



Readiness for Learning with Mobile Phones: A Case Study with Undergraduates of Faculty of Science, Eastern University, Sri Lanka

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors designed the study, wrote the first and final draft of the manuscript. Author ST managed the literature searches. Author KANKK performed the statistical analysis, and wrote the protocol. Both authors read and approved the final manuscript.

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ABSTRACT

The expeditious development of new technologies and their improvement in performance and functionality, determine the new trends of strengthening teaching and learning practices of higher education settings. Development of mobile technologies enables the users fully mobile which leads to new ways of bridging the boundaries of time and space in education settings by means of Mobile Learning (ML). ML can be used by students and teachers to improve overall learning experience.

This study aimed to evaluate the readiness of students of Faculty of Science, Eastern University, Sri Lanka, for leaning with mobile phones (LMP) as a solution for the lack of computer facilities to access recently introduced Moodle and Google classrooms learning systems at any time. Further, it was aimed to understand the current status of mobile phone usage for studies, availability of resources for LMP, and barriers or limitations of LMP. A qualitative approach was adopted for this study. Data were collected based on a questionnaire, from 150 students in the Faculty. Analysis

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was performed with some statistical techniques: proportion test; Chi-square test; and binary logistic regression.

This study could reveal that students are ready to use mobile phones to enhance learning process in a more personalized way and some students had already started LMP, even though some students were not aware of it. The readiness for LMP was dependent on awareness of LMP, and limitations such as screen size, memory, battery lifetime, and typing difficulties. With a awareness program, LMP can be implemented in the Faculty as an alternative solution for lacking facilities enabling students to access Moodle, and Google classrooms leaning systems. This situation encourages teachers to motivate students to use mobile phones to enhance teaching and learning success.

Keywords: Learning; teaching; mobile learning; smart phone.

1. INTRODUCTION

Technology has affected all most all the aspects of our lives and it makes our works easier and more efficient. These technological innovations offer more opportunities in teaching and learning process. There can be seen a positive motivation on the learning processes with new technologies [1]. Advancement in technology allows students in active learning [2]. At the same time, computer-based several methodologies have been developed for learning process [3]. There are various types of technologies used in educational systems, such as smart boards, television, projectors, digital cameras, mind training software, computers, PowerPoint presentations, 3D visualization tools, etc. All these help teacher to improve students' knowledge easily.

Mobile devices are reasonably less priced than desktop computers, and there is a low cost method for internet access. Mobile devices are used for teaching and learning process and it is normally known as mobile learning (ML) [4]. ML focuses on the mobility of the learner, communicating with portable technologies and ML includes handheld computers, MP3 players, notebooks, mobile phones and tablets. The ML can be considered as the third wave of learning. Availability is the one of the strongest feature of mobile technologies and it can be accessed almost anywhere. It's almost instantaneous to share with everyone, using the same content that leads to instant feedback and tips.

1.1 Literature Review

Several researchers have been conducted on ML. They are based on mobile learning architecture [5], models [6] and current trend [7]. Sarrab, Elgamel, and Aldabbas [8] in their research explored the framework of ML and how

to utilize the whole learning system. In this paper the benefits and problems of ML environments have been discussed. As the advantages of ML, they mentioned endorse distance learning, access to content at any time, student-centered learning can be increased, for on schedule training or review of content, access the content from anywhere, can be more effective for differently-abled, enhancement of needs of the students and self learning, can improve interaction between and among students and instructors and minimize cultural and communication barriers between Faculty and students by using communication channels. They outlined the up comings as the future challenges of ML: may give the way to cheat, creating general user interface, design an effective context aware mobile application, the problem of learners trusting the wireless network, prevent the disclosing of the learner information via network, could require additional learning curve for non-technical learners, enable the use of m-learning application across mobile platform, can create a feeling of isolation, separation or of being out-of-the-loop, could give tech-savvy learners an advantage over non-technical learners and might render some content outdated because of rapid upgrades.

A brief review about challenges (pedagogical, technological, policy and research) in implementation of mobile learning has been made by Jasti, Lawson, Diack, and Khaddage [9]. It discusses possible solutions that could be deployed to tackle those challenges. A unique approach is then applied to bridge the gap between formal and informal learning via MAT (Mobile Applications Technology). This approach is based on STEAM (Science, Technology, Engineering, Art and Mathematics) as subjects to be taught and the specific skills needed to achieve the RLOC (Required Learning Outcome) that can support student learning informally. This

specific approach shows how to advance mobile learning in formal and informal settings. When bridging formal and informal learning, schools should not be aiming to unintentionally formalize informal learning, but rather they should be looking to find unique methods and approaches to incorporate mobile learning and blend it seamlessly into their settings to create an engaging informal learning environment. The approach proposed in this paper could be used as a good starting point.

Ismail, Azizan, and Gunasegaran [10] have studied University students' readiness for the integration of mobile technologies in education system within their learning institutions. The study was carried out in 11 public universities in Malaysia. It was revealed that majority of students in Malaysian public universities were still moderately ready for mobile learning. Many of them seemed to be not quite familiar with such learning approach even though there is an interest among them to learn more about mobile learning. Furthermore, some were quite concerned on cost issue. Despite this, respondents were somewhat agree that they are interested to know more about mobile learning. As a result of the data analysis, some important issues emerged which give rise to the importance of assessing students' readiness for a successful implementation of mobile learning. This could imply that they did not really understand the benefit that they could gain through mobile learning. Furthermore, cost issue is considered a concern among respondents if mobile learning is implemented at their University.

Alssaid, Ismail, and Hashim [11] have validated a model for mobile applications as one of the modern teaching methods with specific focus on its effectiveness on the teacher's role and development of Libyan learners' motivation towards learning. To achieve this research aim, the researcher used a descriptive approach as a quantitative research design that utilizes a Structural Equation Modeling (SEM) Method in order to evaluate the main hypotheses of the research. The study sample consisted of 450 participants (lecturers at the Faculties Physical Education-Libya). The conclusion of the resulting study showed the presence of a weak or low correlation (16) linking mobile learning applications and the development of students' motivation towards learning. However, the study showed that the impact of mobile learning applications on the teacher's role. Moreover, the

study found that the teacher's role has a higher level of significant influence or impact than mobile learning applications on the development of students' motivation towards learning. The results also revealed that there is an indirect impact of mobile applications through the teacher's role which was higher than its direct impact on the development of students' motivation towards learning.

Papadakis, Kalogiannakis, and Zaranis [12] have examined whether Greek preschoolers are designed to adapt to proper standards for children to develop social, emotional and cognitive development in the formal and informal learning environment in self-proclaimed educational applications. The study results were disappointing. The majority of the apps was incorporating a low level of thinking skills, failed to teach the deeper conceptual understanding of certain things and was showing the basics about numbers and letters only. Self-proclaimed educational apps do not meet the developmental needs of preschoolers, and it was noticed that high-quality educational apps are hard to find. They suggested evaluating the reliable and practical framework of mobile content.

Papadakis, Kalogiannakis, Sifaki, and Vidakis [13] have evaluated how often students used a mobile phone to access various activities on Moodle. A survey on self-reported usage was collected from 122 University students in a course offered by the Faculty of Preschool Education at the University of Crete. Follow-up interviews were also conducted. The results show that Moodle is used merely as an electronic document repository and not as a useful learning tool due to the limitations of mobile access on usability and reliability.

In the present, mobile phones are used by the majority of people in the world, and it has been found that by 2016, 25% mobile owners use two or more phones for different purposes such as storage, media player, the navigation system, digital camera, game console and a communication platform [14].

As a mobile device, a smart phone can be used to enhance the teaching-learning process, group collaboration among students through communication applications, interactive displays, and video features. In the classroom, mobile phones are used to increase student collaboration among students and enhance student-centered learning. And also, the best features of the mobile phone are small and

portable. Therefore, users can bring them anywhere, any time and any place. There are so many advantages of using mobile phones for study purposes.

1.2 Current Status of the Country and Faculty

Sri Lankan University system, including some government universities, uses new technology such as learning management system (LMS), online education, especially in distance education. It makes students more interested to learn, help them with busy schedules, freedom to work at home on their own time, train students to learn new technology skills they can use later in the workplace and decrease paper and photocopy costs, promoting the concept of green revolution.

Eastern University, Sri Lanka, is a developing University in the country. It is running in Batticaloa district in the eastern province, with five faculties: Agriculture; Arts and Culture; Commerce and Management; Health-care Sciences; Science, and Information Technology. Further, Trincomalee campus and an institute called Suvami Vipulananda Institute of Aesthetic studies (SVIAS) are also affiliated with Eastern University.

Faculty of Science follows a semester-based education system and offers knowledge in Botany, Chemistry, Zoology, Computer Science, Applied Mathematics, Pure Mathematics, Statistics and Physics, under two streams Biological Science and Physical Science. In addition to the general degree of three years, Faculty of Science offers special degree programs, of four academic years, in all subjects except Statistics and uses Grade Point Average (GPA) system in grading. The faculty is running with limited resources such as laboratories, laboratory equipment, and computers facilities. No separate computer laboratory is available for the Faculty of Science. Faculty of Agriculture, Arts and Culture, Commerce and Management, Information Technology and Science, which are in the same premises, are sharing University ordinary computer laboratories. Recently, most of the faculties including Science started use of Learning Management System (LMS) such as moodle, and google classrooms and students were motivated for the use of them.

However, most of the time, Computer laboratories are being used for practical classes. They are generally not available for students'

self-access and unable to access all the time. Because of these reasons students spend only a few hours with computers every week. And also many of undergraduate students are not very comfortable with computers. Now a days, some University students use mobile devices such as laptop, notebooks, and mobile phones. With compared to the usage of other mobile devices, usage of smart mobile phones is higher. Almost all the students are currently using smart mobile phones to send short messages, E-mails and view social web pages every day. Further, it could be observed that few students use smart mobile phones to search during classroom exercises.

1.3 Objectives of Study

This development and students' trend can be used to overcome some of difficulties that students face due to lack of resources within the Faculty, especially difficulties in access to learning materials, searching materials, classroom activities, finding research materials, communication among students them self and communication with teaching staff, illustration and simulation processes which are much important and essential for all the subjects offered. And also, use of mobile phone will make students' learning process easy and help students to do learning activities efficiently during the time of travelling also.

So far, no any study has been carried out to discover the readiness of undergraduate in Faculty of Science, Eastern University, Sri Lanka, for learning with mobile phones (LMP) within the University. As mentioned above, there are so many benefits of mobile learning and these benefits compelled us to conduct such a study.

Therefore, this study was planned as a case study with undergraduate students of Faculty of Science, Eastern University, Sri Lanka, to reveal their readiness for mobile learning and also to identify current status, barriers, limitations, and factors affect the preparedness of undergraduates for the use of mobile phones for education.

2. METHODOLOGY

This study was based on qualitative approach. Data for this study were collected from students by using a questionnaire that was designed based on literature review and discussion. The survey revealed information in five categories:

personal information; family background; availability of resources; readiness for mobile learning; current status of usage; and limitations of mobile phone usage in learning. Under the category personal information, gender, religion, district of living, stream of study (Biological Science, Physical Science), year of study (first, second, third), accommodation type(home, hostel), and current Grade Point Average (GPA) (GPA up to current year of study) were investigated. Family income in four levels (<20000, 20000-40000, 40,000-60,000, and > 60000), educational level of family members (any family member is having a degree or not), availability of Internet facilities at home (yes, no) with type of connections (wired, wireless) were taken into consideration under the family background.

Meanwhile, possessiveness of a smart phone (yes, no), internet access via smart phones (yes, no), use of applications in smart phone (yes, no), ownership of multiple phones (yes, no), reasons of using numerous mobile phones are the factors were taken into account under the availability of resources.

Factors such as awareness about LMP, readiness for LMP, preference for LMP with compared to traditional learning, preparation for accessing course contents, ability to manage study with mobile phone, ability to study only with mobile phones, willingness to pay additional payment for internet usage, accessing LMS (learning management system), and instant message with instructors were taken into investigation under the category readiness.

Under the current status of use of mobile phone, it was considered activities such as communication, e-mail, text message, scheduling appointments, banking, playing games, using online maps, sharing information with friends, sports and news, shopping, social network, and obtaining weather updates. In addition to these activities, usage of mobile phone for study purpose also was investigated. Usage of audio, video, E-books, notes, PPT slides, research papers and study forums were considered as educational activities. Further, limitation of mobile usage for study purposes, such as screen size, memory capacity, battery lifetime, and typing difficulty were also considered.

In the Faculty, there were about 244 and 303 numbers of students in Biological stream and Physical streams respectively at the time this study was conducted. A sample of size of 150

students was taken for this study. This sample size was determined based on convenience by including nearly 25% of total students. The sample size was proportionally allocated for Biological and Physical Science streams. Then, from each stream, students for the sample were selected from a list of students, by using the simple random sampling technique with the help of the statistical package Minitab. First, selected students were educated about objectives of this study and the benefits that students can gain. Then, questionnaires were delivered and collected the necessary information. Anyhow, due to some practical examinations, it was unable to receive data from some Biological students. Therefore, it was filled by Physical Science students in the parallel batch to meet 150.

Almost all the factors considered in this study were qualitative (categorical). Z score at GCE(A/L) examination, was the only quantitative variable. Majority of factors were binary responses (yes, no) while a few factors, such as year of study, and family income, were multilevel. In case that factors having only yes/no binary responses, proportion test was performed to see the significance of the number of responses in each level. Dependence of readiness for mobile learning on each qualitative factor was tested separately by using the Chi-square test. Larger *P*-value (>0.05) of Chi-square test indicates that preparedness for LMP does not depend on the element considered. Effects of quantitative factors on readiness were evaluated based on binary logistic regression. Willingness (binary) was taken as the response, and quantitative variables were chosen as predictors. Significant predictors produce lesser *P*-value for significance test of corresponding coefficients in the regression model. Minitab 14 version was used for the analysis, while, for creating graphs and tables, MS Excel 2000 was used.

3. RESULTS AND DISCUSSION

The composition of the sample is explained concerning gender, religion, a stream of study, year of education, and type of accommodation in Table 1. *P*-value in the last column is from proportion test that applied to check the same composition among levels of each factor. A *p*-value less than 0.05, indicates that level-wise synthesis factor considered is not identical. Almost equal numbers of male and female undergraduates have been taken for this sample. There can be seen significant differences in religions-wise composition. Majority of students

in this sample are from Physical Science stream, and there can be noticed a significant difference in numbers from Physical and Biological Science streams. Numbers of undergraduate from each year of study seem to be proportional to sizes of batches. Among the undergraduates used for this study, majority, more than 80%, have accommodated in hostels.

Fig. 1. Shows the status of availability of necessary resources for LMP.

Nearly half of undergraduates in this sample are having internet connections at home, and this indicates that they are familiar with the use of the internet. More than 90% undergraduates are currently using smart phones which are essential for LMP. This implies the availability of adequate resources required for LMP. Sample data shows that nearly 90% of undergraduates use their smart mobile phone for internet access. This figure confirms the familiarity of students with the use of intelligent mobile phones for accessing the internet. Majority of undergraduates assure that necessary applications are in their mobile phones. A lower percentage, less than 20%, of undergraduates are having more than two mobile phones in which some has two smart phones.

Fig. 2 represents the readiness of undergraduates for LMP.

Majority of undergraduates are aware of LMP. However, the percentage of students who do not know LMP is comparably high. This requires an awareness program on LMP. Even though the situation is like that, almost all the undergraduates are ready for LMP. A higher percentage (above 70%) of undergraduates expresses a higher preference for LMP than the traditional learning. At the same time, three-fourths of undergraduates confirm that they can

manage studies effectively with LMP. However, a majority (about 75%) of undergraduates assure that they are unable to study only with LMP. These figures emphasize that undergraduates in the Faculty are ready and willing to start LMP. The particular matter that has to emphasize that about 65% of undergraduates is not willing to bear any additional payment as mobile charges. This requires free internet facilities at least within the Faculty premises.

For several activities, undergraduates use mobile internet. Some of the everyday events are listed in Fig. 3.

Majority of undergraduates (more than 75%) use mobile phones for accessing LMS in the Faculty. This is a good sign that implementation of LMP within the Faculty will be useful and successful. Among the other activities that undergraduates involve with mobile internet, instant messaging, communication, text messaging, playing games, refereeing online maps, gathering information from friends, listening to sports and news, use of social network, and obtaining weather updates take a higher place. However, it could be observed that majority of students are not using mobile phones for banking, and shopping purposes. Even though about 53% of undergraduates use mobile phones to keep records about schedules or appointment, a higher percentage of undergraduates is not using the phone for that. *P*-value of proportion test that applied to each factor discussed above, given in Table 2 confirm these results. These *P*-values indicate the significance of proportions of undergraduates who involve with these activities and those who do not engage. *P*-values of most of events are closer to zero. This is an indicator that most the students are engaged and familiar with the most of activities in Table 2.

Table 1. Composition of the sample concerning each factor

Factors	Levels	Percentage	<i>P</i> -value
Gender	Male	51	.74
	Female	49	
Religion	Christian	6	.000
	Hindu	19	
	Muslim	16	
	Buddhist	59	
Stream	Bio Sc.	24	.000
	Physical Sc.	76	
Year of Study	First	76	.000
	Second	15	
	Third	9	
Accommodation	Home	15	0.000
	Hostel	85	

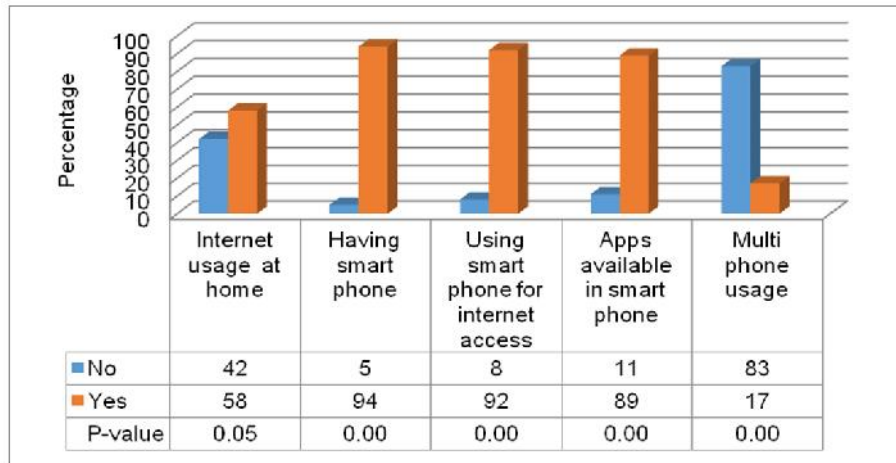


Fig. 1. Availability of resources

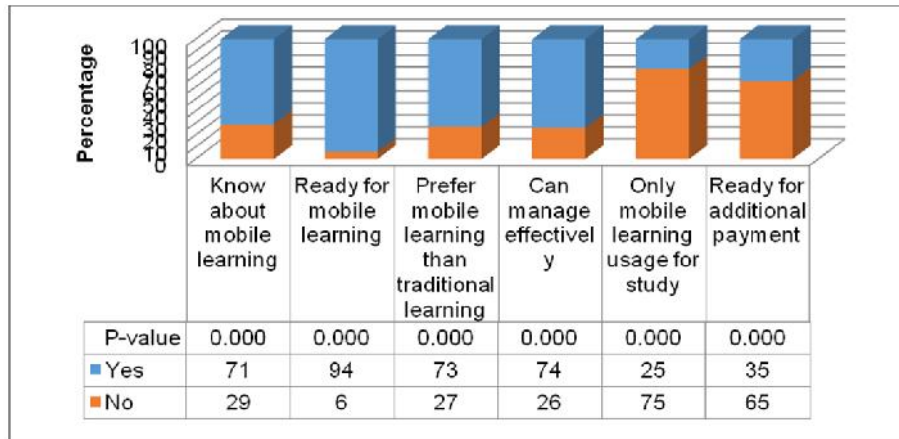


Fig. 2. Readiness for learning with mobile phones

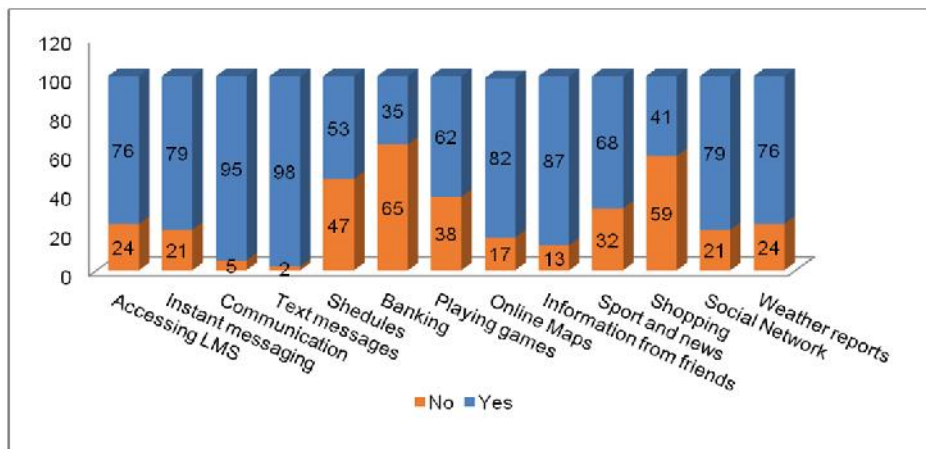


Fig. 3. Activities with mobile phone

Table 2. P-values of proportion tests

Activities	P-value	Activities	P-value
Accessing LMS	.000	Online Maps	.000
Instant messaging	.000	Information from friends	.000
Communication	.000	Sport and news	.000
Text messages	.000	Shopping	.02
Schedules	.54	Social Network	.000
Banking	.000	Weather reports	.000
Playing games	.005		

Currently, undergraduates use mobile phones for collection of different types of study materials. The usage of the most common study materials is given in Figure 4 with their percentages. Majority of undergraduates use audio, video, E-books, notes, power point presentation slides, and research articles for study purposes. The highest usage is to find notes. It can be observed that undergraduates show low tendency to join with study forums. These figures show the necessity and the

importance of LMS system and access to the system so that student can gather necessary information quickly.

As discussed in the literature, there can be seen some issues associated with LMP. The most common issues identified by undergraduates are presented in Fig. 5. According to them, screen size, memory capacity, battery lifetime, and typing difficulties are the common issues with LMP.

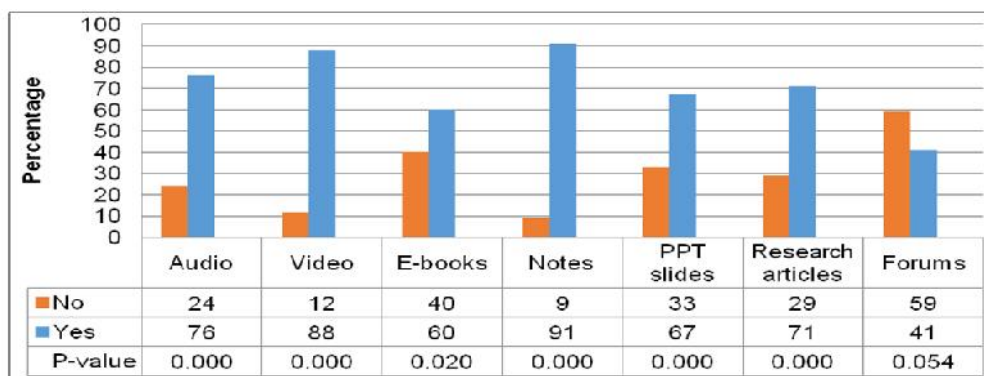


Fig. 4. Materials access to a mobile phone

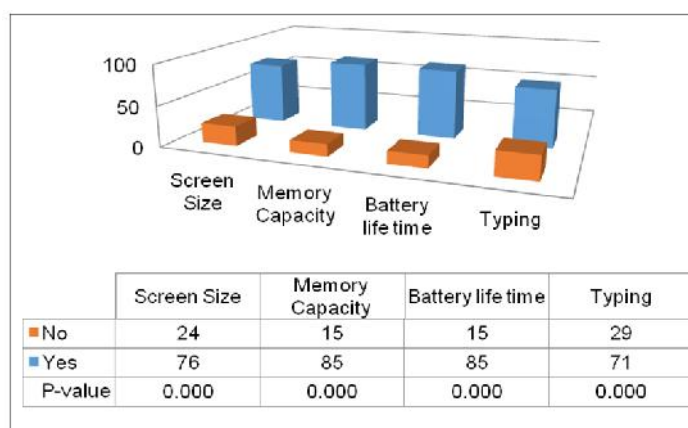


Fig. 5. Students opinions of limitations of LMP

Factors that affect the readiness of undergraduates for LMP, that identified based on Chi-square test and binary logistic regression, are given along with their significance separately in Table 3. Willingness for LMP does not depend on gender, religion, the stream of study, year of study, type of accommodation, family income, family education, internet usage at home, ownership of the smart phone, additional payment for phone, availability of apps in phones, and status of having multiple phones. However, low *P*-values of factors: own smart phone, and readiness to pay an additional payment as phone charges indicate that these factors affect willingness for LMP to some extent even though they are not significant.

The readiness of undergraduates for LMP is dependent on knowledge about LMP and limitations such as screen size of mobile phones, memory capacity, battery time, and typing difficulty in the phone. However, it is clear that screen size is marginally significant. With compared to other significant factors, screen size does not affect much on readiness for LMP.

In 2015, based on the study conducted with students from University of Sultan Qaboos, Sarrab [15] also has stated that students are aware of mobile learning and acceptance level of mobile learning is high. Further, according to this study, students were engaging in the use of mobile phones for learning purposes. In 2016, it has been found that Malaysian University students also are ready for mobile learning and students requires knowledge about mobile learning [12]. Further, it is stated that readiness of students for free education does not depend on gender, age, ethnic, program, year of study, institution, a field of research and students are

concerned about cost. It has been stated by Udell and Woodill[16], that students are provided various possibilities by mobile devices on education. Even though mobile devices are the dominant and revolutionary solution. By Dumancic, Matijevic, and Topolovcan [17], it has been stated that mobile learning is not a solution for all issues in the educational system.

Effect of factors considered on readiness for LMP was tested by using Chi-square test. Total numbers of responses for 'No' level of preparedness was meagre. When this total number is decomposed to several levels, values for most of the levels become zero or low. Therefore, in performing chi-square test, some levels of some factors were combined when expected counts for some levels were less than five. In case of family income, religion, and year of study, original levels of those factors were re-determined. Only three levels (less 20 000, 20 000 – 40 000, above 40 000) were considered for family income, while levels Christian and Muslim were joined as one level in case of religion. In a year of study, second year and third year were taken as one level.

When expected counts were less than five and the factor has only two levels, binary logistic regression technique was used separately to check the effect of a factor on readiness for LMP. In this case, just most important factors were considered. Even though data for the district were recorded, it was not taken into the analysis because most districts had a little number of undergraduates. Majority of students had not given responses for GPA, type of available connection at home, number of smart phone in use. Hence, those factors were excluded from the analysis.

Table 3. Significance of factors on readiness for LMP

Non significant factors	P-value	Significant factors	P-value
Gender	.67	Knowledge about LMP	.002
Religion	.17	Screen size	.05
Stream of study	.31	Memory capacity	.008
Year of Study	.14	Battery time	.07
Accommodation	.57	Typing difficulty	.02
Family Income	.65		
Family Education	.59		
Internet usage at home	.39		
Own smart phone	.07		
Readiness to pay an additional payment	.09		
Availability of Apps in phone	.34		
Own multiple phones	.69		

4. CONCLUSION

Undergraduates at Faculty of Science, Eastern University, Sri Lanka, are much keen in use of mobile phones for learning and almost all the undergraduates are having smart phones. Further, it could be observed that most of the undergraduate students are currently using their mobile phones for learning activities. The readiness of undergraduates for LMP does not depend on most of the factors considered and knowledge on LMP was the only factor affects willingness in addition to limitations of mobile usage such as screen size, memory, battery lifetime, and typing difficulties. With an awareness program, LMP system can be launched within the faculty.

Since most of the undergraduates are ready for using the mobile phone for study purposes, resources require for LMP are also available, and most of the undergraduate students are currently using their mobile phones for learning activities, LMP can be officially started, and other students also can be motivated to use mobile phones for learning process such that students can gain the benefits of LMP. Anyhow, before initialization of LMP, some awareness programs on LMP should be conducted for students especially for those who are not aware of LMP. Further, the range of Wi-Fi facility available in the Faculty also should be expanded enabling students to access the LMS and internet from any place in the Faculty at any time. Parallel to them, teaching panel is also should be made aware of LMP and motivated for the use of LPM to gain its' benefits by overcoming difficulties that face due to lack of resources.

At this stage, undergraduates at Faculty of Science only were considered for this study. This study can be continued with students in other Faculties of the University.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Passey D, Rogers C, Mitchell J, McHugh G. The motivational effect of ICT on pupils, (Nottingham, DfES); 2004. Available:http://www.education.gov.uk/publications/eOrderingDownload/Df_ES-0794-2003.pdf
2. Dzakiria H. Technology does not always teach distance learners, but effective distance teachers do. *Malaysian Online Journal of Instructional Technology*. 2004; 1(1):60-81.
3. Subramaniam G. Confronting Asian concerns in engaging learners to online education. *International Education Studies*. 2008;1(4):10-18. Available:<http://dx.doi.org/10.5539/ies.v1n4p10>
4. Chmiliar L. Mobile Learning - Student Perspectives. In J. Sanchez & K. Zhang (Eds.). *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*, Chesapeake, VA: AACE. 2010;1646-1651.
5. Trifonova A, Ronchetti M. A General Architecture for M-Learning. Department of Informatics and Telecommunications, University of Trento, 38050 Povo (Trento), Italy.
6. Koole M. A model for framing mobile learning. In M. Ally (Ed.), *Mobile learning: Transforming the delivery of education & training*. Athabasca: AU Press. 2009;25-47.
7. Wu WH, Wu YCJ, Chen CY, Kao HY, Lin CH, Huang SH. Review of trends from mobile learning studies: A meta-analysis. *Computers & Education*. 2012;59(2):817-827.
8. Sarrab M, Elgamel L, Aldabbas H. Mobile learning (m-learning) and educational environments. *International Journal of Distributed and Parallel Systems (JDPS)*. 2012;3(4):31-38.
9. Jasti P, Lawson A, Diack M, Khaddage F. A case study of student's attitude towards the adoption of educational apps and mobilization as teaching and learning tools at a Historical Black College (HBCU) in the Southeastern Part of the United States. In D. Rutledge & D. Slykhuis (Eds.), *Proceedings of SITE 2015-Society for Information Technology & Teacher Education International Conference* (pp. 1644-1649). Las Vegas, NV, United States: Association for the Advancement of Computing in Education (AACE). Available:<https://www.learnstechlib.org/primary/p/150219/> (Retrieved April 29, 2018)
10. Ismail I, Azizan SN, Gunasegaran T. Mobile learning in Malaysian Universities: Are students ready? *International Journal*

- of Interactive Mobile Technologies. 2016; 10(3):17-23.
11. Alssaid AAM, Ismail NAB, Hashim NB. The impact of mobile learning applications on the lecturer's role and development of learner's motivation towards learning: empirical study at the faculties physical education-Libya. International Journal of Business and Management. 2016;11(9): 134-147.
 12. Papadakis S, Kalogiannakis M, Zaranis N. Educational apps from the android google play for Greek preschoolers: A systematic review. Computers & Education. 2018;116: 139-160.
 13. Papadakis S, Kalogiannakis M, Sifaki E, Vidakis N. Access moodle using smart mobile phones. A Case Study in a Greek University; 2018.
 14. Nielsen Survey. The mobile consumer: A global snapshot; 2013.
Available:<http://www.nielsen.com/content/dam/corporate/uk/en/documents/Mobile-Consumer-Report-2013.pdf>
 15. Sarrab M. An empirical study of factors driving the adoption of mobile learning in Omani higher education. International Review of Research in Open and Distributed Learning.2016;17(4):331-349.
 16. Udell C, Woodill G. Mastering mobile learning; 2014.
Available:<http://public.eblib.com/choice/publicfullrecord.aspx?p=1772076>
 17. Dumancic M, Matijevic M, Topolovcan T. How mobile learning can change education. International Inter Disciplinary Research Journal. 2016;6:31-40.

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