

## Design and Implement Mobile Learning Application for Students in Higher Education

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**Abstract:** Many systems have been implemented according to e-Learning and m-Learning, some of them deal with the structure and implementation of the system and others are concerned with the criteria and characteristics of the system. Hybrid hardware and software is our main goal to reach good performance, high priority and optional security of implemented system in addition to the satisfaction of both students and lecturer of the system. The hardware gives high speed and security in addition software gives flexibility and accessibility. The implemented approach deals with the time divided between the student's attendance and request and the permission of accessing the lecture. To solve this situation the access of online lecture is divided into three categories; inside the classroom, inside the university and outside the university. This approach leads to an effective mobile learning application via synchronizing the platform environment of the online lecture. The applicable questionnaire shows that most students and teachers want to apply mobile learning in education.

**Key words:** Mobile learning, e-Learning, blended learning, mobile applications, mobile framework-learning, educational pedagogy learning, students

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### INTRODUCTION

Mobile device or handheld can refer to any device with the ability of movement or mobility and still with the access of their request mobile applications. These devices are different in sizes, functions, characteristics. Most of these devices have input/output device, memory and processor in addition to the transceiver (transmitter and receiver). Most of these devices can be connected to the internet via Bluetooth, WiFi, Wireless LAN, Wireless WAN or via any type of access point. These devices, including cellular mobile phone, laptop, tablet, iPad, iPhone, smart phone. Recently, cellular mobile phone introduced many services and applications that can be applied anywhere and anytime. Merging the Internet and mobile leads to create a powerful environment that become the main part of our life with their wide range of applications in education, learning, business, marketing, robot, medicine, government activities, social networks, ..., etc.

Nowadays, according to high level of technology such as multimedia and high speed, learning and education form a principal part of our life especially in Internet and mobile that delivering rich and interactive services (Stickel *et al.*, 2008).

**Learning:** Is an overlap between the teaching and learning processes as well as between the different ways of learning. There is an overlap between the teaching and learning as well as between the different ways of learning. It has been the subject of many changes from traditional education to distance learning to electronic learning to the mobile learning to virtual learning to blended learning. Many concepts are raised at each stage to specify teaching and learning at that period. The following few words will be concentrating on the two main aspects of e-Learning and m-Learning (Dierking *et al.*, 2003; Fong *et al.*, 2008).

**e-Learning (Blended Learning):** E-learning has a new definition of the education way that are provided in schools, academies, faculties and universities and other related environment. This definition, includes influence parts of e-Learning such as technology, organization and management system that enables and facilitates web-based learning. All components of this environment are working together to facilitate delivering educational contents to the user. The speed paste in the technologies of e-Learning leads to think about the implementation of standard e-Learning model in order to facilitate this environment. This standard form aims to reach flexibility

to the user, flexibility to content development, flexibility to e-Learning development and flexibility to platform development (Abbas, 2016; Emmanouilidis *et al.*, 2008; Varlamis and Apostolakis, 2006).

**m-Learning:** Adaptation of new methods of education and learning may face problems and challenges because many teachers and professors are still believe in traditional learning methods and think of them as the best methods for education. The majority of mobile users and mobile penetration (number of mobile users per number of population) over the world and more than 70% of the world population are using mobile devices. This means that, there is a big demand for mobile applications and one of the most interested application is mobile learning in which you can access any data anytime, anywhere in case you have the internet access via mobile. The fast development in mobile technologies leads to manufacturing new mobile generations such as smart phones. Smart phones offer high performance specifications that are capable to interact, talk, text, capture, send, receive and view with multimedia applications. These characteristics support the adaptation of mobile learning in many universities and academies (Wang *et al.*, 2008; Menkhoff and Magnus, 2010; Batista *et al.*, 2010).

The big challenge in advanced technology is how to be adapted for your application in a simple, easy method in addition how you can make humans accept this technology or application. The proposed approach tries to implement a simple mobile learning framework that can be applied in the classroom and out of the classroom. This approach offer a facility to the teacher to control the time available for the lecture on both sides enough time available for discussion and time available for questions. Many rules are expressed via the implemented algorithm to control all the activities allowed for the authorized users.

**State of art:** Mobile learning has been characterized as learning encouraged by mobile devices for example, cell phones, tablet PCs and individual media players (Valk *et al.*, 2010; Quinn, 2011) in both formal and casual instructive settings (Traxler, 2010; Jones *et al.*, 2013). Mobile learning has turned out to be widespread as the improvement of mobile devices with advanced wireless communication technology innovation has energized learning “progressing”, utilizing cell phones in instructional settings. It allows students to get to take in substance from different areas and times (Hyman *et al.*, 2014; Garcia-Cabot *et al.*, 2015) and share learning contents to others (Woodill, 2010). This technological

innovation has encouraged higher education establishments to build the use of portable innovation to satisfy their students desires and needs. At present, numerous college students bring their own computerized device to college, particularly small, convenient ones, for example, cell phones and tablets (Dahldtrom and Bischel, 2015; O'Bannon and Thomas, 2015) and they hope to get scholarly assets utilizing their mobile device. Mlearning in Higher education in many countries has not got to be widespread across the universities is still in the testing stage (Hyman *et al.*, 2014). In addition, the examination into mobile adapting primarily has been founded on the difficulties and the chances of this technology used in training and in online distance learning specifically. What's more, numerous new research points have been rising in different territories, including mechanical, educational, and methodological issues and issues identified with substance and UI adjustment (Awder and Mazen, 2017). So, Awder and Mazen (2017) have been designing framework for education systems that focus on these factors for developing educational mobile applications which are technical aspect logical aspect and cultural aspects.

The mobile applications have the principle distinctive qualities, for example, the less reliant space and time, more personalization and more incorporated to other portable application and services. Among the many fields of the mobile application development, one of the developing fields is the education. The latest reviews and improvements of portable application in instruction are educational games (Quan-Haase, 2008), a mobile learning framework (Ogara *et al.*, 2014; Hou and Wu, 2011) and interactive learning table (Contreras-Castillo *et al.*, 2006). Studies show that mobile applications give preferred outcome over desktop applications in language learning (Hrastinski, 2006), help to show signs of improvement abilities in math and writing (Jeong, 2007). Numerous mobile communication applications are accessible for free, e.g., Whatsapp Messenger, Blackberry Messenger, Google Hangout and so forth and may supplant the corresponding book. But since, the applications are not incorporated into the school database (educators, students, classes and parents records), the messages cannot be besides prepared by the school data framework. Hence the correspondence, application can't add to the school information to be used for choice emotionally supportive network by the school administration. Instant messaging will be represented as a part of the proposed mobile learning application in this research. Thus, it is essential to review and show the researches in this regard. The university students will be represented as a part of people who are using the instant messaging vastly

(Quan-Haase, 2008). Researchers have shown how instant messaging can be integrated into students social and academic lives (Ogara *et al.*, 2014). In the field of teaching and learning support with instant messaging tool, this tool could be used to support concurrent discussion activities (Hou and Wu, 2011). The learning process the formal and informal interactions incorporated with instant messaging tools in online learning environments could have a positive effect (Contreras-Castillo *et al.*, 2006; Hrastinski, 2006; Jeong, 2007). According to Timmis (2012) instant messaging conversation offers a means of sustainable peer support among undergraduate students through digitally mediated communication and collaborative activities that cross formal and informal boundaries. The concretion of artifacts, meaning making, motivation and affective support were also demonstrated. In learning process the formal and informal interactions incorporated with instant messaging tools in online learning environments could have a positive effect (Contreras-Castillo *et al.*, 2006; Hrastinski, 2006; Jeong, 2007).

Farmer (2005) shows that, mobile instant messaging tools is used to support teaching and learning in higher education. From above quotes it is revealed that instant messaging is represented as an important part to improve the process of mobile learning for students in higher education. Mobile learning as other processes will be affected by different characteristics. These characteristics will have a direct impact on the success of the process of mobile learning. In turn, these characteristics will motivate learners to use mobile-learning (So, 2016). A framework has been introduced and empirically tested by Karimi (2016). The results suggest that individuals learning style and perceived playfulness influence m-learning usage in both learning situations while performance expectation and personal innovativeness are only influential in specific learning contexts. Component determining will be represented as another success key factor of mobile learning. There are different frameworks have been developed in this regard. For instance Nicholas suggested a framework for sustainable mobile learning. Their framework is based on five components: economic sustainability, social sustainability, political sustainability, and technological sustainability and pedagogical sustainability.

Motiwalla explains a framework and evaluation focused on extension of e-Learning characteristics and mobile connectivity to propose a framework for mobile learning application (Motiwalla, 2007). Another study is done by Liu *et al.* (2010) to determine the factors that have impact on the mobile learning acceptance in China. Six different factors have been proposed in this study.

Then each of learning autonomy, self-efficacy, teacher readiness, student readiness, subjective norm and behavioral control have been listed as the main factors for the study. Mohammed shows a study to explore quality factors for mobile learning system. The study is based on 392 student's perspectives to achieve its goal, this study used questionnaire as a quantitative method. Then each of (sustainable mobile learning, the rational analysis of Mobile Education (FRAME) Model and mobile learning: a framework and evaluation) framework has been tested. The results of this study offer an empirical support for identifying the guidelines that contribute to the design and development of high quality mobile learning systems based on students perceptions (Almaiah and Man, 2016).

## MATERIALS AND METHODS

**Framework of mobile learning application:** The overall system scenario as shown in Fig. 1. After installing the required mobile application or authorized mobile, so, these mobiles can identify their tasks to cooperate and access these attributes, these attribute are:

- Lessons
- Exams
- Courses

**Access the direct lectures:** The students can access their attribute via. a rule implemented to organize the flow of data between the system and authorized user users. The students can customize his profile by selecting and adding his personal photo to be as iconic for his device.

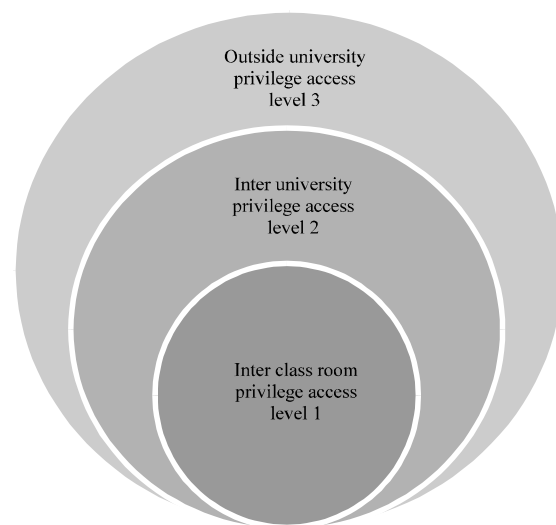


Fig. 1: Map diagram of the learning model

**System architecture:** Define When the student accesses the classroom by the same time the lecturer stated at that time the model starts operating and continues to the end. The lecture which is normally 50 min this model offers the following services:

- Copying the presented lecture
- Students can interact with the lecturers

The model gives the permission to access these data to those registered only and the students will have these categories depending on the area of access:

- 1st privilege: via. classroom for those students presented in the class
- 2nd privilege: via. the university campus: for those students that in the university campus
- 3rd privilege: via. out of the university not attended to the university

When the program is installed, then all the requirements and rules of the executed are shown to the subscribed students. In this case the student understands his situation and from which position he accesses the system (via classroom, via. university campus and outside the University campus) as it shown in Fig. 2 and 3.

**Implement categories and rules**

**Gently we have two main categories:** First non authorized persons can work access or control any data and only can see the overall process. Second authorized persons can access and enter within the system to request or do a certain activity. Authorized persons can be divided into three categories with specific priority:

**Cat 1:** Category number one is related to the students who attend the class with the classroom (Via. Wi-Fi). Cat 1 has first privilege level to do their activities. Cat 1 has a specific time TS1 authorized.

**Cat 2:** category number two is related to the students who attend the class within the University campus and outside the classroom (Via. wireless LAN). Cat 2 has second privilege level to do their actives. Cat 2 has a specific time TS2.

**Cat 3:** Category number three is related to the authorized student who attend the class from outside the university campus (Via. WAN). Cat 3 has third privilege level to do their activities. Cat 3 has a specific time of TS3. Under this approach we conctracted six rules as below:

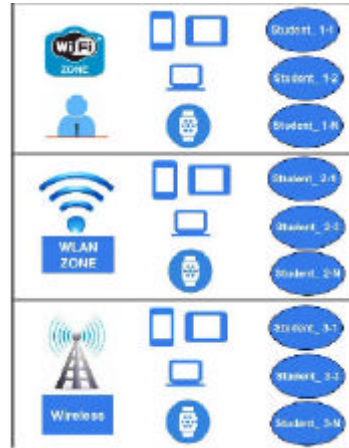


Fig. 2: Mobile learning system architecture

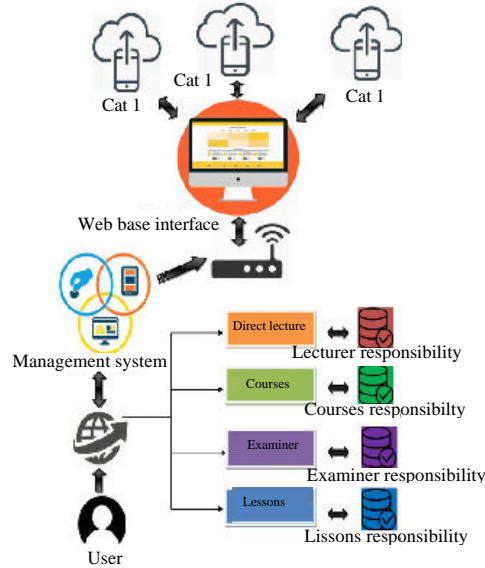


Fig. 3: Mobile learning rules and requirements

- Rule 1: (TL = 50 M) We assume that the time allocate for a lecture is 50 min
- Rule 2: (TP = 50% TL) We assume that the time allocated for a teacher (professor) is 25 min
- Rule 3: (TS = 50% TL) We assume that the time allocated for students (Cat1+Cat2+Cat3) is 25 min

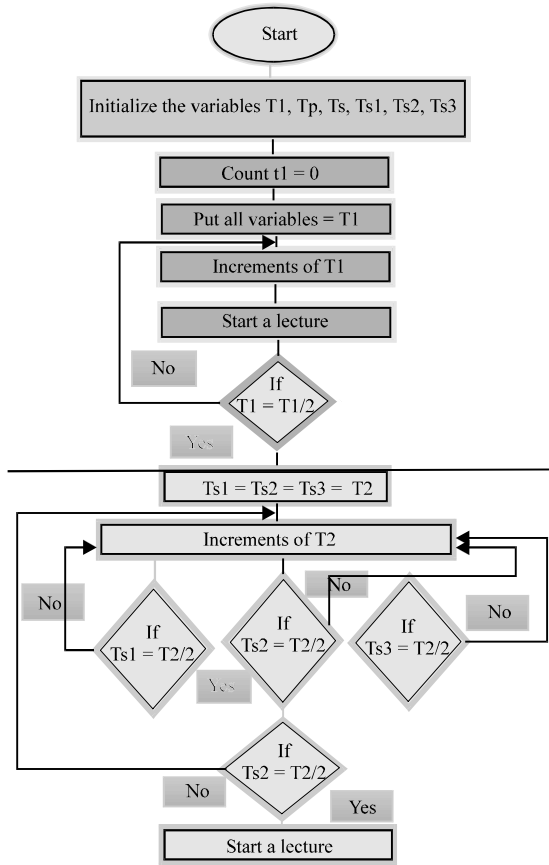


Fig. 4: Flow chart for the mobile learning system

**Priorities and rules:** To implement the mobile learning system many priorities and rule are specified and mentioned below:

- Rule 4:  $(Ts1 = 50\% TS)$  if  $(cat1 > cat2 > cat3)$  we assume that the time allocated for  $Cat1$  is 12.5 min. Assuming  $cat1$  in the largest group and  $Cat3$  is the smallest group
- Rule 5:  $(TS2 = 30\% TS)$  if  $(CAT1 > CAT2 > CAT3)$  we assume that the time allocated for  $Cat2$  is 7.5 min. Assuming  $Cat1$  in the largest group and  $Cat3$  is the smallest group
- Rule 6:  $(TS3 = 20\% TS)$  if  $(Cat1 > Cat2 > Cat3)$  we assume that the time allocated for  $Cat3$  is 5 min. Assuming  $Cat1$  is the largest group  $Cat3$  is the smallest group

**Mobile application algorithm:** The detailed procedure of the system operation is shown in Fig. 4. The operation of the system will be started when the lecturer gives the order to start the lecture. The 50% of the lecture will be spent on the lecture subject contain and the other 50% of

the lecture will be divided between the student groups and individual student activities and conversations. The period of the lecture that is controlled by the system and the lecturer is the admin, if he wants to interrupt the procedure of the lecture he can do it.

## RESULTS AND DISCUSSION

**Survey analysis:** Mobile learning depends on the knowledge of students and lecturer about this environment. This survey is divided into two categories:

**First category:** (Student study sample) this sample 101 students that form 80% of the overall student of the Telecommunication Engineering Department, Technical College of Engineering, Sulaimani Polytechnic University, Iraq.

Question one deals with the type of mobile device in which indicated most of the tested sample used iPhone and Samsung as shown in Fig. 5. This means that most of students using modern and smart mobile that are very important in mobile learning.

Questions two and three deal with using of Internet and mobile in which it is clear that more than 50% of the tested sample using 2-6 h of Internet and mobile per day as shown in Fig. 6. This indicated that most of the student spend long time using Internet and mobile that lead to specific knowledge on the tools of mobile learning.

Questions four and five deal with playing games and using social media as shown in Fig. 7 and 8. This indicated that most of the student about 80% spend little time for playing games on mobile, in addition most of students about 70% spend little time on using social media. This indicated that those students are studying at communications engineering department and they need to study hard at this department.

Question six deal with spent time on mobile learning in which that indicated about 40% of the students spends 2-6 h per day using mobile for learning as shown in Fig. 8. This item including wide area such as; self learning over mobile, studying lectures over mobile, copying and printing required documents, searching and selecting subjects from Internet via mobile.

Questions seven deals with spending money of Internet over mobile in which it is clear that about 57% spend  $>10\%$  in this item as shown in Fig. 9. This is a cross question that concludes these students are at low level of economy.

Questions eight, nine, ten, eleven and twelve deal to get information about events, healthcare, research, study lectures and watch movies. These items are 87, 75, 89, 86 and 89% of the student are concerned with these

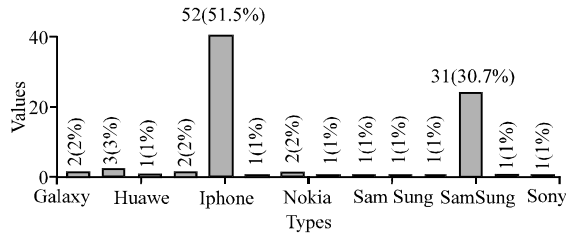


Fig. 5: Mobile cellphone types

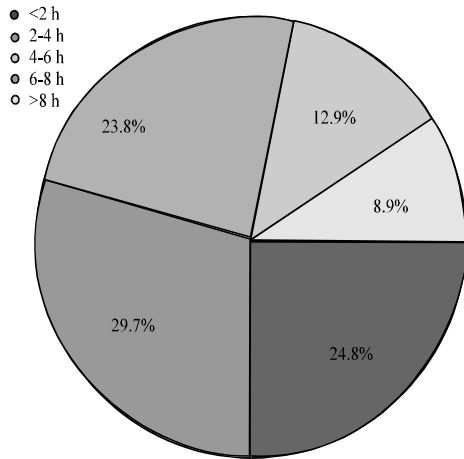


Fig. 6: Using of internet on mobile

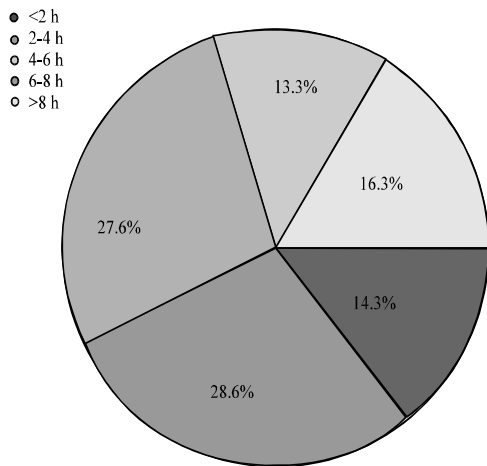


Fig. 7: Using of mobile

activities. So, it is clear that about 80% of the tested sample have some interest with mobile applications as shown in Fig. 10.

Question thirteen deal with time spend for mobile, this indicated about 60% of the sample spend 1-2 h using

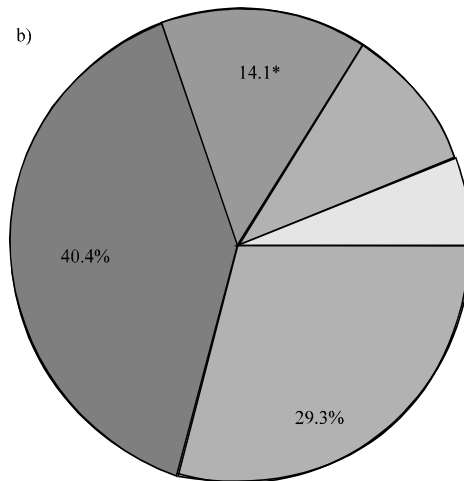
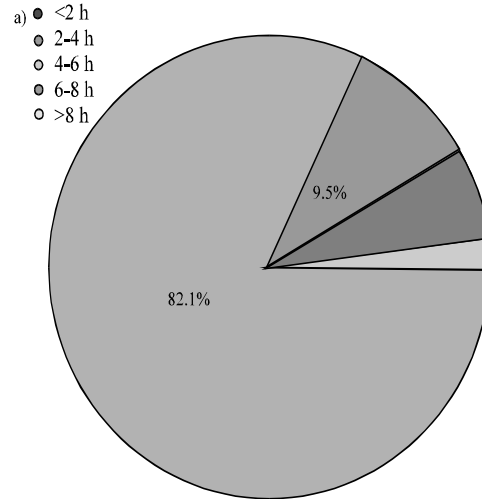


Fig. 8: Playing games and using social media

mobile as shown in Fig. 11-16. This indicated that a good percentage of students spend a lot of time using mobile. Question fifteen deal for using mobile for spending time. This item indicated that there are randomly scatterd of ansewes as shown in Fig. 17 and 18.

**Second category:** (Lecturer study sample) this sample 10 lecturers that form 50% of the overall lecturers of the Communication Engineering Department, Technical University, Sulaimai, Iraq.

Questions one-four deal with the using of mobile, Internet, social media and datashow in education in which about 90% of the lecturer are agree and strongly agree with using mobile, internet, social media and datashow in education as shown in Fig. 19-28. This indicated that

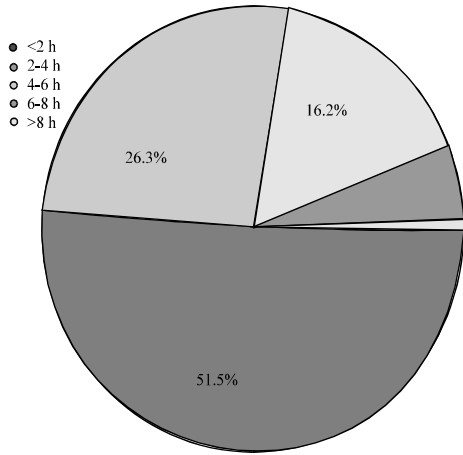


Fig. 9: Learning with mobile

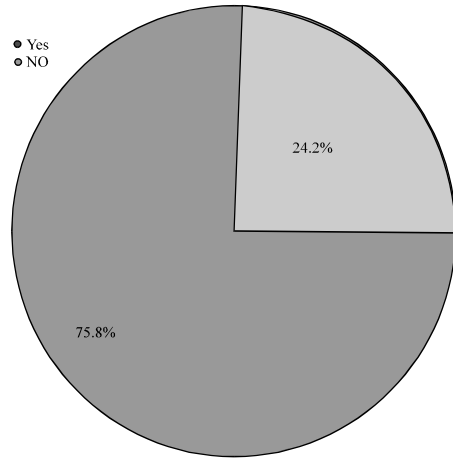


Fig. 12: Search for medical information via. mobile

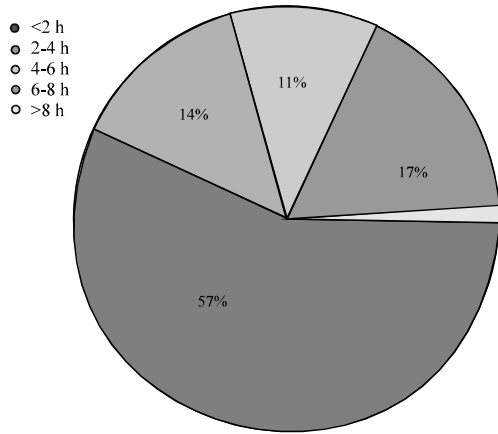


Fig. 10: Money spend for internet over mobile

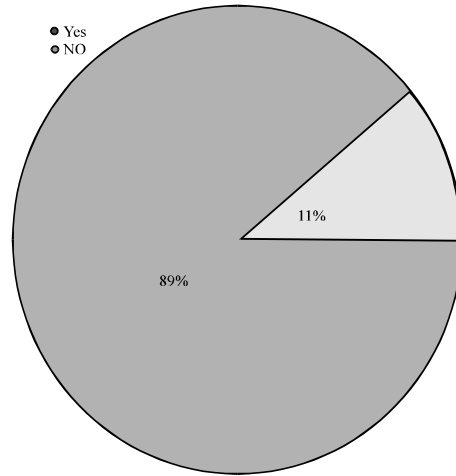


Fig. 13: Search for information regarding studying subjects

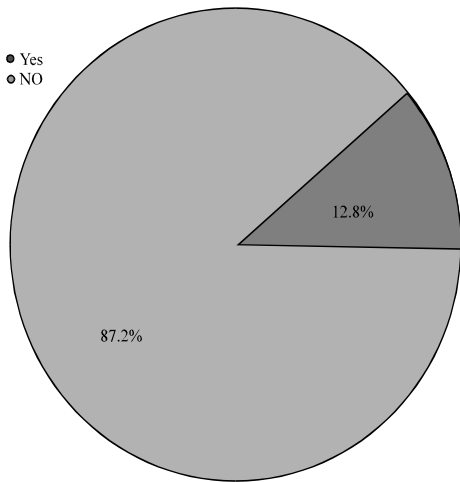


Fig. 11: Internet use from mobile

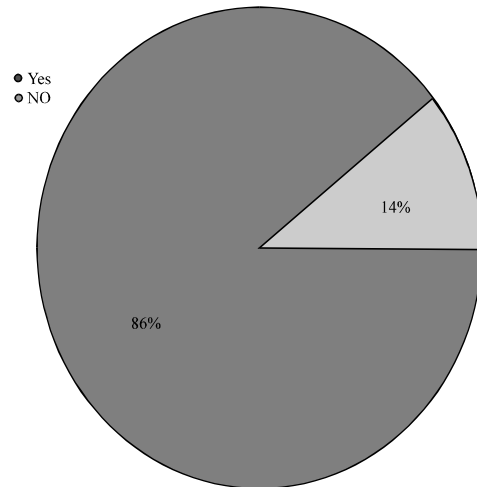


Fig. 14: Read and study lectures using mobile

using technologies and tools (mobile, internet, social media and datashow) in education are very important

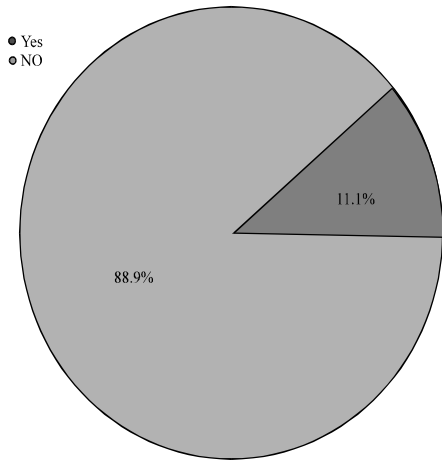


Fig. 15: Using mobile applications

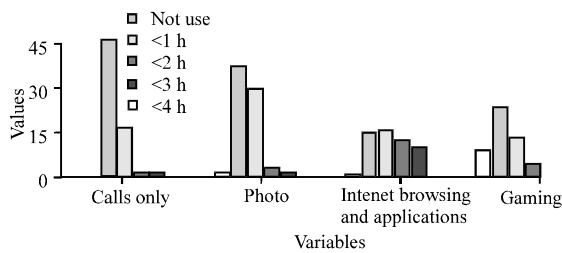


Fig. 16: Using mobile

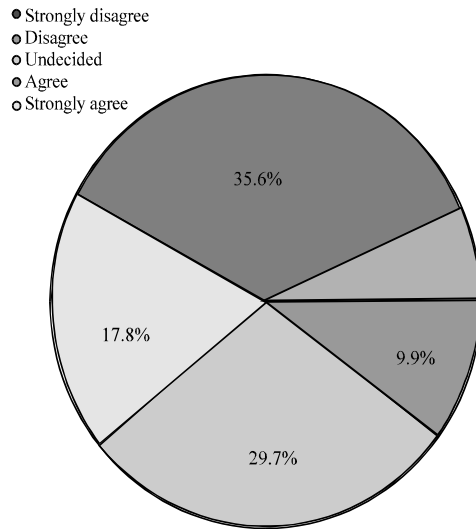


Fig. 18: Using mobile for spending time

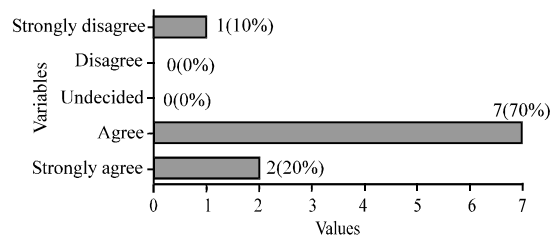


Fig. 19: Usage a mobile in education

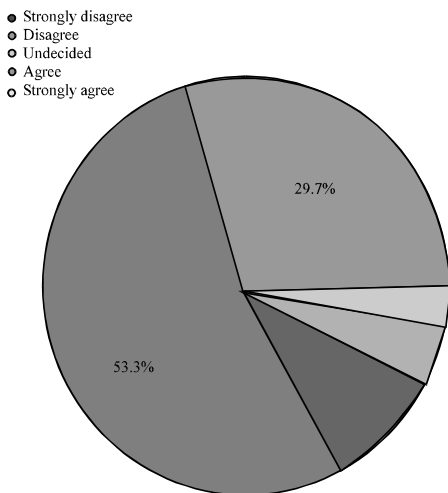


Fig. 17: Learning via. mobile

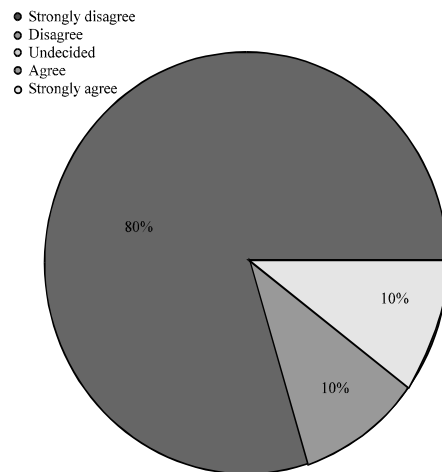


Fig. 20: Mobile usage in education

issue and can be adapted by lecturers. The survey analysis demonstrated that there is a strong orientation among students and lecturers in the use of mobile phone applications, so, it is necessary to design a simple

applicable design and easy to use by students to help them in learning and studying. This design started with first menu of user interface as shown in Fig. 29. According to this design each authenticated user can inter to the mobile learning application via. his/her user name and



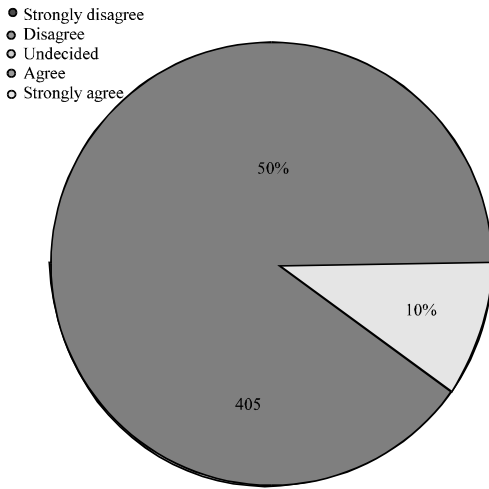


Fig. 21: Social media in education

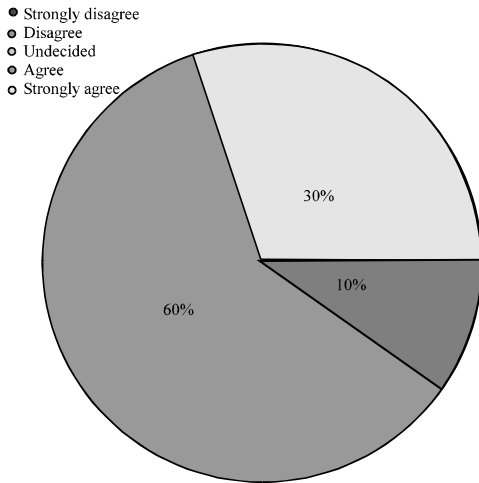


Fig. 22: Using mobile, internet, social media and datashow in education

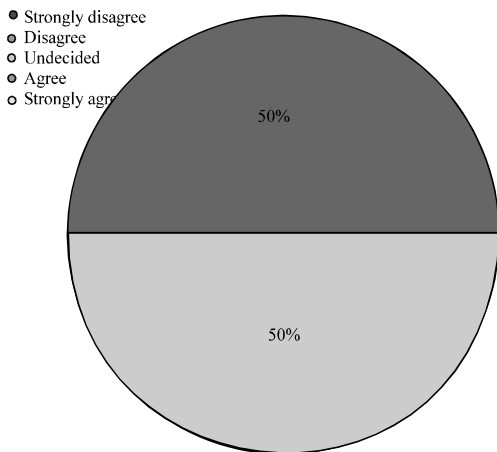


Fig. 23: Using white board in education

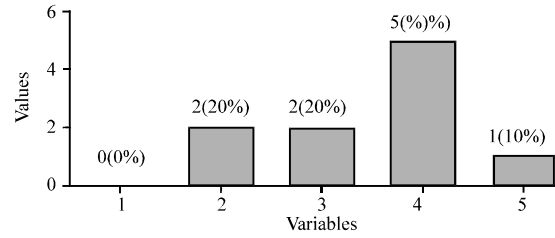


Fig. 24: Mobile learning knowledge

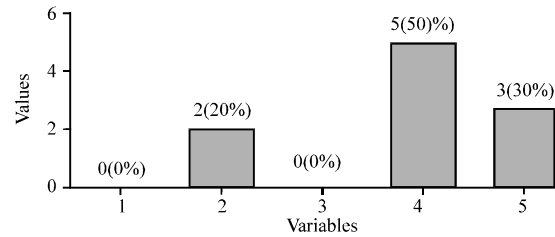


Fig. 25: Knowledge about e-Learning

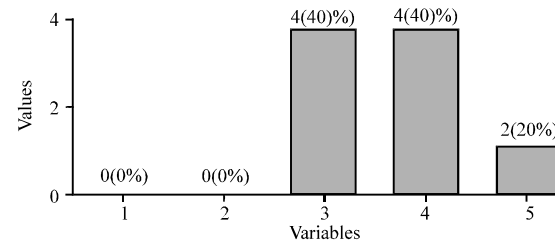


Fig. 26: Knowledge about blended learning

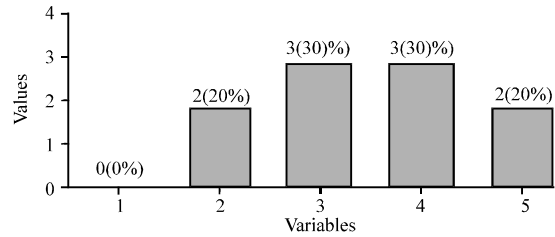


Fig. 27: Knowledge about distance learning

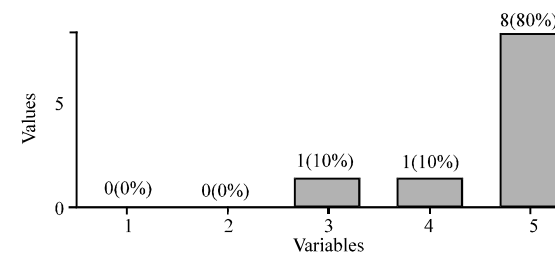
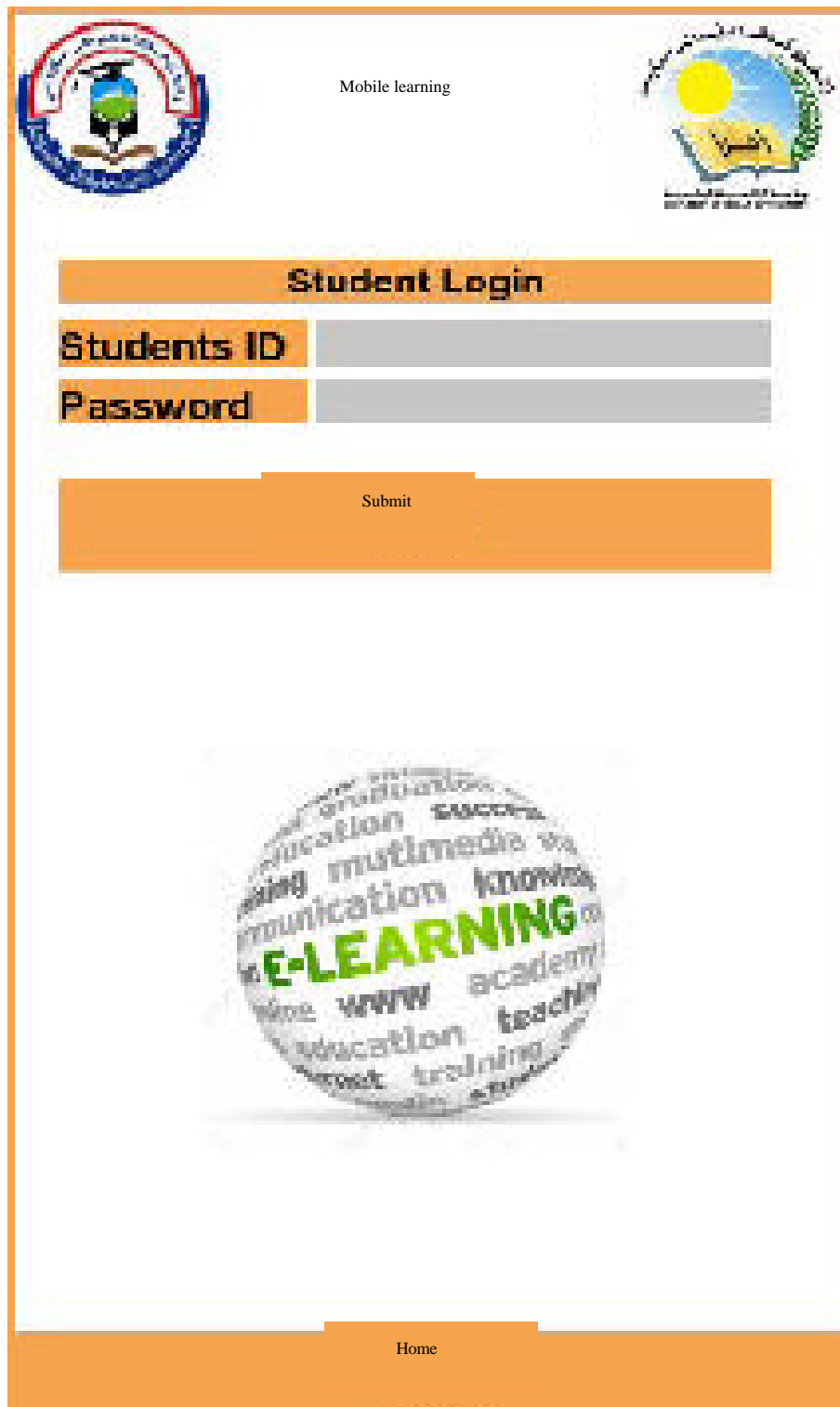


Fig. 28: Lecturer knowledge about adapting tools and technologies in learning and education



The image shows a mobile learning login interface. At the top left is a circular logo with a book and a globe. At the top right is another circular logo with a sun and a book. In the center, the text "Mobile learning" is displayed. Below this, there is a section titled "Student Login" in a blue bar. Underneath, there are two input fields: "Students ID" and "Password", each with a corresponding grey input box. Below these fields is a blue "Submit" button. At the bottom of the interface is a blue bar with the text "Home". In the center of the page, there is a 3D sphere graphic with the word "E-LEARNING" in large green letters. Other words on the sphere include "education", "multimedia", "communication", "knowledge", "academy", "teacher", "training", "www", "success", and "graduation".

Fig. 29: Mobile learning login interface



Fig. 30: Mobile learning classroom interface

password. The design of mobile learning application focuses on the ease of dealing with the application to be appropriate and an assistant to both the professor and the student as shown in Fig. 30.

### CONCLUSION

Recently electronic learning and mobile learning application have been developed. The advanced in technology and the specification of mobile leads to rise up the usage in the education environment. The implemented approach leads to design and implement a framework for mobile learning application. The main advantage of this approach concentrates on the dividing the lecture time into categories according to the attendance of the students. In addition, it also depends on certain rules applied via. implemented approach. The most important finding of this research is most of the students and lecturers of tested sample are strongly agree of adpting mobile learning in education in addition they have high knolege of mobile learning.

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### REFERENCES

- Abbas, H.A., 2016. Obstacles to the spread of E-Learning in the Arab Countries. *J. Educ. Learn.*, 10: 347-354.
- Almaiah, M.A. and M. Man, 2016. Empirical investigation to explore factors that achieve high quality of mobile learning system based on students perspectives. *Eng. Sci. Technol. Intl. J.*, 19: 1314-1320.
- Awder, M.A. and I.G. Mazen, 2017. Design a mobile learning framework for students in higher education. *JUHD.*, 3: 288-296.
- Batista, S., P. Behar and L. Passerino, 2010. Use of graph2Go in M-learning: A view from the pedagogical model. *Key Competencies Knowl. Soc.*, 324: 12-22.
- Contreras-Castillo, J., C. Perez-Fragoso and J. Favela, 2006. Assessing the use of instant messaging in online learning environments. *Interact. Learn. Environ.*, 14: 205-218.
- Dahldrom, E. and J. Bischel, 2015. ECAR study of undergraduate students and Information Technology. *Educ. Comput. Res.*, 17: 389-413.
- Dierking, L.D., J.H. Falk, L. Rennie, D. Anderson and K. Ellenbogen, 2003. Policy statement of the informal science education ad hoc committee. *J. Res. Sci. Teach.*, 40: 108-111.

- Emmanouilidis, C., N. Papathanassiou and A. Papakonstantinou, 2008. Current trends in E-training and prospects for maintenance vocational training. Proceedings of the CMMFPPT 2008 5th International Conference on Condition Monitoring and Machinery Failure Prevention Technologies CM-MFPPT, July 15-18, 2008, Heriot-Watt University, Edinburgh, UK., pp: 466-471.
- Farmer, R., 2005. Instant messaging: IM online! RU?. *Educ. Rev.*, 40: 49-62.
- Fong, J., K. Reggie and F.L. Wang, 2008. *Hybrid Learning and Education*. Springer, Berlin, Germany, ISBN:9783540851707, Pages: 474.
- Garcia-Cabot, A., L. De-Marcos and E. Garcia-Lopez, 2015. An empirical study on M-learning adaptation: Learning performance and learning contexts. *Comput. Educ.*, 82: 450-459.
- Hou, H.T. and S.Y. Wu, 2011. Analyzing the social knowledge construction behavioral patterns of an online synchronous collaborative discussion instructional activity using an instant messaging tool: A case study. *Comput. Educ.*, 57: 1459-1468.
- Hrastinski, S., 2006. Introducing an informal synchronous medium in a distance learning course: How is participation affected?. *Internet Higher Educ.*, 9: 117-131.
- Hyman, J.A., M.T. Moser and L.N. Segala, 2014. Electronic reading and digital library technologies: Understanding learner expectation and usage intent for mobile learning. *Educ. Technol. Res. Dev.*, 62: 35-52.
- Jeong, W., 2007. Instant messaging in on-site and online classes in higher education. *Educause Q.*, 30: 30-36.
- Jones, A.C., E. Scanlon and G. Clough, 2013. Mobile learning: Two case studies of supporting inquiry learning in informal and semiformal settings. *Comput. Educ.*, 61: 21-32.
- Karimi, S., 2016. Do learners characteristics matter? An exploration of mobile-learning adoption in self-directed learning. *Comput. Hum. Behav.*, 63: 769-776.
- Liu, Y., H. Li and C. Carlsson, 2010. Factors driving the adoption of m-learning: An empirical study. *Comput. Educ.*, 55: 1211-1219.
- Menkhoff, T. and L.B. Magnus, 2010. Engaging Students in Higher Education Through Mobile Learning. In: *Organizational, Business and Technological Aspects of the Knowledge Society*, Lytras, M.D., O.D.P. Patricia, Z. Adrian, R. Alan and M. Hermann et al., (Eds.). Springer, Berlin, Germany, ISBN:978-3-642-16323-4, pp: 471-487.
- Motiwalla, L.F., 2007. Mobile learning: A framework and evaluation. *Comput. Educ.*, 49: 581-596.
- O'Bannon, B.W. and K.M. Thomas, 2015. Mobile phones in the classroom: Preservice teachers answer the call. *Comput. Educ.*, 85: 110-122.
- Ogara, S.O., C.E. Koh and V.R. Prybutok, 2014. Investigating factors affecting social presence and user satisfaction with mobile instant messaging. *Comput. Hum. Behav.*, 36: 453-459.
- Quan-Haase, A., 2008. Instant messaging on campus: Use and integration in university students everyday communication. *Inf. Soc.*, 24: 105-115.
- Quinn, C.N., 2011. *Designing M-Learning: Tapping into the Mobile Revolution for Organizational Performance*. John Wiley & Sons, Hoboken, New Jersey, USA.,
- So, S., 2016. Mobile instant messaging support for teaching and learning in higher education. *Internet Higher Educ.*, 31: 32-42.
- Stickel, C., A. Scerbakov, T. Kaufmann and M. Ebner, 2008. Usability Metrics of Time and Stress-Biological Enhanced Performance Test of a University Wide Learning Management System. In: *HCI. Usability Education Work*, Holzinger, A. (Ed.). Springer, Berlin, Germany, ISBN:978-3-540-89349-3, pp: 173.
- Timmis, S., 2012. Constant companions: Instant messaging conversations as sustainable supportive study structures amongst undergraduate peers. *Comput. Educ.*, 59: 3-18.
- Traxler, J., 2010. Will student devices deliver innovation, inclusion and transformation?. *J. Res. Center Educ. Technol.*, 6: 3-15.
- Valk, J.H., A.T. Rashid and L. Elder, 2010. Using mobile phones to improve educational outcomes: An analysis of evidence from Asia. *Intl. Rev. Res. Open Distrib. Learn.*, 11: 117-140.
- Varlamis, I. and I. Apostolakis, 2006. The present and future of standards for E-learning technologies. *Interdiscip. J. E. Learn. Objects*, 2: 59-76.
- Wang, M., D. Novak and R. Shen, 2008. Assessing the Effectiveness of Mobile Learning in Large Hybrid Blended Classrooms. In: *Hybrid Learning and Education*, Fong, J., K. Reggie and F.L. Wang, (Eds.). Springer, Berlin, Germany, ISBN:978-3-540-85169-1, pp: 304-315.
- Woodill, G., 2010. *The Mobile Learning Edge: Tools and Technologies for Developing your Teams*. McGraw-Hill Education, New York, USA., ISBN:978-0-07-173984-9, Pages: 268.