

Mobile Mediated Learning and Teachers Education in Less Resourced Region

Abdul Rashid Ahmadi, Samiullah Paracha, Hamidullah Sokout, Mohammad Hanif Gharanai

Abstract—Conventional educational practices, do not offer all the required skills for teachers to successfully survive in today's workplace. Due to poor professional training, a big gap exists across the curriculum plan and the teacher practices in the classroom. As such, raising the quality of teaching through ICT-enabled training and professional development of teachers should be an urgent priority. 'Mobile Learning', in that vein, is an increasingly growing field of educational research and practice across schools and work places. In this paper, we propose a novel Mobile learning system that allows the users to learn through an intelligent mobile learning in cooperatively every-time and every-where. The system will reduce the training cost and increase consistency, efficiency, and data reliability. To establish that our system will display neither functional nor performance failure, the evaluation strategy is based on formal observation of users interacting with system followed by questionnaires and structured interviews.

Keywords—Computer Assisted Learning, Intelligent Tutoring system, Learner Centered Design, Mobile Mediated Learning and Teacher education (MMLTE).

I. INTRODUCTION

EDUCATIONAL system in Afghanistan dramatically improved after the collapse of "Taliban" regime, particularly the school enrolment and the educational facilities; however, the quality and the facilities are inequitably distributed across the country. Even with the growing number of schools, there are still not enough qualified and motivated teachers at the grant-root levels.

Education is fundamental for development, peace, stability and good governance. Updating curriculums, teacher training, libraries, preparing laboratories, experiment tools and equipping classrooms with new and innovative technology are the most crucial and essential part of modern schooling and informational society.

The curriculum need to be updated and revise regularly to address the emerging educational needs. Curriculums development or revise, even a part of it needs a national teacher training program, because school teachers are not expert or specialist of teaching a particular subject.

ICT are widely used in field of education to facilitate the teaching and learning. According to situation of less resource region like Afghanistan e-learning especially mobile learning helps to apply new educational theories.

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In the next sections we start our paper from analyzing Current Educational Status (Section II) and following by: Section III (Theoretical Foundation), Section IV (Mobile Mediated Learning and Teacher Education system), Section V (The Architecture), Section VI (Evaluation Strategy), Section VII (Related Works) and Section VIII (Future Works).

II. CURRENT EDUCATIONAL STATUS

Most of the teacher in the rural area of Afghanistan are not qualified and classes being taught by teacher with poor professional teaching qualification. Therefore curriculums development or revise, even updating part of it needs a national teacher training program. Conducting a national teacher training for each change in curriculums need too much budget and take time to complete. Especially the rural areas which the program will be taken after finishing the urban areas, the gaps between releasing new curriculums and completion of teacher training program will badly affect the student knowledge and may have undesirable impact on student results.

Ministry of education of Afghanistan has planned to achieve the gender equality by 2015, with a focus on full and equal access of girls in basic education of good quality. Today, 40 percent of total student (or 9.7) are girls. The percentage of girls enrolment show of improvement in gender equality because, in 2001, girls were not allowed to go to formal schools, but still need to accelerate this procedure. The shortage of female teachers is one of the main obstacles to increasing girls' enrolment, because Afghan parents indicate that qualified female teachers are a pre-condition for enrolment and progression of their girls through the education system. Although, the number of teacher increased from 20,700 to over 207 thousands, but still only 34% are female [1]. Therefore, for providing primary education to girls in Afghanistan it's urgent to train and hire new female teachers. Female teacher will play a great and encouraging role for girl's enrolment. For developing existing teacher's teaching skill there are barriers to avoid the training programs especially for women. Teacher Training Colleges are non-existent to serve the local teachers, so it's need to travel them to other places to participate in training sessions. For women leaving their family and going alone to other places is not easy in Afghanistan, due to cultural background.

Textbooks were designed, developed and printed in good quality and expected to be reused in the future. But the current experience proves the opposite of prospection. Partly as a result many students, particularly in remote rural areas, do not have access to a full set of textbooks on time. There are

several barriers that stand in the way of providing all students with full sets of textbooks and additional reading material. These include insufficient financial budget allocations for printing and distributing textbooks, limited logistical capacity to distribute textbooks on time, and security problem do deliver the educational materials on time.

Government of Afghanistan develops National Educational Strategic Plan (NESP) to overcome the problem by targets both equitable access to education and quality of education delivered and received. NESP gives second priority to upgrade teacher's skill and qualifications to improve their teaching skill. The plan is to establish a system to improve the capacity of mentors and administrative staff of Teacher Training Colleges and thereby increase students' learning achievements. By increasing the capacity of schools Afghan government have planned to achieve the Millennium Development Goal by 2020 [2].

Nowadays, researchers of Information and Communication Technology (ICT) and educators are trying to customize teaching process from banking model to a dynamic system according to student's activities by means of intelligent educational system and facilities. Afghanistan educational system is full of problem and challenges, so it's better to give priority to teacher education by using new technologies.

III. THEORETICAL FOUNDATION

Mobile learning with the unique and distinctive feature of portability function, offer the ability to create and do the activities and situation in different places, outside the classroom and not only in front of the computer. Mobile learning technology provides rich digital tools with connectivity for sharing, creating and using artifacts and visualization that can be use outside and inside different learning environment. These are idea for changing from machine-centered automation to user-centered services. People are interacting with other people and to machine. With this idea we can make changes on existing idea of ICT in Education [3].

A. Collaboration and Learning

The study of collaboration has to be realized way back to diverse theories of cognition and psychological development. These theories explore how different types of interaction between peers and experts are integral to learning and cognition. Two type of peer learning, which are peer-to-peer interactions between "equals", and peer-to-mentor interaction. The Piagetian school support peer-to-peer interaction which result in cognitive restructuring, while Vygotskian theories can seen to support a peer-to-mentor interaction, because the mentor is more able partner, and can facilitate the development for knowledge and skill by scaffolding activities [4]. Both schools support social interaction as a key role in learning, while Vygotsky's work introduced a wider theoretical development of cognitive science with combination of psychology and anthropology to form the basis of situated learning. "*Situated learning is a general theory of knowledge acquisition based on the notion that learning (stable,*

persisting changes in knowledge, skills and behavior) occurs in the context of authentic activities" [5].

In this paper we have focused on the constructivist and constructionism view of learning by supporting and enhancing collaboration among group of teacher with the use of technology.

B. Constructivism

Constructivism argued that people are not just passive receptacle of information, but they can construct their own knowledge base on their past experiences and reflection of those experiences. The knowledge is "*to understand is to invent*" [6] meaning that knowledge is not a segment of information to be retrieved, memorized and later applied. But, it is achievable via interaction with environment and conversation with people.

Learning can be a social process of collaborative between people and support of technologies. Constructivism in e-learning system like Mobile Mediated learning and Teacher Education (MMLTE) is the idea of shifting view of technology from cognitive delivery system to being consider as a tool to support collaborative conversations, about specific topic [7]. The constructivism considered as a process of learning which learner actively construct or build a new idea or concept instead rather than completely relying on knowledge of cognitive delivery.

C. Constructionism

Constructionism is a success factor of constructivism [8]. Although inspired by the constructivist theory that individual learners construct mental models to understand the world around them. The constructionist postulates that learning can happen most effectively when people are also active in making tangible objects in the real world. Therefore, constructionism is connected with experiential learning, and builds theory of constructivism. The important factor in constructionism is that learners reinforced learning when they have to explain their tangible object to others and that force to think hard about the content and think about the best ways to teach it others.

D. Experiential Learning

Another widely used theory in education is experiential learning which implies learning by doing [8]. Kolb describe experiential learning as where learners "*must be able to involve themselves fully, openly, and without bias in new experiences; they must be able to observe and reflect on these experiences from many perspectives; they must be able to create concepts that integrate their observations in to logically sound theories; and they must be able to use these theories to make decisions and solve problems*" [9]. Experiential learning is a cycle based on four elements: (i) concrete experience; (ii) reflective observation; (iii) abstract conceptualization; and (iv) active experimentation.

The cycle Fig. 1 begins with learner's experience which is followed by a reflection phase. The learners make inference of what they have experienced, leading to future actions in which the students experiment with different behaviors. This starts a new cycle as students gain new experiences based on their

experimentation. Although this continuum is presented as a cycle, the steps may occur in nearly any order. This learning cycle involves both concrete components (steps “i” and “iv”) and conceptual features (steps “ii” and “iii”), which involve a variety of cognitive and effective behaviors.

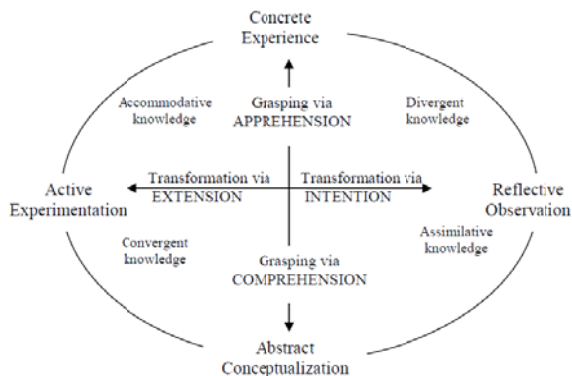


Fig. 1 Kolb's experiential learning cycle [10]

IV. MOBILE MEDIATED LEARNING AND TEACHER EDUCATION

Mobile Mediated learning and Teacher Education (MMLTE) system is a mobile learning system. Mobile learning is the use of mobile or portable devices for learning purpose anytime anywhere. Mobile learning or M-learning is new area in education and it's a type of e-learning or ICT in education.

A. Why Mobile Learning?

Due to, problems in field of education in Afghanistan, we are proposing a mobile learning system. For having a sustainable development of education in developing countries, ICTs particular mobiles have the potential for increasing access to and improving the relevance and quality of education. Mobile are great tools for acquisition and absorption of knowledge, offering developing countries creative opportunities to enhance education systems, and widen the range of opportunities for business and the poor [11].

One defining feature of ICTs is their ability to transcend time and space. Handheld system are summarized in seven useful feature for formal and informal education: “portability, small screen size, computing power (immediate starting up), diverse communication networks, a broad range of applications, data synchronization across computer, and stylus input device” [12]. Portability and computing power of mobile devices are the most two effective feature of mobile devices which distinguish the handheld devices from other emerging technology. These two features made the mobile devices as perfect tool for learning purposes.

The access level of Information and Communication Technology (ICTs) is different from developing countries to developed countries. People in the rich countries have the luxury of both wired and wireless technology, of both personal computers (PCs) and smart phones. Developing countries tend to rely mainly on mobile networks, and even the numbers of phones are already increased than PCs. Afghanistan as a developing country mobile usage and service are more popular

than PC or other technologies. Nowadays, the 89% of population in Afghanistan covered by mobile services and mobile penetration is 80% of total population [13].

The wide range usage of mobile in Afghanistan, portability of mobile devices, and computing of power of mobile devices are enabler technologies for mobile learning in Afghanistan.

B. System Functionality

Mobile Mediated Learning and Teacher Education (MMLTE) system is an ICT based learning system which consists of individual mobile learning, collaborative and peer learning system. MMLTE system impact is improving quality of educational system through improving teachers teaching skills as specified in "program 2" of National Educational Strategic Plan (NESP) for Afghanistan; free from challenges of ethnic, location and gender [2].

Individual learning or self-development is the functionality of system to enable teacher self-study. Learner of the system can learn from data which system is providing through knowledge base functionality. By using this system learners can create knowledge and exchange with other teachers. All the exchange data and user can be store on their account for future use. This system will help to teacher to be independent from physical materials which are very limited in Afghanistan. With the MMLTE system teacher can access the learning materials in almost every subject anytime anywhere. Unlimited number of teacher have access the system at same time. Many schools in developing countries and some of the developed countries have limited and outdated library resources. Afghanistan as poor country is unable to provide on time and update textbook for teacher and for libraries due to security and financial problem. Hence, providing updated textbook for all over Afghanistan at the same time via mobile technology is a solution to overcome the problems.

Collaborative and peer learning the second and most important functionality of MMLTE system. Mobile technology offers new dimensions to support and promote useful learning activities that include features such connectivity, context sensitivity and interactivity [14], [15]. Mobility can offer opportunities to promote and enhance collaboration by enabling learners to involve in activities from different locations. These different settings provide innovative way for teachers to interactively learn from mobile devices independent of location and PC screen. The important key factor of the collaborative learning systems are the creation, action and experience sharing of learners [16].

After the release of new curriculums by the Ministry of Education, most of the private school hire a tutor for each subject to teach. Hiring tutors is very costly for Ministry of Education, because public schools in Afghanistan are financially depending on Ministry of education. Tutoring via mobile technology is a solution. Teacher training by tutor is one of the best training opportunities for learners and especially for in-service teachers. MMLTE system is supporting tutoring from a central place to support all teachers in all over Afghanistan. Teacher can connect tutors to ask question and solving their problems. The tutors are responsible

for answering the question and giving additional advice for teachers. The system is intelligent to send question of the right tutor. The tutors are categorized according to teaching subject and educational levels.

Collaboration can enhance the learning environment. Collaboration in MMLTE system can be used for two purpose: (i) for learning purpose; and (ii) management purpose. Expert teachers can help others by sharing their experience. Teacher can share their problem with their colleges without need to be inside the wall of schools. In second part teacher and management can share information about schedule changes, meeting and other managerial process.

Application provides the option for user to add new topics, capture photos and update the existing locker on their accounts.

In the middle tier system is assemble base of four components: (i) Administration web services; (ii) Tutor web services; (iii) student module; and (iv) expert module. Administration web services and Tutor web services are web service and used through browsers. The system administrators as actor of system use administration web services to monitor the system, users and way of using. Tutors are using web service too. Tutors are responsible for answering the question of learner and adding knowledge on knowledge base.

The experts in expert module designs subject and courseware in specialized level. Courseware design is based on multilayered structure of courseware. Experts adding new unit, lesson and topic on knowledgebase database through expert module. Courseware is acting as effective interface between learners, learning materials and learning activities.

VI. EVALUATION STRATEGY

The investigation will use a combination of qualitative and quantitative techniques however; our proposed evaluation strategy can be best described as a qualitative framework with quantitative components. For testing the hypothesis we are looking for the cause, effect and prediction-making to analyze user-system modes of interaction. The type of data collection will be qualitative including interviews, participant observations, questionnaires etc. Around 40-50 in-service teachers (male and females in equal proportion) from different parts (urban and rural) of Afghanistan will participate in the evaluation of the MMLTE prototype. The minimum age limit will be 20 years old and the evaluation will be carried out in four public schools in Kabul and Ghazni provinces.

Together with participants' observation and questionnaires, informal semi-structured interviews will be used to capture participants' beliefs, feelings, perceptions, motivations and behaviors in relation to MMLTE. An iterative prototyping approach will be used with usability evaluation occurring as part of that iteration. Our evaluation strategy will be based on formal observation of the user interaction and the framework's.

VII. RELATED WORK

This section briefly surveys three type of mobile learning service: (i) mobile for curriculums delivery; (ii) mentoring through mobile or mobile peer learning; and (iii) collaborative learning. For each category we review the major similarity and difference of MMLTE system and exiting initiatives. From existing systems we are going to do comparative analysis of Radical Learning[17] and MXit platform in South Africa, Road to Reading program in Mali [18] as initiatives for curriculums delivery, Teaching Biology project [19] in South Africa and SMS Education Management Application in Kenya as peer, collaborative and management mobile application in education.

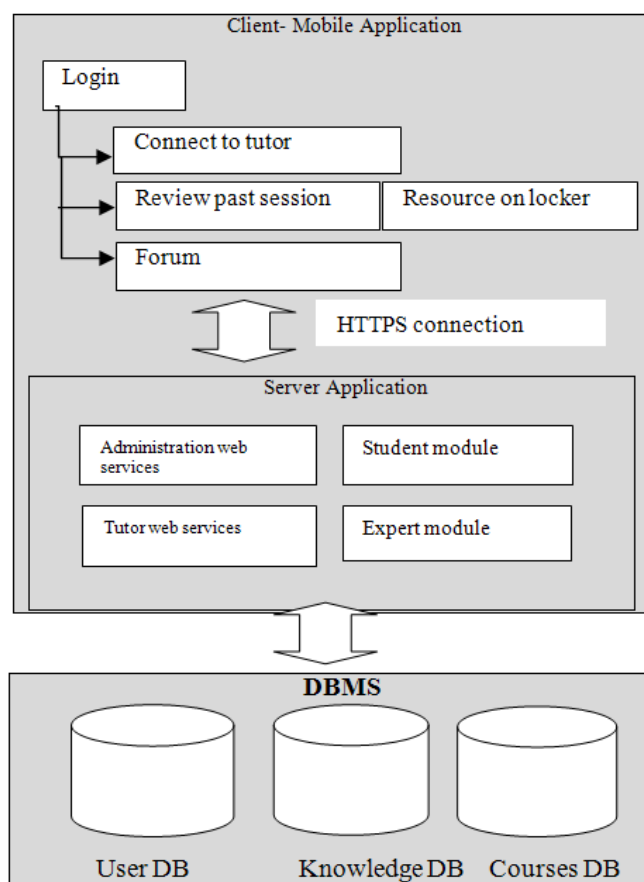


Fig. 2 Mobile Mediated Learning and Teacher Education Architecture

V. THE ARCHITECTURE

MMLTE system is a mobile application using 3-tier client-server architecture. As shown in Fig. 2 the system has three major components: (i) client side application; (ii) server side application (intelligent tutoring functionalities); and (iii) the Knowledge bases.

Client side application is basically a Graphic User Interface (GUI) to facilitate learners to use the system services. This client application needs to install on mobile devices. Learner or user of system can directly connect to tutors to ask questions or getting advices. The connection could be on one to one or learners can use recorded data on various subjects.

In this part we compare our proposed system with Radical for Learning and Road to Reading systems for curriculums delivery functionality. The major difference between MMLTE system and Radical for Learning is that whilst it has the strength of providing daily lesson plans for teachers, as well as keeping parent up to date from their child schoolwork by providing weekly schedule, but still it's limited from Grade R to Grade 3.

Road to Reading aims to improve teacher quality of instruction by providing access to lesson plans through smartphone. The lesson in reading and science was designed and posted on the web in student-centered approach. Teachers and directors are trained to use GPRS enabled phones to download lesson and feedback forms on a one-to-one basis in formal classroom setting and informally outside of school hours. The teachers were able to submit the feedback through SMS. The Road to Reading was a good enthusiasm and pedagogical success, but, it was limited to support the primary school teachers. The program focused on empowering teachers to teach literacy. For accessing Radical for Learning and Road to Reading user need to use web browsers.

The second and most important part of the MMLTE system is a specific function for peer learning between teacher and dedicated team of tutor in Ministry of Education and collaborative learning among teacher. Collaborative function is communication among teachers to solve the problem in collaboration and for information sharing for management purpose. In this manner we can compare it with Teaching Biology Project in South Africa and SMS Education Management Application (SEMA) in Kenya.

Teaching Biology Project (TBP) offers the functionality of collaboration through creating network of teachers in range of school, but this collaboration is in blended learning not totally online learning. TBP use SMS to send the administrative and content specific message for teachers. For online chatting among teacher used MXit, but problem encountered because, MXit does not compatible with all type of phones [18].

SMS Education Management Application (SEMA) is same as MMLTE system in information sharing, communication between teachers and Ministry of Education officials. But, the system was mostly used for collecting information from schools for ministry. Another limitation was SMS which was limit to 160 characters [20]

VIII. FUTURE WORK

The purpose of MMLTE system is to train and support in service teachers through mobile devices which are widely used in Afghanistan. M-learning or mobile service experience is continually demanding by learners. Due to, future improvement of ICT and educational theories, MMLTE system in this stage will not properly answer all demand of learners. The past evolution of ICT in education can prove my claim. Now MMLTE system provides teaching material for teachers and it's also source of tutoring and coaching for in-service teachers. This system also provides a way of learning from each other in collaborative manner.

One another learning method is learning through experience or experiential learning. This method is most effective for teachers. Now, most of Afghani's public schools are facing lack of labs and lab materials. As mentioned, most of the classes are being taught by unprofessional teachers and their educational background is below grad 12th. It means the teachers themselves didn't have the experience of lab and experiment of textbooks. They are unable to teach class exercises effectively for student. Due to, the up-front cost of Labs, it seems they would not equipped in near future. Therefore, in next version of MMLTE system, we want to add the virtual lab functionality. Virtual lab in mobile format is a cost effective and easy to deliver for teachers and students. System update and upgrade is easy. With this functionality we would be able to provide experiential learning.

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