

Design and Implementation of Mobile Application Learning for Human Computer Interaction

Tan Phei Yee¹, Wong Chun Fong² & Ng Boon Ding³

^{1,3}JTMK, Politeknik Kuching Sarawak, Km 22 Jalan Matang,
93050 Kuching Sarawak, Malaysia

²JKM, Politeknik Kuching Sarawak, Km 22 Jalan Matang,
93050 Kuching Sarawak, Malaysia

tpy@poliku.edu.my

ABSTRACT

This paper presented a mobile application named HCI Go. Human Computer Interaction is a theoretical subject. Most of the time, the teaching and learning session adopt chalk and talk method. Thus, the production of this application is to enrich the teaching and learning method by adopting the 20th century learning method. This is an interactive learning application. With this application, user will experience the interactive learning for Human Computer Interaction subject. User also can enrich their knowledge in this subject through the interaction in the application. It has the potential to change the way we teach and learn across the typical classroom board. It can upgrade, and expand the participation in lifelong learning. However, it cannot replace lecturers, but in addition to existing methods it can improve quality and achieve their teaching, and reduce time for administration. This is aligned with the 20th century learning method where it enables every student to achieve their potential and help to build an education workforce that is authorized to change. At the same time, the education application will be able to aspire towards future learning communities. In addition, HCI is a subject that is not only learnt by students in colleges or university, but, personnel involved in this field will also can use this application to enrich their knowledge for their daily working activities.

Key Words: mobile application, teaching, learning, Human Computer Interaction

1. INTRODUCTION

Mobile learning enables learners to learn anywhere and at any time using mobile technologies (Vosloo, 2012). The use of mobile devices, such as smartphones, mobile phones, tablets, PDAs, MP3s, and pocket PCs, for computing education is constantly gaining interest among researchers and educators (Ihantola *et al.*, 2013; Moreira & Ferreira, 2016; Prenner *et al.*, 2014; Oyelere *et al.*, 2016a; Tortorella and Graf, 2017). These interests are boosted because of mobile devices' availability, low cost, technology infrastructure availability, and learners' interests (Oyelere *et al.*, 2016a & Oyelere *et al.*, 2016b). Learners can now carry mobile devices anywhere, anytime to support their learning and personal activities. Although learning through mobile devices is envisaged as beneficial, especially in computing classrooms, learners' perception and experience will determine the success of this technological intervention.

According to Bombaes A., (2018), Mobile learning (M-learning) is the future modern way of learning and important for the students to keep pace with changing technology and time. M-learning has a key position in the development of new teaching methodologies for higher education students. Learning through M-technology is free of limitation; the student can access the knowledge and information at any time and any place. According to Oxford dictionary, learning mean trying to gain knowledge or certain skill through alternatives such as study, daily experience or being taught by someone. Whereas, according to Han, Q (2017), the advantages of mobile learning can manifested in mobility, high efficiency, personalized and generalized. Mobile learning (m-learning) can be defined as learning where learner is not constrained by physical location and utilized the mobile technologies in gaining knowledge and skills needed. With m-learning, learner can gain knowledge and skills anywhere and not limited to inside a classroom.

According to Kukulska-Hulme, (2007), mobile learning becomes one of the methodologies in teaching and learning is due to portable, lightweight and small devices that can fit in a pocket such as mobile phones, smartphones and Personal Digital Assistants. With all these devices, learning and

teaching can be done anywhere. M-learning also becomes popular due to the low cost of this devices compared to desktop computer.

Human Computer Interaction is one of the courses offered in Polytechnic Kuching Sarawak for semester three students who enrolled for the Diploma in Information Technology (Digital Technology) programme. Due to the advantages brought by mobile learning, a mobile application is created to aid the lecturers and students in the teaching and learning process.

Even though students can access the notes and doing the assessments such as quiz through portal e-learning Polytechnic Kuching Sarawak, students still require Internet connection all the time. By using mobile application, students only need to install the application and then they can access all the notes, exercises and quiz without Internet connection.

There are two objectives in creating this mobile application for the course Human Computer Interaction. The first objective is to create mobile application for the course Human Computer Interaction is to enable students in learning according to their own target anytime and anywhere. This means students can gain the knowledge needed in achieving the course learning outcome without limited to location or time. The second objective is to provide a mobile application where students can access notes, exercises and quizzes without Internet connection. They only need Internet connection to install the mobile application in one-time basis only.

According to Mohanna, M & Capus, L (2013), the Usage of mobile telecommunication data networks is so sensitive because of their rather high costs compared with those of using office or home networks for internet surfing. Thus, volume of download data required to get certain information still a worrying obsession for most mobile data users.

The rest of this paper is organised as below: section 2 reviews on researches mobile learning; section 3 describes the methodology in developing the mobile app; section 4 discusses of the findings; section 5 discusses prototype of the mobile app; section 6 describes the discussion and the last section concludes the overall paper.

2. LITERATURE REVIEW

In a study conducted by Irwan *et al.*, (2013) regarding the acceptance of Polytechnic's student toward mobile learning in AutoCAD teaching and learning process, it had been found that level of mobile usage for teaching and learning is high among Polytechnic's student. The study also shows that Polytechnic's student has a strong positive attitude towards mobile learning. Besides that, study done by Ghani C., Shangeetavaani K., Shah A., (2017), mentioned that students have the awareness to mobile technologies in learning process. Due to this, mobile learning should be utilized in the teaching and learning process for the benefits of the students and lecturers in Polytechnic Kuching Sarawak.

There are a lot of methods used in the teaching and learning process. Mobile learning (M-learning) is a new learning method that maximizes the usage of mobile devices and technologies in education field (Sharples, Corlett, & Westmancott, 2002). According the study done by Furió, D., *et al.*, 2015 compared between mobile learning and traditional classroom learning showed that mobile learning method achieved higher results in term of knowledge compared to traditional classroom method. The respondents of the study also stated that with mobile learning, they felt more satisfy compared to traditional classroom learning. According to Ivica, B *et al.*, (2013), students felt more motivated in learning with the incorporation of mobile technologies in the teaching and learning process. While a study done by Hürst *et al.*, (2007), Wen & Zhang (2015) and Oyelere, *et al.*, (2016b) showed that students learning achievement improved through mobile learning application.

Mobile phones are the most affordable tool of communication through which users can share ideas and can enhance their learning as compared to the computers (Poong, Yamaguchi, & Takada, 2017). According to Young, Hongxiu, & Christer (2010), the benefit of mobile technology is that user can access the learning material independent of place and time. Mobile technology provides its users learning opportunities and user learning experience are no longer bounded by physical location of the learner. With the advancement of technology mobile devices are getting smart, ease to carry and powerful (Yang, 2005; Gan, 2015).

In order to develop a mobile application that is more user friendly, the mobile application must be attractive, interactive where user can interact easily with the mobile application and easy to use so that it is time effective and users does not need to spend a lot of time in learning to use the mobile application (Flood, D *et al.*, 2012). In the context of developing world, the usage of mobile application would not cost a lot. Other than that, it can be used widely in different areas and it is easy to be used. According to Chohan *et al.*, (2017), the market of mobile applications is expanding in a fast pace with mobile area is continuing to improve in performance and combined with high demand from users for

greater features. Regarding to Moreira & Ferreira (2016), mobile learning supported the teaching of requirement engineering and make the teaching and learning more fun and enjoyable. With the invention of greater features, the usefulness of the mobile also increases and users can perform different tasks by using the mobile (Harrison *et al.*, 2016).

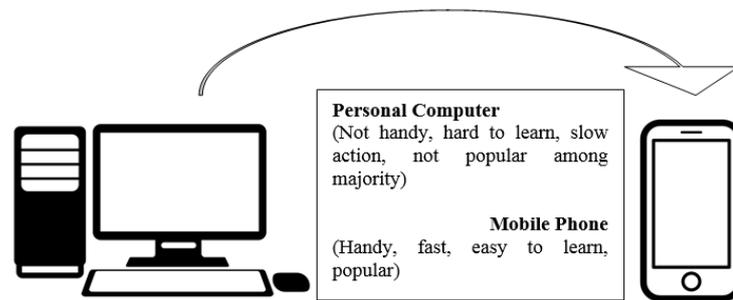


Figure 1: PC vs. Mobile Phone (Source: adapted from Chohan *et al.*, 2017)

3.0 RESEARCH DESIGN AND METHODS

The software development methodology applied is based on ADDIE Model which consisted of five main phases which are Analysis, Design, Development, Implementation and Evaluation.



Figure 2: ADDIE Model

The design of HCI Go application includes Platform Design and System Design comprises of several interactive features as shown in Figure 3. The learning material comprises text, images and interactive animations. The application runs on Android Operating System and uses Adobe Air to play. A user has to download and install HCI Go application onto their mobiles. The following table represents the interfaces are designed based on the HCI Go modules described in Table 1.

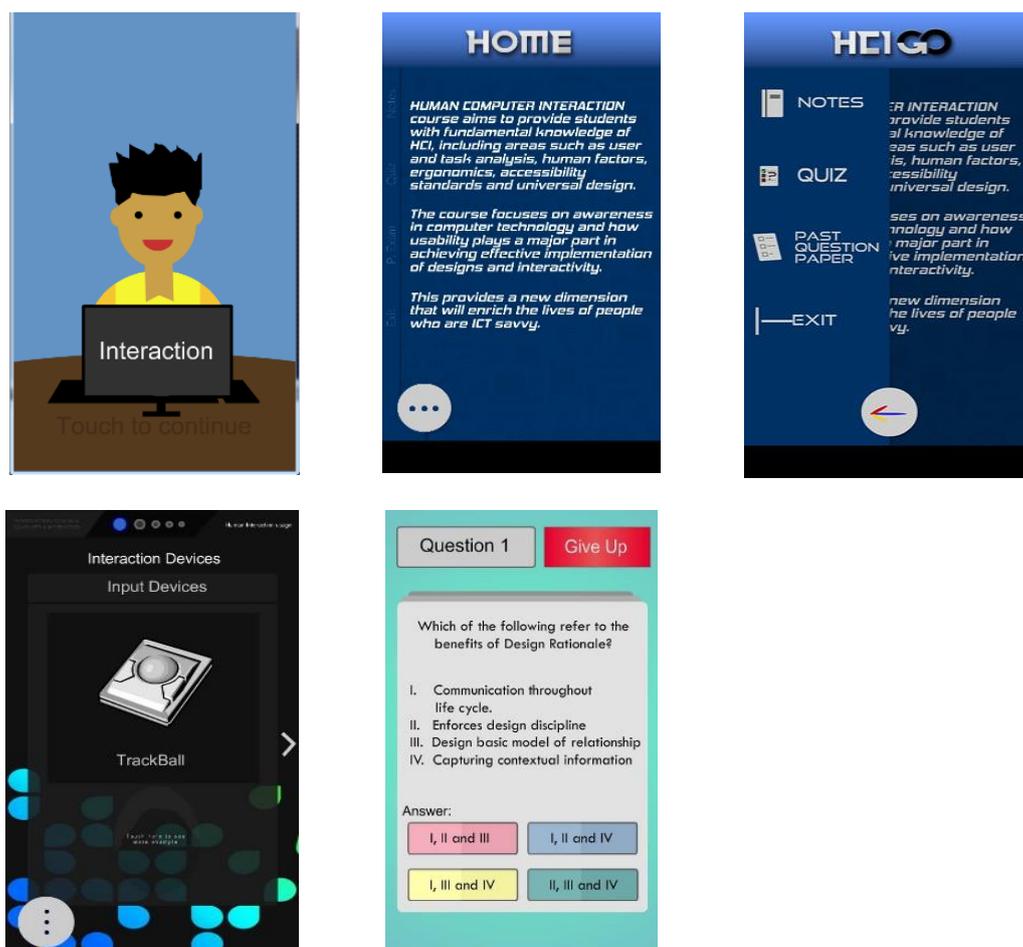


Figure 3: System design of HCI GO

Table 1: Interface Design of HCI GO modules

Modules	Description
Notes Chapter Sub Chapter Quiz	Presenting information, providing offline notes, interactive notes. Opportunity to think hard about the concepts presented in the learning material and to test his/her understanding of the topics.
Past Question Paper	Opportunity to think hard about the Past Question paper presented in the learning material and to test his/her understanding of the topics.
Exit	To do selection when exit the application.

4.0 FINDINGS

The population of this study consisted of all diploma student in the Department of Information Technology and Communication at the Polytechnic Kuching Sarawak of Malaysia. There were 90 students attending Human Computer Interaction course. However, the researchers distributed the study instrument (a survey questionnaire) to 30 students who were randomly selected from both programs as the sample for this study.

Questionnaire is consisted of two parts: first part used to have basic information of respondents based on their age and gender and second part measures intention of students to learn through mobile application of HCI GO in terms of usability, design and content using five-point Likert scale. All questionnaire items were adapted from different studies (Milošević, Ivković, Manasijević, & Nikolić,

2015; Al-Ani & Sarab M. Hameed, 2013) with little modifications of words and sentences in accordance with the current study.

The mean value of this study is translated according to the following translations:

Table 2: Mean Score Interpretation

Mean Score	Interpretation
1.00 - 1.80	Very Low
1.81 – 2.60	Low
2.61 – 3.20	Medium
3.21 – 4.20	High
4.21- 5.00	Very High

(Source: adapted from Moidunny, 2009)

To carry out this study, the researchers conducted briefings to ensure respondents answered all the items according to the correct understanding, the researchers have read and explained each item carefully to the respondents.

Pilot study is conducted before actual study is carried out. This study aims to identify problems related to understanding and interpretation of the items in the questionnaire and getting feedback to improve the items that have been constructed (Mohd Majid A.G., 1990). Pilot study was conducted on 10 respondents consisting of JTMK students. The reliability level analysis of the questionnaires was carried out using Alpha Cronbach test. The results of pilot studies have obtained alpha values as high as 0.970. According to Mohd Salleh & Zaidatun (2001), a study that achieves alpha value of 0.6 and above has the reliability of acceptable questions.

A total of 30 sample questionnaires were distributed to students of the Department of Information Technology and Communication, Polytechnic Kuching Sarawak. The respondents' self-information was analyzed using Descriptive Statistics Analysis using frequency and percentage distribution. Table 3 refers to respondents by gender.

Table 3: Gender

Gender	Frequency	Percent
Male	20	66.7
Female	10	33.3
Total	30	100.0

The result of the questionnaire was also found that 20 male students (66.7%) and 10 female students (33.3%) have become the respondents of this study. The majority of the respondents consist of age ranges from 19 to 25 years (86.7%).

This section will analyze questionnaires for the application of HCI GO application in terms of usability of application among students of Polytechnic Kuching Sarawak. Overall, the mean score for the usability of application is very high at 4.346. Table 4 below shows the usability of application.

Table 4: Usability of Application

Items	SD %	D %	N %	A %	SA %	Mean	Std. Deviation
This application is easy to use	0	3.3	13.3	36.7	46.7	4.2667	.82768
I enjoy using this application	0	0	13.3	33.3	43.3	4.1000	.99481
This application has clear presentation	0	0	13.3	30	56.7	4.4333	.72793
This application is suitable for all user	0	0	13.3	20	66.7	4.5333	.73030
This application is attractive	0	0	16.7	26.7	56.7	4.4000	.77013
TOTAL				4.3466			

The finding from Table 4 shows the application is suitable for all users recorded a mean value of 4.533. Subsequently, a mean value of 4.43 indicates that the application has clear presentation. Through this study, the researcher also found the mean value of 4.40 where this application is attractive. The mean value of 4.26 shows the application is easy to use.

Meanwhile the mean findings and standard deviation for design of application for HCI GO are as shown in Table 5.

Table 5: Design of Application

Items	SD %	D %	N %	A %	SA %	Mean	Std. Deviation
Type of text used is easy to read	0	0	0	36.7	53.3	4.4333	.67891
Presentations were clear and organized	0	0	10	36.7	53.3	4.4333	.67891
Link are consistent	0	3.3	10	26.7	60.0	4.4333	.81720
Link are easy to identify	0	0	16.7	13.3	70.0	4.5333	.77608
Layout are consistent	0	0	10.0	36.7	53.3	4.4333	.67891
TOTAL				4.4533			

Table 5 above shows the design of application of HCI GO is very high with a total mean score of 4.453. The findings find that this application link is easy to identify with a mean value of 4.53. Through this study, researchers also found a mean value of 4.33 where the presentation were clear and organized, type of text used is easy to read, link and layout are also consistent.

Table 6: Content of Application

Items	SD %	D %	N %	A %	SA %	Mean	Std. Deviation
Learning objectives were clear	0	0	13.3	20.0	66.7	4.5333	.73030
Content was organized and well planned	0	0	13.3	30.0	56.7	4.4333	.72793
Application workload was appropriate	0	0	13.3	30.0	56.7	4.4333	.72793
Application organized to allow all students to participate fully	0	0	13.3	30.0	56.7	4.5333	.68145
The quizzes and sample test is very useful	0	0	13.3	33.3	53.3	4.4000	.72397
TOTAL						4.464	

This section analyzes questionnaires for the content of applications in terms of usage and suitability for the application of HCI GO applications among the students of Polytechnic Kuching Sarawak. The result of the analysis shows the overall score mean is very high at 4.464. Table 6 above shows the content of application.

The finding from Table 6 find a mean value that is very high at 4.53 where the learning objectives were clear and application organized to allow all students to participate fully. While content was organized, well planned and the application workload was appropriate making a reference to score mean value that is very high at 4.43. A very high mean value of 4.40 indicates that the quizzes and sample test is very useful for the respondents.

Table 7: Overall of this application

Overall of this Application	Frequency	Percent
Disagree	1	3.3
Neutral	5	16.7
Agree	9	30.0
Strong Agree	15	50.0
Total	30	100.0

Table 7 shows that overall of this application. 50% of the respondent give strongly agree that overall of this application is good. Only 3.3% of the respondent disagree the overall of this application is good.

Table 8: Are you going to use this application?

Are you going to use this application?	Frequency	Percent
YES	29	96.7
NO	1	3.3
Total	30	100.0

Meanwhile Table 8 shows that 96.7% of respondents give "yes" that they are going to use this application. 100% of respondents will suggest this application to others.

5. PROTOTYPE

The developed “HCI GO” mobile application was designed to be user friendly. It is developed by using Adobe Flash. Adobe Flash is used as an interface in developing the application and the programming language used is ActionScript. Touching the startup screen makes the main menu appear. The mobile application is developed by dividing the content of the application into four main activities namely as notes, Quiz, Past Question Paper and Exit (table 1). The notes modules consists of offline notes of main chapter, sub chapter for every topic while learning learning the notes provide activities like interactive notes. For the assessment activities, HCI GO application integrate quizzes, and past year question(archie) so that students able to review and exercise the quizzes and past year questions. The Exit modules allowed the students to click to exit the application. Meanwhile the HCI GO home menu and some features are shown in Figure 4.

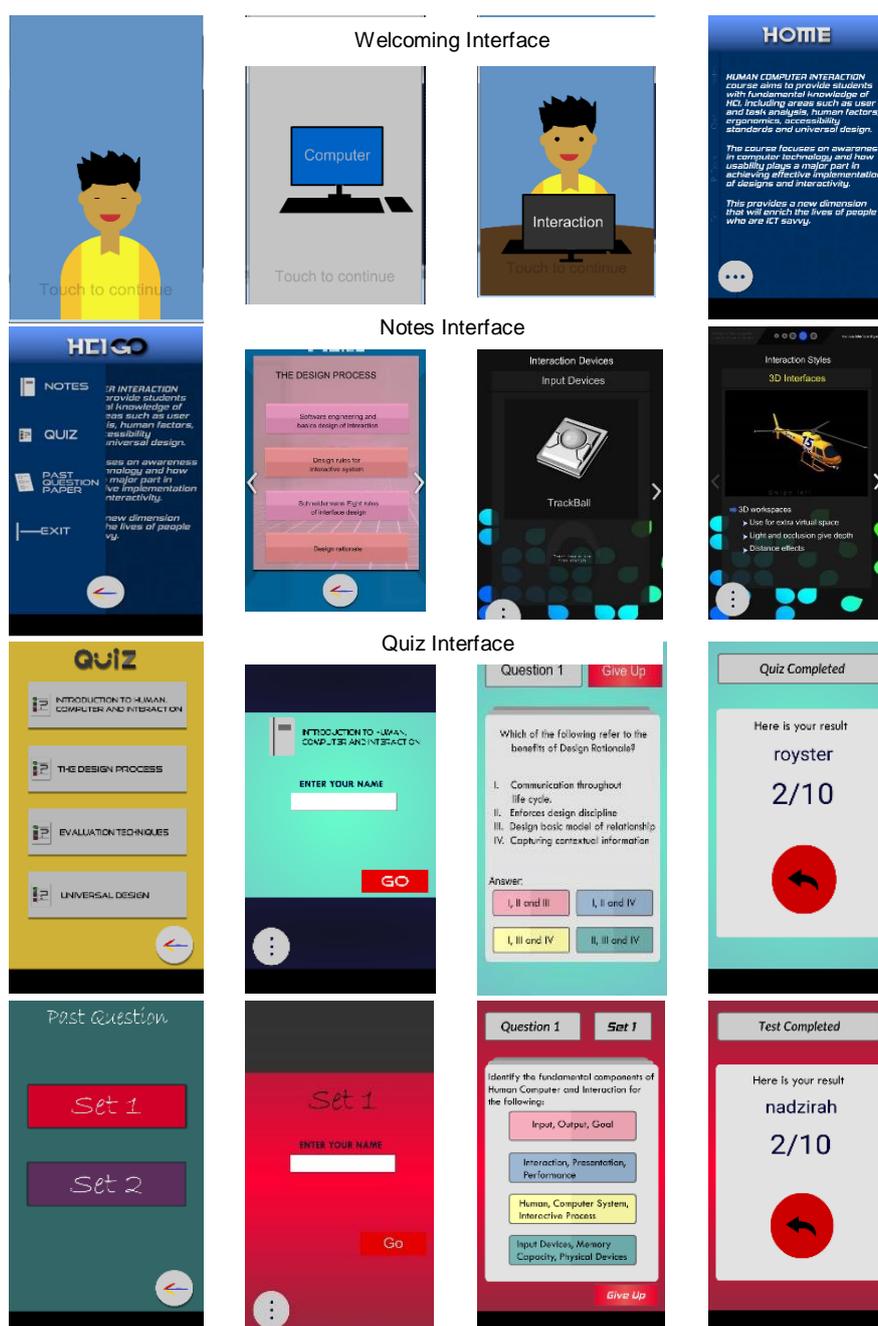


Figure 4: HCI GO features and interfaces

6. DISCUSSION

Based on the findings of the study, a mobile educational application for learning Human Computer Interaction successfully developed based on the ADDIE instructional design model. The application was designed and developed as an effort to make teaching and learning of Human Computer Interaction more interesting and enjoyable for teacher and students.

When comes to the opinions of students on HCI GO application design in terms of usability of application, design of application and content of application, it is clear that most of students expressed a high level of satisfaction on the design, usability and the content of the application. The findings indicate the importance of interface design and attention to usability will lead to better mobile learning and well-designed educational applications. These results are in line with the results of several other studies employed user interface design (Harrison *et al.*, 2013; Tahir & Arif, 2014)

The current study contributed to the literature in that using mobile applications in teaching and learning can be a more effective tool when compared to traditional paper-based activities. The benefits of educational materials using smartphones apps are that they allow users to have an instant access to educational data and to enjoy the freedom of mobility in places where no computers are available at any time when learners need them. The findings support assertions made by researchers (Hürst *et al.*, 2007, Wen & Zhang ,2015 and Oyelere, *et al.*,2016b) mentioned that mobile learning can assist students to achieve their learning objectives owing to flexibility of the format for the transmission of knowledge.

7. CONCLUSION

By creating a mobile application for the course of Human Computer Interaction, students will be motivated in learning the course because they can learn the course according to their own pace. They do not need to force themselves and they can study in a more relax environment. The students can get all the information needed for the course as well as quiz which can help the students to assess their own understandings regarding the course. They do not need to go to the library to search for information and can access the information anytime and anywhere. So, learning through mobile application is very flexible for students.

The overall findings of this study contribute to a better understanding of polytechnic students' perceptions on mobile learning at the Polytechnic Kuching Sarawak. Based on the results of this study, the researchers view that polytechnic students accept the notion of M-Learning positively and that they are willing to use it. These findings are consistent with other research results presented in the current literature about the topic. Current literature indicates that they believe task can be improved if students are exposed to M-learning.

A clear strategy is therefore required prior to the implementation of M-learning. Moreover, the results of the study show that Malaysians students are well educated and updated with the modern high-technology devices used by educational institutions in the developed countries around the world. Also, students are not only knowledgeable about these high-tech devices but actually use them in their daily life matters. Therefore, it is advisable that this usage is transmitted to educational purposes.

REFERENCES

- Al-Ani, M. F., & Sarab M.Hameed. (2013). Students' Perspectives in Adopting Mobile learning at the University of Bahrain. *IEEE*.<https://doi.org/10.1109/ECONF.2013.59>
- Bombaes, A. (2018). Student's Intentions to Use M-Learning: An Empirical Perspective from the Philippines. *Business and Economic Research* ISSN 2162-4860, Vol 8, No. 1
- Chohan, A. H., Affandi, H. M., Awad, J., & Che-Ani, A. I. (2017). A Methodology to Develop a Mobile Application Model to Appraise Housing Design Quality. *International Journal of Interactive Mobile Technologies (IJIM)*, 11(6), 4-17.
- D. Flood, R. Harrison, C. Iacob, and D. Duce,. (2012). Evaluating Mobile Applications: A Spreadsheet Case Study. *International Journal of Mobile Human-Computer Interaction*, 4(4).
- Furió, D., Juan, M. C., Seguí, I., & Vivó, R. (2015). Mobile learning vs. traditional classroom lessons: a comparative study. *Journal of Computer Assisted Learning*, 31(3), 189-201.
- Gan, C. (2015). An empirical analysis of factors influencing continuance intention of mobile instant messaging in china. *Information Development*.
- Ghani C., Shangeetavaani K., Shah A. (2017). Usage of Mobile Among Mechanical Engineering Students at Premier Polytechnics Malaysia. *International Journal of Academis Research in Business and Social Sciences*, Vol 7, No.12. ISSN:2222-6990. 1111-1128.

- Han, Q., (2017). The Design and Implementation of Mobile Learning System. In 7th International Conference on Mechatronics, Computer and Education Informationization (MCEI 2017). 24-28
- Harrison, R., Flood, D., & Duce, D.(2013). Usability of mobile applications: Literature Review and Rationale for a New Usability model. *Journal of Interaction Science*, 1(1), 1-16.
- Hürst, W., Lauer, T., Nold, E. (2007). A study of algorithm animations on mobile devices. In Proc. of the 38 SIGCSE technical symposium on Computer science education (SIGCSE '07), ACM, New York, NY, USA, 39(1), 160–164.
- Ihantola, P., Helminen, J., & Karavirta, V. (2013)How To Study Programming On Mobile Touch Devices: Interactive Python Code Exercises. In Proceedings Of The 13th Koli Calling International Conference On Computing Education Research. 51-58.
- Irwan, I.M., Norazah, M.N., Ridzwan, C.R., Rosseni,D. (2013). The Acceptance of AutoCAD Students for Polytechnic on Mobile Learning. *Procedia-Social and Behavioral Sciences*, 169-176.
- Irwan, I. M., Norazah, M. N., Rosseni, D., Arif, a. R. A., & Ridzwan, C. R. (2015). Design and development performance-based into mobile learning for TVET. *Procedia - Social and Behavioral Sciences*, 174, 1764–1770. <http://doi.org/10.1016/j.sbspro.2015.01.835>
- Ivica, B., Ante, B., Martin, S., & Drljevic, N. (2013). Teaching and learning computer science sorting algorithms with mobile devices: A case study. *Computer Applications in Engineering Education*, 21(S1), E41–E50.
- Milošević, I., Ivkovic, D. Z., Manasijevic, D., & Nikolic, D. (2015). The effects of the intended behavior of students in the use of M-learning. *Computers in Human Behavior*, 207-215
- Mohd Salleh A., & Zaidatun T., (2001). Pengenalan kepada analisis data berkomputer SPSS 10.0 for windows. Kuala Lumpur : Venton Publishing.
- Mohamad Najib A.G., (1999). Penyelidikan pendidikan. Skudai: Penerbit UTM.
- Mohanna, M & Capus, L(2013). Mobile Learning Application Based On Rss Feed Technology. In Proceedings of the International Conference Mobile Learning, 256-256.
- Moidunny, K. (2009). The Effectiveness of the National Professional Qualification for Educational Leader (NPQEL). Unpublished Doctoral Dissertation, Bangi: The National University of Malaysia.
- Moreira, F., Ferreira, M.J., (2016). Teaching and learning modeling and specification based on mobile devices and cloud. In 11th Iberian Conference on Information Systems and Technologies (CISTI), IEEE, 1–6.
- Oyelere, S. S., Suhonen, J., & Sutinen, E. (2016a). M-learning: A new paradigm of learning ICT in Nigeria. *International Journal of Interactive Mobile Technologies*, 10(1), 35–44.
- Oyelere, S.S., Suhonen, J., Shonola, S.A., Joy, M.S. (2016b). Discovering students mobile learning experiences in higher education in Nigeria. In *Frontiers in Education Conference, USA*, 1–7.
- Poong, Y. S., Yamaguchi, S., & Takada, J.-i. (2017). Investigating the drivers of mobile learning acceptance among young adults in the World Heritage town of Luang Prabang, Laos. *Information Development*.<https://doi.org/10.1177/0266666916638136>
- Prenner, G., Rotheneder, A. Schikuta, E. (2014). NetLuke: web-based teaching of algorithm and data structure concepts harnessing mobile environments. In Proceedings of the 16th International Conference on Information Integration and Web-based Applications & Services, ACM, 7–16.
- Tahir, R., & Arif, F.(2014). Framework for evaluating the usability of mobile educational applications for children. In *Society of Digital Information and Wireless Communications*. 156-170.
- Tortorella, R. A.W., & Graf, S. (2017). Considering learning styles and context-awareness for mobile adaptive learning. *Education and Information Technologies*, 22(1), 297–315.
- Vosloo, S. 2012. UNESCO Policy Guidelines for Mobile Learning. In: UNESCO (ed.). Paris, France: UNESCO.
- Wen, C., & Zhang, J. (2015). Design of a microlecture mobile learning system based on smartphone and web platforms. *IEEE Transactions on Education*, 58(3), 203–207.
- Yang, K. (2005). Exploring factors affecting the adoption of mobile commerce in Singapore. *Telematics and Informatics*, 257-277.<https://doi.org/10.1016/j.tele.2004.11.003>
- Young, L., Hongxiu, L., & Christer, C. (2010). Factors driving the adoption of mlearning An empirical study. *Computers & Education*, 1211-1219.