assist teaching and learning processes.

3. Learning through mobile phones

Several researches proposed a handheld device i.e. mobile phone as the most suitable device in order to promote e-learning especially in higher education (Oyelere et al. 2016, Suki and Suki 2010, Prensky 2005). Furthermore, a research carried out by So (2016) identified varied key factors of e-learning through mobile phones i.e. mobility and ubiquity, to strengthen their viewpoint by vehemently suggesting it a suitable medium for learning. For instance, multiple researches also stressed upon the ever increasing popularity of mobile phones amongst students; whereby, one cannot gainsay the significance of widely used mobile application i.e. “short message sending (SMS)” (Kim, Mims and Holmes 2006).

Further adding to this, Kahveci, Sahin and KahveGenc (2011) highlighted a key element that users’ perceptions are determined by device ownership, which ultimately gets reflected in their perception regarding benefits of education through mobile phones. For instance, according to a report published by a developing country (Malaysian Communications and Multimedia Commission [MCMC], (2010), statistics have revealed that over seven years from 2004,

percentage of hand phone users got doubled from 12.8% to 28.5% in Malaysia. Moreover, this ownership also exceeded 100% in year 2011 amongst Malaysians (MCMC, (2011). Whereby, multiple researches stressed upon potential of developing countries in terms of utilizing mobile phones as teaching and learning tools in higher education, since the device ownership might not be a big hurdle due to widespread of mobile phones. However, some researches also discussed the shortcomings in learning that can be caused by handheld device like mobile phones, i.e." the limitation of the screen size (Cavus and Ibrahim 2017, Sharma and Barrett 2008), security issues (Dubey et al. 2016, Kim, Mims and Holmes 2006), and limited adoption for educational use (Peters 2007).

Whereas, Wai et al. (2018) and Ismail, Azizan and Azman (2013) vehemently argued in favor of learning through incorporation of mobile phones due to its manifold educational benefits for students. This argument would be strengthen if same convenience level would continue to prevail for students i.e. ease in searching online material, also if it would continue to be a source of an effective communication medium to students.

Form perspective of developing countries, e-learning through mobile phones is still beginning to take its first steps in educational institutions i.e. colleges and universities (Kabir et al. 2017). Despite of being at infancy, multiple researches highlighted varied factors regarding potential benefits of mobile phones in higher education institutions in Pakistan (Raza et al. 2018). Moreover, higher education service quality indicators have been utilized in number of researches to examine student's notions regarding quality of educational environment (Kwan and Ng 1999) (see table 2).

For instance, a recent study reported regarding implementation of strategies for incorporation of mobile phones in universities to assist in English vocabulary and online searches for learning (Liu 2016). Researchers proposed three significant components that are referred as vital for successful implementation of mobile phones in developing countries like Pakistan that are" pedagogy, stakeholders and technology planning, and management" (Kabir et al. 2017).

Service Quality Indicators of Higher Education

Considering the service quality literature, previous researches demonstrated that consumers are the pivotal element in terms of service quality (Kessler 1995). Lewis and Booms (1983) defined service quality by emphasizing direct relation of customer expectations with well delivered services. Whereas, in the context of higher education, service quality parameters are no less vague. An abundance of research suggesed that for the higher education, agreement of researchers regarding one such universally accepted definition of service quality does not exist. Hence, general concept of service quality should be considered appropriate in learning settings of higher education.

However, research carried out by Kwan and Ng (1999) proposed a well defined set of higher education service quality indicators, which a number of studies extensively utilized to examine the

quality of education services provided by universities. Thus, nine higher education service (HES) quality indicators, proposed by Kwan and Ng (1999), got validated multiple times as they have been utilized to analyze the services offered by universities (Peng et al. 2006, Watson, Saldaña and Harvey 2002). In present study, these HES quality indicators have been selected in order to access student's preferences of learning either via mobile phones or face to face approach against each indicator. The nine factors, proposed by Kwan and Ng (1999), have been presented below in table 2.

Table 2. Higher Education Service (HES) quality indicators

Sr. no.	Constructs	Description
1.	**Course content**	• Usefulness of course material from perspective of career development and personal growth • Syllabus in course
2.	**Facilities**	Provision of facilities and their quality: • Library • Computers • Recreational Facilities • Sports
3.	**Lecturer concern for Students**	• Teacher's concern pertaining to growth and development of student • Empathy and affection towards student • Conversation with students after class
4.	**Social activities**	• Significance of social activities in the university/college life. • A source of interactions with other students through sports events, extracurricular activities etc.
5.	**Communication with university**	• Official principles and policies for students to communicate with University management • Numerous tools and channels for students to share ideas with university management.
6.	**Assessment**	Assessment relates to evaluation of student's learning through • Traditional tests • Exams • Quizzes
7.	**Counselling services**	• Support provided by advisor to achieve goals

8.	**Instruction medium**	• Language used by instructor in teaching process, i.e. in lectures, tutorials, presentations etc.
9.	**People**	• Relates to the source of social interaction in university • Triggers active engagement to make new friends

The purpose of present research is to add a perspective of developing country i.e. Pakistan to international literature, which majorly emphasized on adoption of mobile phones as pedagogical and learning tools in higher education institutions. Nowadays, education can be delivered in two ways, i.e. traditional (face to face) and/or e-learning (using technology). Therefore, this study intends to utilize higher education service (HES) quality indicators proposed by Kwan and Ng (1999) that have been adopted for use in the e-learning context of Higher Education Institutes (in Pakistan), mainly for investigating preference of students' on mobile phones and face to face against relevant HES quality indicator. Quality indicator number eight i.e. Instruction medium, will not be utilized in this study as medium of e-learning has already been selected to investigate student's perception in present research. Accordingly, the preference of students over face to face and mobile phone against the eight remaining HES quality indicators will be analyzed. It has been proposed that the government needs to consider alternative ways to bridge the digital divide between higher education by using much affordable technologies i.e. mobile phones.

Methodology

The subject for this study was experimental respondents to gather information concerning student higher education service quality indicator preference for a device i.e. mobile phone. Students from higher education institutes of Pakistan were chosen as respondents, i.e. from both public and private sector universities. Reason for selection was because they were receiving education in a blended learning model "i.e. a mixture of e-learning and traditional learning format". Therefore, this constituted convenience sampling; whereby, respondents were chosen because of their familiarity with blended learning model. Moreover, rudimentary purpose behind adoption of such approach was to avoid possible hindrances, which could be caused due to selection of students' either related to only traditional learning or e-learning only.

In present study, data was collected by using a quantitative instrument i.e. a structured questionnaire. Pilot test of questionnaire was done by getting it filled from university students. The questionnaire comprised of two sections; first section requested the respondents' demographics related information, while section two consisted of such questions which asked respondents' regarding their preference of device in relation to the eight higher education service (HES) quality indicators. In this section, items were rated on a five-point likert scale with "1" representing "Strongly Disagree", and "5" representing "Strongly Agree".

Prior to questionnaire filling, students were elaborated regarding eight HES quality indicators, so that student's understanding could be enhanced about the questionnaire. Respondents of this study belonged to 2 business schools of Pakistan's private and public sector universities. Enrolments of students were mainly in business programmes i.e. "BBA Hons, BS Applied Management, MBA, MBA Engineering and MBA Executive". The survey was conducted in two phases i.e. in recent two years. In first year, data was collected from 300 students for a period of 5 months. While in second year, 260 participants' filled questionnaire for a period of 3 months belonged to universities in Lahore, Pakistan. In order to investigate students' preference regarding learning through mobile phone or face to face approach, higher education quality indicators proposed by Kwan and Ng (1999) were adopted particularly while researching in e-learning context of Pakistan's Higher Education Institutes.

5.1. Data Analysis

All analyses in present study were performed using Statistical Package for Social Science (SPSS). Since the rudimentary aim of this research was to investigate the students' preferences on mobile phone vs. face to face approach in e-learning context, descriptive statistics were calculated to summarize the data. A total of 560 responses were obtained through convenience sampling; however, 42 responses were rejected due to missing values, skewness, and normality issues. Thus, final data of 518 respondents was analyzed using SPSS.

Results and discussions

6.1. Students Demographics

The profile of the respondents has been presented in below mentioned table 3, which clearly highlights that in present study, number of male participants (59.1%) exceeds than female participants (40.9%).

Table 3. Demographics of the Students

Demographics	Frequency	Percentage
• Gender		
• Male	306	59.1
• Female	212	40.9
• Age		
• 15-20	122	23.6
• 21-25	359	69.3
• 26-30	23	4.40
• 31-Above	14	2.70
• Education		
• BBA	349	67.4

• MBA	116	22.4
• EMBA	35	6.80
• MBA. Eng.	18	3.50

From table 3, it can be observed that largest cohort of respondents belonged to age brackets of 21-25 (69.3%), whereas respondents of 15-20 age group were having percentage of 23.6%. In line with this, 4.40% was in age bracket of 26-30, and students having ages of 31 and above were the lowest category. Interestingly, majority of students fall in age ranging from 15 to 25 with the value of 92.9%. Further adding to this, table 3 also indicates data concerning respondents from their educational status perspective, i.e. majority of students were enrolled in the Bachelors (BBA) programme (67.4%), while enrolment in the Master (MBA) programme was 22.4%. Furthermore, remaining 10.3% students were receiving education in the Professional degree programmes, i.e. Executive MBA and MBA Engineering.

6.2. Students Preference of mobile phone vs face to face against HES Quality Indicators

In present study, the assessment of student's preference for learning via "mobile phone or face to face format" has been examined against eight higher education services (HES) quality indicators, proposed by Kwan and Ng (1999), on a 5-point Likert scale "Course content, Facilities, Lecturer's Concern for Students, Social Activities, Communication with University, Assessment, Counselling Services & People". Respondent's views have been collected to obtain average responses against HES indicators in order to compare student's preference on learning via mobile phone and face to face method (see table 4).

Table 4 Device vs face to face Preference of Students

Higher Education Service (HES) Quality Indicators	Face to Face	Mobile
1. Course Content	3.76	2.95
2. Facilities	3.74	3.06
3. Lecturer's Concern for Students	4.05	3.77
4. Social Activities	2.90	4.17
5. Communication With University	3.66	4.35
6. Assessment	3.53	3.93
7. Counselling Services	4.22	3.89
8. People	4.40	4.12

Table 4 provides the results of average responses concerning all respondent's preferences across eight higher education services quality indicators. In context of e-leaning, majority of students preferred blend of both approaches (i.e. mobile phone and face to face) for higher education

services quality indicators, precisely referred as blended learning model, results are elaborated in the following text.

Course Content: In terms of Course Content, first quality indicator of HES, students with an average of 3.76, preferred face to face approach over learning through mobile phones, having an average of 2.95. Since course content is related to the material and it's components that are part of a specific course, aforementioned value clearly indicates that students prefer direct course discussion with teachers rather than though mobile phones. Normally, students tend to perceive it more useful in lessening their cognitive load, ultimately leading towards increased satisfaction.

Facilities: There were questions asked from respondents concerning Facilities provided by institutes, second quality indicator of higher education services, which refers to provision of library, recreational facilities, sports, or computers. Of which an average of 3.74 of students preferred to attain academic learning and other facilities provided by the institutes in face to face/ live settings, rather through mobile phones, having an average of 3.06. Certainly, physical facilities promote a creative learning environment, which encourages students to perceive high achievements and outcome. In that sense, it does not only enhance learning but also reduce behavior problems, as students tend to learn better through concrete rather than abstract experiences.

Lecturer's Concern for Students: While coming towards third HES quality indicator i.e. Lecturer Concern for Students, which refers to the level of personal attachment of teachers towards their students, and solving student's course related issues even after class. The majority of students preferred face to face format with an average of 4.05 over mobile phones, having an average of 3.77. Though both averages are close, having very little gap, results imply that students tend to find face to face interactions more convenient and comfortable in terms of discussing lecture related issues with their teachers. Furthermore, student's socioemotional well-being is, certainly, deemed to be critical to teachers, and attachment is considered as the foundation of socioemotional well-being.

Social Activities: Social activities and on campus events play a significant role in shaping the social and intellectual fabric of a university. It allows students to interact with their fellows through multiple sources, i.e. events, club, job fairs or for virtual interactions through technology, it could be web-based social network. In response to the questions concerning social activities i.e. for this quality indicator of HES, there is a clear shift noticed from face to face having an average of 2.90, to mobile phone with an average of 4.17(see table 4). It is logical that students would be inclined towards using mobile phones, since they can access it anywhere and anytime as physical social activities are usually constrained by time and space.

Communication with University: Communication with university is referred as student's preferred communication channels with management of university. Advances in digital media

made mobile phones as the first preference to communicate with university, with the average of 4.35. For this quality indictor, a noticeable shift has been observed from face to face, having an average value of 3.66 to mobile phones. It can be inferred from results that since mobile phone is a ubiquitous device; therefore, students tend to be more at ease as the carry mobile all the time.

Assessment: The sixth higher education services quality indicator is Assessment, which serves as an individual evaluation system, and provides a way to compare performance across spectrum and across students (i.e. exam, quizzes, and assignments). Mobile phone, being the first preference of students, has achieved more popularity with the average value of 3.83. Whereas, face to face format is student's second preference having the average value of 3.53. Thus, results exhibit that students want to have assessment provided on device, rather than face to face (i.e. traditional learning method). Rational reasons are manifold as mentioned above, majority of people access internet from their mobile phones due to widespread advancement of technology; thus, facilitates their overall learning experience.

Counselling Services: This HES quality indicator, i.e. Counselling services, is related to the personal advices offered by university's advisors to mentor students pertaining to their personal or university life problems. Majority of students are inclined towards face to face format for this quality indicator with the average value of 4.22. However, mobile phone is preferred by students as their second preference, having an average value of 3.89. Whereas, a close competition exists in average values of this quality indicator, reveals that students would not encounter many issues while having counselling sessions with teachers through mobile phones. Although traditional method, i.e. face to face is preferred by students, we can infer from the minor gap between average values that chances of shift to mobile phone prevail for this quality indicator.

People: This is the last quality indicator, i.e. people, which is related to the knowledge and skills that universities help students acquire also enable them to meet and make friends, and adapt to technological and social change. Students prefer face to face approach in terms of this HES quality indicator, with the average value of 4.40. However, second preference of students is mobile phone with the average value of 4.12. People is turned out to be the fifth indicator for which students have chosen traditional learning, i.e. face to face, rather than mobile phone, which strongly recommends that face to face format is rudimentary component in e-learning. Since going to university and meeting people leads to new ways of seeing the world, to new horizons and networks, and to significantly enhance personal experience; therefore, face to face format is preferred over mobile phone.

Based on the overall preferences of 518 students, table 4 clearly indicates that for higher education service (HES) quality indicators, complete face to face / traditional learning does not seem to be an optimal solution. Results from statistical averages reveal that students preferred face to face format for five out of eight HES quality indicators, i.e. 'Course Content', 'Facilities' 'Lecturer's Concern for Students ', 'Counselling Services', and 'People'. Whereas for remaining three HES

quality indicators, i.e. 'Social Activities', 'Communication with University', and 'Assessment', majority of students are inclined towards using mobile phone. By looking on overall average results, it can be inferred that students perceive mobile phones beneficial for learning and recreational purposes, which shows their willingness to adopt new portable technological device besides face to face format.

Conclusion

In recent times, the need for usage of technologies has amplified at a larger rate especially when accession of information gained significance; thus, leading towards removal of time and location constraints. Despite the small size and screen of mobile phones, they are enriched with multiple significant features; therefore, effects of mobile phones to e-learning are an interesting issue to be investigated. While results of present study revealed that students have shown keen interest in switching to e-earning for most of educational and counselling services. Whereas, the average findings regarding average student device preference vs. face to face format, indicated that students prefer blended learning environment in context of e-learning, i.e. mixture of face to face and mobile phone. This is mainly because when eight higher education services (HES) quality indicators, proposed by Kwan and Ng (1999), were applied in present study, student's preference towards mobile phone over face to face learning was noticeable against three quality indicators. This student's inclination could be due to manifold advantages as e-learning through mobile phones is vehemently an incredible source of knowledge, skills, and facilitates learning attitude. Besides this, due to increased mobile networks coverage, process of continuous education can be augmented through continuous access via mobile phones, for instance, "it provides assistance for learners in sending and saving the learning content irrespective of time and place".

Moreover, it further leads to conclusion that in order to increase student satisfaction in e-learning context, "one size fits all" proves to be a wrong notion. Therefore, to enhance student retention in e-learning setting, student's preference should be given weightage, as whether a student finds face to face more convenient or he finds mobile phones more comfortable in terms of receiving a certain higher education service. While in future, effect of other portable devices in context of e-learning would be an interesting issue to be researched in order to provide lifelong learning.

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