A Proposed MobileSchool System for Requirements of Secondary Schools in Malaysia

Ahmad Sobri Hashim[1] and Wan Fatimah Wan Ahmad[2]
Department of Computer & Information Sciences, Universiti Teknologi PETRONAS,
Bandar Seri Iskandar, Perak, Malaysia
Email: sob_87@yahoo.com[1] and fatimhd@petronas.com.my[2]

Azizah Jaafar[3]
Institute of Visual Informatics,
Universiti Kebangsaan Malaysia,
Bangi, Selangor, Malaysia
Email: aj@ftsm.ukm.my[3]

Shahrina Md Nordin[4]
Department of Management & Humanities, Universiti Teknologi PETRONAS,
Bandar Seri Iskandar, Perak, Malaysia
Email: shahrina_mnordin@petronas.com.my[4]

Abstract— **Teaching and learning have recently been influenced by the fast growing of sophisticated mobile phone technologies. On the other hand, in ensuring the developed devices are usable to the users, it is insufficient to merely rely on advanced educational device itself. This paper hence presents a proposed mobile learning management system (MLMS) namely MobileSchool for secondary schools in Malaysia. For the purpose of MobileSchool development, an initial study had been conducted to achieve three main objectives: to determine the target users' familiarity level on Learning Management System (LMS) usages, to identify target users' readiness level of utilizing to-be developed MLMS in their daily teaching and learning activities; and to get users' proposed functions that need to be included in the system. This study employed two approaches for the data collection which included questionnaire and interview. The questionnaire instrument involved 575 students from secondary schools in Perak. The data were then triangulated through interviews that involved 10 teachers and 10 parents using similar questions developed in the questionnaire. Both data were compared with the results that have been produced by three similar studies. The results show that students were quite familiar with LMS and they gave positive feedbacks on utilization of the system that will be developed. Besides, the results were also in line with produced results of three similar studies. Finally, MobileSchool has been developed based on the functions proposed by respondents.**

Index Terms—**mobile phone technology, mobile learning system, familiarity level, readiness level**

I. INTRODUCTION

Mobile Learning Management System (MLMS) is the use of mobile device technologies to manage teaching and learning of the institutions [1]. This system is achievable because of rapid improvements being undertaken to the mobile devices by developers. Here, mobile devices refer to cellular phones, smartphones and tablet PCs [2]. Usually, MLMS consists of several basic functions such as course enrolment, upload/download learning materials, online assessment, online discussions and student's record management [3].

The integration of sophisticated technology with a system itself is insufficient to ensure the system is usable to the target users. It has to be incorporated with user requirements and needs [4]. According to Gunda [5], lack of emphasis in gathering requirements to develop an information system (IS) leads to waste, loss and users are unable to operate the system well. Consequently, developer and researcher have to consider user requirements, perspectives and needs in producing a useful system or application [6].

The main objective of this study is to develop an MLMS namely MobileSchool that incorporates users' requirements and needs. Due to the abovementioned problem of producing a system, an initial study has been performed to identify user's familiarity with Learning Management System (LMS) practices in their schools, to determine their readiness in using the MLMS that will be developed and to identify the functions that need to be included based on their requirements. User existing technological knowledge, user readiness in changing to the new system and user requirements are important components in ensuring the developed system is usable to the users and can be an effective tool [7] for secondary education. MobileSchool is aimed at providing students and teachers teaching and learning medium which can be performed via mobile devices. Moreover, it also will provide a communication medium with school community including school administrators, teachers, students and parents to communicate effectively in improving students' academic achievements.

The conducted initial study focuses only on students, teachers and parents of secondary schools in Perak.

This paper is organized into five sections; section I for introduction of the study; related literature studies will be

presented in section II, section 3 will explain on the method of conducting the initial study and, software and tools used to develop MobileSchool; results and analyses of initial study and the proposed initial MobileSchool system will be discussed and presented in section IV; and finally the completion of study objective will be summarized in section V.

II. LITERATURE REVIEW

Learning Management System (LMS) is a web-based application used to plan, implement, and evaluate a specific learning process of an institution [8]. Generally, an LMS provides instructors with guidelines to construct and deliver the course content, monitor student's involvement, and evaluate performance of the students [9]. The instructor and student can also utilize its interactive features such as video conferencing and discussion forums provided by LMS [10]. In the simplest idea, LMS provides educational organizations with a useful technology to manage the activities of teaching and learning as well as organizes student's records [8].

Brown & Johnson [11] have identified three advantages which are relevant to the LMS utilization in the educational institution. One of the advantages is LMS provides a centralized learning environment in ensuring the consistency of course content and messages given to the users. The LMS can be accessed by multiple users at any given point in time. The LMS ensures the delivery and evaluation consistency since all users see the same material in the same manner. Secondly, LMS allows instructors to review student's record and performance to enhance student's academic achievement. Finally, LMS provide instructors and students with interactive discussion space to encourage students to participate actively in learning the courses offered. Generally, discussion space is one of the important requirements to fulfill the collaborative type of learning theory [12].

Mobile learning (m-learning) is a current technology that can be implemented in LMS to enhance the existing LMS as it provides more dynamic mobility to the system [13]. Nowadays, mobile internet-enabled devices are very popular in student society. Almost each sold phone enables usage of internet services via networks like GRPS, UMTS, WiFi, WAP or HSDPA. Mobile devices such as iPhone and Android-based systems increase the popularity of smartphones for private users [14].

In this section, literature studies also have been conducted to two important elements; importance of requirement study in developing a system and mobile learning systems (MLS) that have been developed by previous researchers in their studies.

A. Importance of Requirement Study for System Development

Requirement gathering is very important in the development of a system so that the system is utilizable by the target users [15]. Usually, the requirements of the system are obtained from the target users based on specific situation and needs of a business process [16]. There are various requirement gathering techniques that can be used in obtaining requirements of the system; questionnaire; interview; observation; video recording; joint application development; prototyping; and many more [17]. As mentioned by [5], misunderstanding during requirement gathering affects the quality of system and increases the system cost production.

Since the last five decades, the computer-based systems development faced so many problems that caused delayed projects and over budget [18, 19]. The systems that have been developed did not meet the requirements and fulfill the intended objectives and purposes of the systems. The main factor of this issue is the difficulties that have been faced in gathering the user requirements and lack of analysis skills in analyzing user requirements during the formulation of system requirements [18, 20].

Wrong requirement determination leads to improper objectives in system development phase. The developed system with wrong or inaccurate specification will never fulfill users' expectations. In addition to that, the changes and modification to the requirements in the middle of project development results to the delay and cost increment [5, 20].

Therefore, it is very clear that user requirements are very important in producing a useful, efficient and effective system or software to the target users.

B. Existing Mobile Learning Systems (MLS)

Seong [21] developed an MLMS named Mobile Learning Course Manager (MLCM). MLCM consists of three main options which are "Announcement", "Assessment" and "Timetable". For the "Announcement" option, an instructor can post any announcement to the students by submitting it to the server and the students will get the updated announcement messages in each of their respective MLCM system. Besides that, the instructor can also upload quiz questions by choosing the "Assessment" option. After a quiz has been uploaded, the students will be notified via a message in the MLCM system. Students need to complete the quiz in 15 minutes. By having this option, it eases the instructor in assessing students at any time and any place. Lastly, the "Timetable" option is provided to alert students 15 minutes before the class begins. It will help students in reminding them of the upcoming class period.

The other example of MLMS is Wireless Classroom (WC) which has been developed by Devinder and Zaitun [22]. The system can be accessed using Pocket PC, notebook and mobile phones. This system implements the collaboration characteristic of mobile devices whereby it provides a medium to the students in communicating and discussing about the courses taught through the classroom chat section which is provided in the system. Students can also ask questions by typing the questions using the system and asking either to repeat, slow down the speed of presentation, or inform the lecturer if the students do not understand any of the topics presented. Other than that, the system also provides a function that can be used for group exercise. Finally, the system is also equipped with online assessment whereby students can perform quiz.

III.   METHODOLOGY

Figure 1 presents the flow of this study. For this study, mixed methods; quantitative and qualitative have been chosen. The main method for this study is questionnaire; meanwhile the interview method has been used to support the results of questionnaire. A total number of 575 students from seven secondary schools in Perak have participated in the study [23].
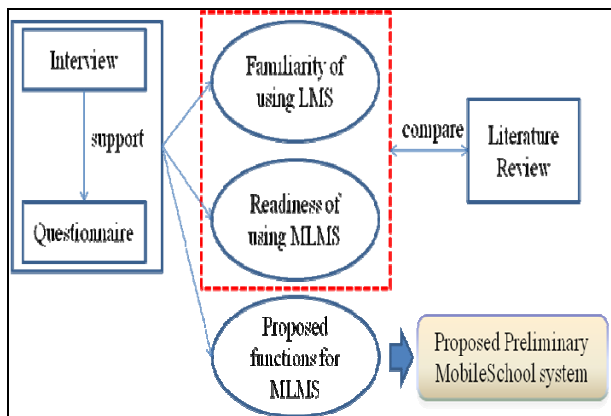

Figure 1. Research Flow

The objectives of the questionnaire are to get the information on familiarity of currently used LMS technology in the schools and to get opinions and perceptions of to-be developed MLMS, MobileSchool. The information is very important to determine the familiarity of learning technologies and readiness level of using the new system. As mentioned in [24], LMS has been categorized in eight main modules; student management and reporting, learning event, resource management and reporting, online course delivery infrastructure, course authoring tools, skills assessment, professional development management, knowledge bases and learner centric. Basically, it is not possible to conduct the study on fully LMS utilization in secondary schools since there are no secondary schools that are utilizing it based on an online search that was conducted with 247 secondary schools in Perak. Therefore, the conducted questionnaire focuses on the utilization of e-learning system as one of the LMS categories. Finally, the questionnaire asks on the readiness of utilizing the new

MLMS and their perceptions toward the integration of mobile phone technologies with LMS.

Students need to rate the statements based on the Likert scale of 1 to 5 (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree). For LMS section, it consists of six statements. The statements include benefits of Internet technologies to the studies, familiarity with e-learning, frequent use of e-learning in the studies, the availability of Internet in schools, the encouragement of using Internet by teachers, school management and parents and learning activities that the students used using the e-learning. Meanwhile, for MLMS section, it includes the familiarity with mobile phones applications, the perceptions of the MLMS utilization in secondary schools and the proposed important functions that need to be included in the system.

The interviews were conducted with 10 teachers and 10 parents who have been selected in random. Similar questions have been asked and qualitative data has been collected to support the quantitative results. The summary of the qualitative results will be presented in Section IV.

The qualitative results were used to support the quantitative results on the familiarity of currently used LMS technology and, readiness and perceptions of using to-be developed MLMS. Then, both results were compared with the existing studies conducted by previous researchers in the similar field.

Finally, a MobileSchool system is developed based on the functions that have been proposed by the respondents of the questionnaire and interview studies.

IV.   RESULTS & DISCUSSIONS

A.   Initial Study

The questionnaire is divided into two sections: current utilized LMS and to-be developed MLMS. Table I presents the mean score of each statement from LMS section.

Based on the mean score of statements in LMS section, most of the respondents strongly believe that Internet technology gives them many benefits in conducting their learning activities (4.2052). However, for the other statements, it can be seen that the mean scores were only a little bit higher than the mean score of Likert scale which is 3.00 (fair).

TABLE I.
MEAN SCORE OF EACH STATEMENT IN LMS SECTION [23]

No	Statement	Mean score	Standard Deviation
1	Internet technologies give many benefits to me in conducting my learning activities.	4.205	0.8571
2	I am very familiar with electronic learning (e-learning) system.	3.233	0.9706
3	I frequently use the Internet technologies in accessing the learning materials.	3.628	1.0295
4	Many assignments that have been given by my teachers require me to use Internet.	3.510	1.2309
5	The Internet is always available for me at anytime as I want to use it.	3.609	1.2543
6	School management, teachers, parent-teacher association and parents really support the use of Internet in my study in this school.	3.407	1.1221

Therefore, it can be said that the students are quite familiar with e-learning, there were sometimes use the Internet technology to access learning materials as some assignments that have given by their teachers required them to use the Internet, the Internet is sometimes available for them when they want to use it and school management, teachers, parent-teacher association and parents support the use of Internet in the school.

In this section also, the learning activities that is frequently conducted using e-learning have been identified. Figure 2 illustrates the percentage of frequently used e-learning functions by the respondents.
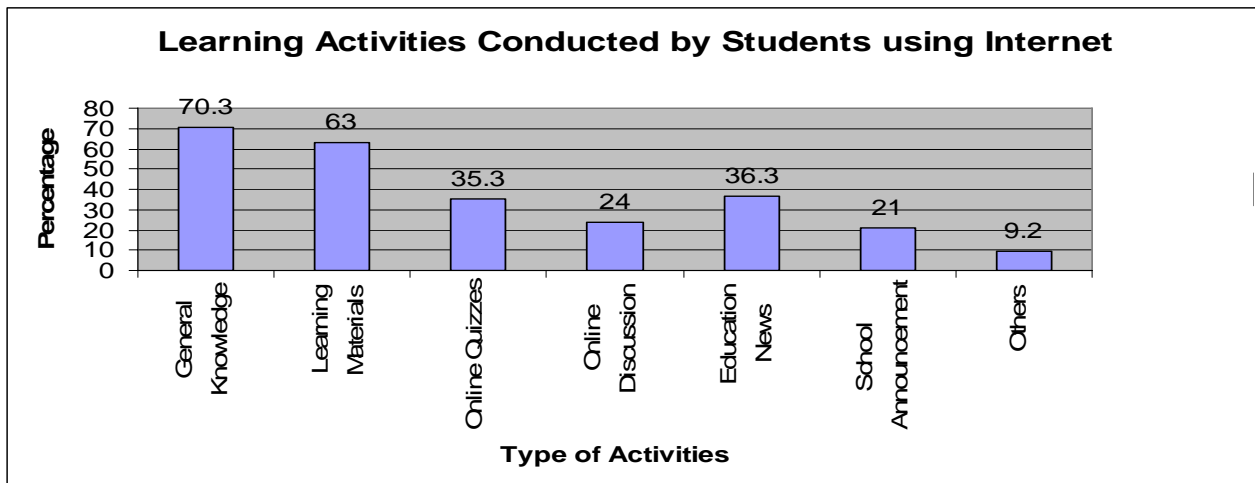
Figure 2. Learning Activities Conducted by Students using Internet [23]

Based on Figure 2, the top four learning activities were conducted by respondents are education general knowledge (70.3%), accessing learning materials (63%), educational news (36.3%) and online quizzes (35.3%).

For MLMS section, the data on familiarity of mobile phones application among secondary school students, perceptions on to-be developed MLMS and readiness of using MLMS are gathered. Table II presents the mean score of each statement in MLMS section.

TABLE II.
MEAN SCORE OF STATEMENTS IN MLMS SECTION [23]

No	Statement	Mean Score	Standard Deviation
1	I am very familiar with mobile phones applications.	3.930	1.0765
2	MLMS will give me more benefits as compared to the current use of e-learning.	3.555	0.9948
3	MLMS will give me more positive outcomes rather than negative outcomes.	3.621	0.8669
4	MLMS will give the opportunity to my parents to get involve in my studies (observe the academic performance and communicate with teachers and school management).	3.650	1.0499
5	I am willing to use the MLMS in conducting my learning activities.	3.804	1.0466

Based on Table II, the mean score of each statement in MLMS section is between average of Likert scale, 3.00 (fair) and 4.00 (agree with the statements). Therefore, for the familiarity of mobile phones applications, it can be concluded that the respondents were familiar with the technologies since the mean score is almost 4.00. Other than that, it can be concluded that they believed the MLMS can give them some benefits as compared to the current use of e-learning, the system can give them positive outcomes against negative outcomes, MLMS can give the opportunity to their parents to get involved in their children's studies and they are willing to use the MLMS in conducting their learning activities.

Similar to LMS section, this section requires respondents to identify the proposed functions that need to be included in the to-be developed MLMS, MobileSchool. Figure 3 demonstrates the percentage of proposed functions. Based on Figure 3, the top five proposed functions that need to be included in MobileSchool are learning materials (75.8%), academic report (64.3%), academic achievement analysis (62.8%), school announcement (54.8%) and student's registration (54.1%).
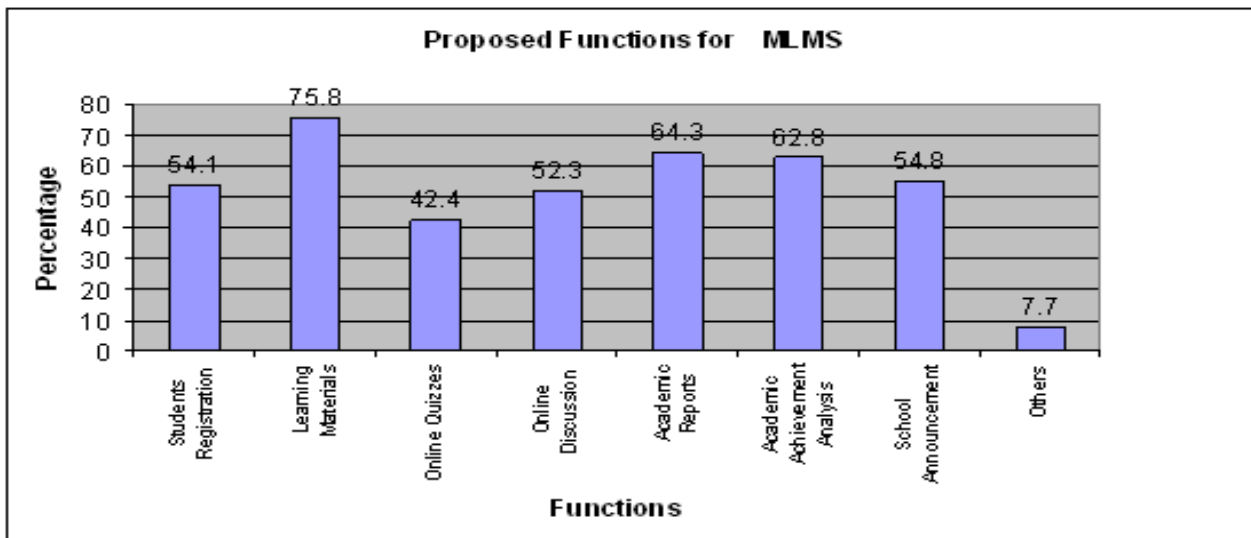
Figure 3. Proposed Functions for MLMS [23]

As mentioned in section III, this study also involves interview. The interview sessions have been conducted randomly with 10 teachers and 10 parents. Similar result as quantitative questionnaire data has been obtained and all teachers and parents have similar point of views regarding the asked questions. The opinions can be summarized as follows [23]:

1. Currently utilized Information Technology (IT) such as computer-based learning and e-learning in education gave positive impacts to the students' academic achievements. Therefore, they believe that to-be developed MLMS will improve students' academic performance much better. Most of them encouraged the utilization of Internet in secondary educations studies. However, teachers admitted that not all assignments require students to use the Internet. Examples of courses that require the usage of Internet are Science, Geography, Mathematics and some from language courses.

2. They also believed that by having such system, it can improve communication among teachers, parents and school management. The to-be prepared functions like academic achievements and academic achievement analysis will ease parents to keep track on their children's academic performance. Teachers claimed that parents and teachers generally met at most once or twice a year to discuss on their children's studies. By having such system, they believed that the relationship between teachers, students and school management can be strengthened.

3. Even though they agreed with the benefits that can be obtained from the system, they are still worried with the misuse of mobile phones in schools. Teachers claimed that the negative impacts of bringing mobile phones to schools include theft, pornographies and other social problems. However, they believed that MLMS will give more benefits as compared to the negative outcomes.

Based on quantitative and qualitative results, it can be concluded that the target users were familiar with currently utilized LMS and users are ready to utilize the system that will be developed (MobileSchool). The familiarity with currently implemented LMS and mobile phones technologies are very important to ensure that the new system is easy to be accepted.

In relation to that, the results that have been obtained were compared with similar studies that have been conducted by previous researchers. For mobile learning utilization, it can be seen that the perceptions of proposed MLMS is in line with three similar studies that have been conducted [25-27].

In [25], the conducted study was on the perceptions of Mathematics learning using mobile phones. The result showed that the students believed the utilization of mobile phone technologies in learning system can give the benefits for them in learning Mathematics in seven ways: exploring mathematics independently, learning mathematics through collaboration, learning mathematics in societal environment, learning mathematics in real life solution, visualizing mathematics dynamically, carrying out diversified mathematical actions using new and advanced technologies, and learning mathematics easily and efficiently. In [26], the studies of perceptions towards the utilization of mobile education has been carried out to the sample of 467 teachers from 32 schools in Cyprus. Based on the results, teachers exhibited above medium levels of perception towards implementation of mobile learning. The same goes to [27] whereby the conducted study concluded that there were strong positive arguments for employing mobile technology in Perak schools.

Finally, the study on perceptions of MLMS also produced positive results in which the respondents believe that the system will give them more benefits as compared to currently utilized e-learning system, give parents wider communication medium with teachers and school management and most of respondents were willing to use the system once it is developed.

B. Proposed MobileSchool System

As highlighted in Figure 3, the top five proposed functions that need to be included in MobileSchool are learning materials, academic report, academic achievement analysis, school announcement and student's registration.

MobileSchool can be used by school administrators, teachers, students and parents of secondary schools in Malaysia. The roles of each user are presented in Table III.

TABLE III.
ROLE OF EACH USER USING MOBILESCHOOL SYSTEM

User	Activity
School Administrator	Manage users' accounts, post school's announcements, manage feedbacks from users, send academic reports, and online chat.
Teacher	Manage course, update profile, create course announcement, manage feedbacks from students and parents, create online course discussion, and online chat.
Student	Update profile, enroll course, access learning materials, create and participate in online course discussion, view academic report, send feedback either to course teacher or school administrator, and online chat.
Parent	Update profile, view enrolled course by his/her child, participate in course discussion, view academic report, send feedbacks either to course teacher or school administrator, and online chat.

Learning Material Function

For learning material function of MobileSchool, teacher is allowed to upload two types of learning materials which are course notes and course exercise. Figure 4 presents teacher's page to upload learning materials.
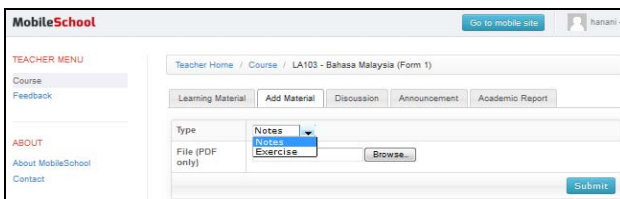

Figure 4. Teacher's Page for Learning Materials Upload

Then, learning materials can be accessed and viewed by students using their own account. The materials will be listed either under notes or exercises. Figure 5 illustrates student's page of learning material. There are two methods of accessing learning material which include downloading the materials by tapping on red-circled icon and saving the materials in mobile phone and run the file using any mobile phone software that can run PDF file format; and accessing material in the web browser by tapping on file name of learning material. Figure 6 demonstrates learning material that is being accessed using mobile web browser. Students can scroll up and down, and zoom in and out in helping them view the content better.
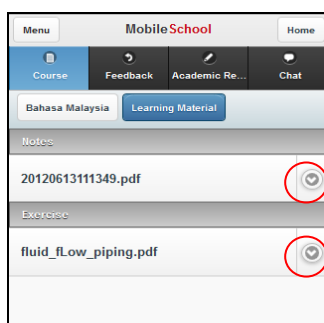
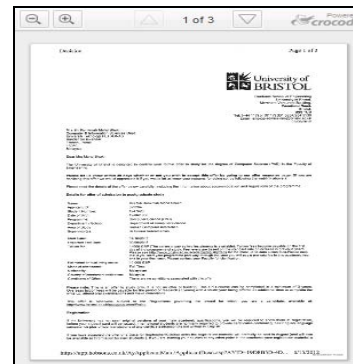

Figure 5. Student's Page for Learning Material

Figure 6. Learning Material Accessed in Mobile Web Browser

Academic Report

School administrators are responsible in preparing and posting the academic reports into the system. There are three different types of academic report: overall, course and individual report. Figure 7 illustrates the administrator's page in posting the academic report.
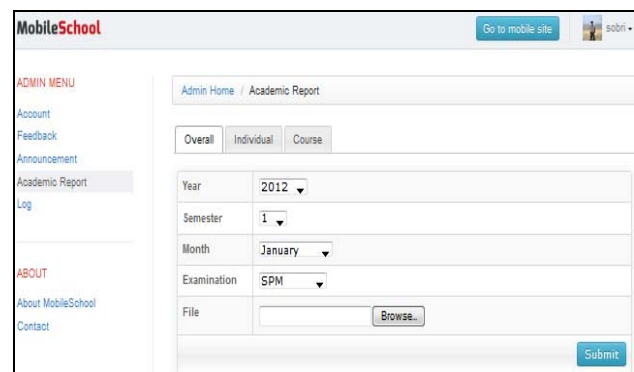

Figure 7. Administrator's Page for Academic Report

Overall academic report can be viewed by all school communities including teachers, parents and students. Meanwhile, course academic report can only be viewed by teachers, students and parents who enrolled in that course and individual academic report can be viewed by the students and his/her registered parents.
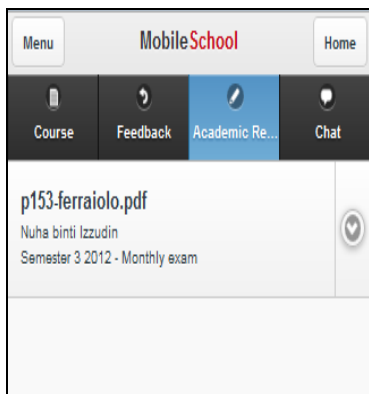
Figure 8. Student's Page to View Academic Report

Figure 8 presents student's page in accessing the academic report. Similar to the learning material, academic report can be viewed using two methods which are, download and view from mobile web browser.

Announcement

MobileSchool allows two types of announcements that can be made which are school announcement and course announcement. School announcement is made by administrators whereas course announcement can be made by teacher who is teaching a particular course. Both announcements will appear in the main page of all users' screen. Figure 9, Figure 10 and Figure 11 demonstrate the administrator's page in posting the announcement, teacher's page to post the course announcement and student's page in viewing the announcement.
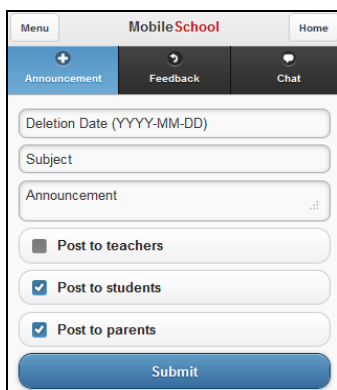

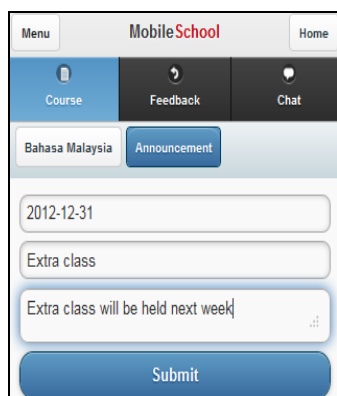Figure 9. Administrator's Page to Post Announcement

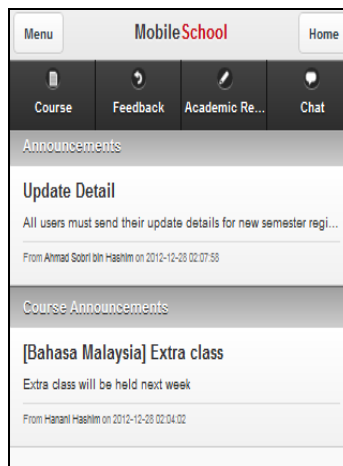Figure 10. Teacher's Page to Post Course Announcement

Figure 11. Student's Main Page

Account Registration

School administrators are responsible for managing all users' accounts. It involves create new account, update account and delete account. Different fields have to be filled for registering different types of users (either school administrator, teacher, student or parent). Figure 12 illustrates the school administrator page to create new account for teacher.
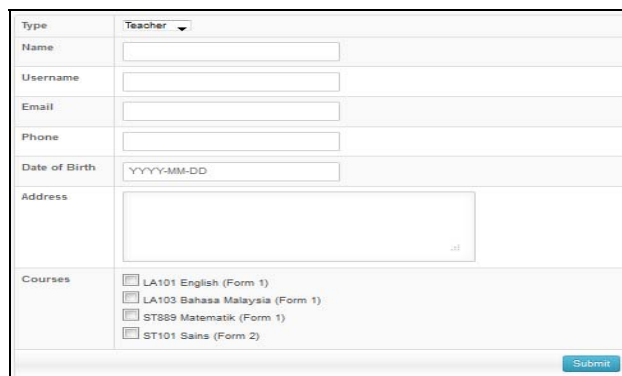

Figure 12. Administrator's Page to Create New Account for Teacher

Based on the presented MobileSchool functions that have been proposed by respondents, the system can be a very useful tool in managing teaching and learning activities for Malaysian secondary schools.

V.   CONCLUSION & FUTURE WORK

An initial study for the development of MLMS namely MobileSchool has been conducted to 575 secondary school students, 10 teachers and 10 parents. The results showed that the target users of the system (students, teachers and parents) were familiar with Internet utilization in learning (e-learning). This information is very important in order to propose the new system that involves the integration of mobile phones technologies with the currently employed system. Besides, the results also showed that the target users were very familiar with mobile phones technologies and they believed the proposed to-be developed MLMS will benefit them in conducting the daily teaching and learning activities.

Parents and teachers also believe that the system will encourage them to actively participate in their children's studies and majority of target users are willing to use the system in the future. From this study also, some functions have been proposed by target users to be included in the system. Finally, MobileSchool has been proposed that integrates the proposed functions including learning materials, academic reports, announcements and user registration.

For future work, this study can be expanded by using different target respondents as sample size. The study can involve sample size representing total secondary school population in Malaysia. Since Malaysia is one of the developing countries, a comparative study on perception towards mobile learning system implementation can be conducted with the developed countries. The developed system also can be expanded by including other functions such as online chat in order to give better medium of communication among school administrators, teachers, students and parents. Other functions that can be added into MobileSchool include feedback, course online discussion, course registration and others. Some tests can also be conducted to identify the effectiveness and usability of the system in real implementation.

REFERENCES

[1] G. Merx, *Mobile Online Learning Management System*, M. L. O. Institute, Mobile Learning Online Institute, 2011.

[2] C.P. Schofield, et al., *Going Mobile in Executive Education*, UNICON Executive Education Consortium, 2011.

[3] A. Gautam, "Ten Must-Have Features in a Mobile-LMS," 2010; http://www.upsidelearning.com/blog/index.php/2010/06/11/10-must-have-features-in-a-mobile-lms/.

[4] A. Dennis, et al., *System Analysis and Design with UML Version 2.0*, John Wiley & Sons, Inc., 2005.

[5] S.G. Gunda, "Requirements Engineering: Elicitation Techniques," Department of Technology, Mathematics and Computer Science, University West, Sweden, 2008.

[6] MentorMate, *Mobile Learning Management System (LMS) & Mobile Learning Content Management System (LCMS) Guidebook for Education & Training Executives*, MentorMate, LLC, 2010.

[7] E.Y. Li, "Perceived Importance of Information System Success Factors: A Meta Analysis of Group Differences," *Information & Management*, vol. 32, no. 1, 1997, pp. 15-28.

[8] I.A. Almrashdeh, et al., "Distance Learning Management System Requirements from Student's Perspective," *Journal of Theoretical and Applied Information Technology*, vol. 24, no. 1, 2011, pp. 17-27.

[9] B. Haugen, "LMS: Learning Management Systems & E-Standard Integration," 2003; http://designtosuccess.com/Portfolio/product2.htm.

[10] Noverant, "ASP Learning Management Systems: Adapting to the Needs of Small to Medium-Sized Life Science Companies," 2006; http://www.noverant.com/press/103106_LSneeds.pdf.

[11] A. Brown and J. Johnson, "Five Advantages of Using a Learning Management System," *Book Five Advantages of Using a Learning Management System*, Series Five Advantages of Using a Learning Management System, Microburst Learning 2007

[12] H. Srinivas, "Collaborative Learning," 2009; http://www.gdrc.org/kmgmt/c-learn/what-is-cl.html.

[13] A. Andronico, et al., "Designing Models and Services for Learning Management Systems in Mobile Settings," *Proc. Mobile HCI Workshop on Mobile and Ubiquitous Information Access 2003*, 2003, pp. 90-106.

[14] P. Lehsten, et al., "A Service-oriented Approach towards Context-aware Mobile Learning Management Systems," *Proc. IEEE International Conference on Pervasive Computing and Communications 2010*, 2010, pp. 268-273.

[15] K.E. Emam and N.H. Madhavji, "A Field Study of Requirements Engineering Practices in Information Systems Development," *Proc. Second IEEE International Symposium on Requirements Engineering*, 1995.

[16] M. Jones and U. Mortensen, *Guide to the user requirements definition phase*, ESA Board for Software Standardisation and Control (BSSC), 1995.

[17] M. Maguire and N. Bevan, "User requirements analysis: A review of supporting methods," *Proc. IFIP 17th World Computer Congress*, 2002.

[18] Kotonya and I. Somerville, *Requirements Engineering Process and Techniques*, J. Willey, 1998.

[19] M. Dorfman, "Requirements Engineering," 1999; http://www.sei.cmu.edu/news-at-sei/features/1999/mar/Background.mar99.pdf.

[20] R. Phariss, "The Importance of Requirements Definition in IT Systems Development," 2006; www.umsl.edu/~sauterv/analysis/f06Papers/Phariss/.

[21] D.S.K. Seong, "Usability Guidelines for Designing Mobile Learning Portals," *Proc. 3rd Internatioanal Conference on Mobile Technology, Application & Systems.* , ACM New York, 2006.

[22] D. Singh and Z. A.B., "Mobile Learning In Wireless Classrooms," *Malaysian Online Journal of Instructional Technology (MOJIT)*, vol. 3, no. 2, 2006, pp. 26-42.

[23] A.S. Hashim and W.F.W. Ahmad, "Readiness level of adopting Customized Mobile Learning Management System (CMLMS) in secondary school," *Proc. 2012 International Conference on Computer & Information Sciences (ICCIS)*, 2012, pp. 1127 – 1132.

[24] N.A.A. Rashid, et al., "E-Learning Management System for Secondary School in Malaysia," *Proc. International Conference on The Challenge of Learning & Teaching in a Brave New World: Issues & opportinuties in Borderless Education*, 2002, pp. 1-10.

[25] N. Baya'a and W. Daher, "Students' Perceptions of Mathematics Learning Using Mobile Phones," *Proc. The 4th International Conference on Interactive Mobile and Computer Aided Learning, IMCL2009*, 2009, pp. 79-87.

[26] H. Uzunboylu and F. Ozdamli, "Teacher perception for m-learning: scale development and teachers' perceptions," *Journal of Computer Assisted Learning* vol. 27, no. 6, 2011, pp. 544-556.

[27] M. Mohamad and J. Woollard, "Bringing change in secondary schools: can mobile learning via mobile phones be implemented in Malaysia?" *Proc. 4th International Malaysian Educational Technology Convention*, 2010, pp. 13.

Ahmad Sobri Hashim is holding a Master degree of Information Technology from Universiti Teknologi PETRONAS (UTP). Currently, he is pursuing his study in Doctor of Philosophy (PhD) level in Information Technology field. His research interests include e-learning and m-learning technologies, information systems, software engineering and human-computer interaction.

Wan Fatimah Wan Ahmad obtained her PhD from Universiti Kebangsaan Malaysia. She is currently an Associate Professor at Universiti Teknologi PETRONAS, Malaysia. Her research interests include topics on Multimedia, human-computer interaction, mathematics education, e-learning and mobile learning.

Azizah Jaafar is an associate professor with 14 years experience as an academia. She headed a Multimedia Research Group during her tenure at Faculty Technology and Information Science. Currently, she is with Visual Informatics Institute as Senior Research Fellow. Her main research interests include Human Computer Interaction, Usability, Accessibility, and e-learning. She leads many research projects and won several research grants from Ministry of Science Technology & Innovation and Ministry of Higher Education, Malaysia to finance all of her projects. She won several research awards in National and International levels of exhibition. She actively involves in several universities' community researches and she heads one of the community project conducted in West Malaysia, Sabah.

Shahrina Md Nordin is an Associate Professor in the area of Communication. She did her PhD in the field of Second Language Education at Universiti Sains Malaysia and her Masters in Teaching English as Second Language at Universiti Teknologi Malaysia. Her current research interests are in Organizational Communication, Corporate Communication and Stakeholder Communication. Her publications often link these Communication studies to Second Language Education making her an advocate of cross-disciplinary studies. She is actively involved as a Project Leader, Principal Investigator or a member to various research projects funded by the federal government, local government, private organizations and an international company. She is attached to the Management and Humanities Department of Universiti Teknologi PETRONAS (UTP), Malaysia and is currently on a secondment to the Transformation Office, UTP, holding an administrative position.