The Potential Role of mLearning for the Training of Health Workers in Some Selected Health Science Colleges in Ethiopia

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This is to certify that the thesis prepared by Tedla Mulatu, entitled: The Potential Role of mLearning for the Training of Health Workers in Some Selected Health Science Colleges in Ethiopia is submitted in partial fulfillment of the requirements for the Degree of Master of Arts in Educational Research and Development complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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ABSTRACT

Regardless of the high potential role thought of mobile device in some pilot projects, there is no enough evidence that describes the potential role of mLearning for the training of health workers in Ethiopia.

This study has the objective of assessing the potential role of mLearning for the training of health workers in Ethiopia. Mixed design cross sectional method has been employed where by a self administered questionnaire was designed and distributed to a total of forty (40) health workers and thirty(30) trainers working in Dr Tewelde, Debrebirhan and Shashamane Health Science Colleges.Policy makers from Federal Ministry of Health has also been included in the study. In-depth interview was also conducted with key informants.

There were six pilot mLearning projects tested in Ethiopia specifically meant to improve the knowledge and skill of health workers. This study explored the potential of mLearning and developed mLearning model for the training of health workers in Ethiopia.

The finding of this study shows that health workers, trainers and policy makers and alike see much potential in using mLearning for the training of health workers to improve the quality of training provided in the Health Science Colleges by loading audio-visual teaching aids, short message service, improving communication between trainers and students, and ultimately equipping learners with the necessary knowledge and skill for better health outcomes.

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My family members, my wonderful wife,Mahider Alemayehu,my sweet daughter,Etsubdenk Tedla and Kidus Tedla are mentioned last only to emphasize the special nature of their extraordinary support during the course of my study and beyond.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Abbreviations and Acronyms

ALPS	Assessment & Learning in Practice Settings
AME	Africa and the Middle East
AMREF	African Medical and Research Foundation
CDMA	Code Division Multiple Access
EFA	Education for All
ESDP	Education Sector Development Program
FMOH	Federal Ministry of Health
GSM	Global System for Mobile
HEWs	Health Extension Workers
HRH	Human Resources for Health
HSC	Health Science College
HSDP	Health Sector Development Program
mLearning	Mobile Learning
MMS	Multimedia Messaging Service
MCIT	Ministry of Communications and Information Technology
IDI	Indepth Interview
ITU	International Technological Union
PDA	Personal Digital Assistant
QR	Quick Reference
SIM	Subscriber Identification Module
SMS	Short Message Service
UNESCO	United Nations Education, Science and Culture Organization

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

The foundations for mobile learning were laid over thirty years ago with the far-sighted Xerox Dynabook project that proposed a “self-contained knowledge manipulator in a portable package the size and shape of an ordinary notebook” which would allow children to explore, create and share dynamic games and simulations (Kay, 1972). This project led directly to the development of personal computing and can be seen as an enduring success of research in technology enhanced learning. However, the early innovations were desktop-based and it is only over the past ten years that mobile learning has developed as a set of significant projects in schools, workplaces, museums, cities and rural areas around the world (Mike Sharples, 2012).

The 2012 report of eLearning Africa indicated that innovative applications of information and communication tools have long been seen as important potential tools to enable educational reform to improve both access to education, and the quality. However, initial educational technology programs across the continent have placed very little emphasis on the practical implications of the use of ICTs to meet broad educational and developmental objectives, instead engaging more narrowly and tackling issues (Bappa, 2012).

Mobile learning is a rapidly developing mode for teaching and learning to deliver content to learners. Additionally, mobile learning can aid both formal learning in traditional classrooms and informal settings outside

classes. UNESCO believes that mobile technologies can expand and enrich educational opportunities for students in a diversity of contexts (UNESCO, 2013).

Underscoring the six Education for All (EFA) goals are the broad objectives of expanding access to education, improving the quality of learning and promoting equity in education. Mobile learning initiatives in Africa and the Middle East (AME) have demonstrated how each of the EFA goals, with the possible exception of Goal 2, can be supported by mobile learning (UNESCO, 2012).

Popular business and technology literature defines mLearning as “e-learning through mobile computational devices” (Quinn, 2000;Trifonova and Ronchetti 2003), or as “the point at which mobile computing and e-learning intersect to produce an anytime, anywhere learning experience” (Harris, 2001, page 190). As argued by Pozzi (2007), the above definitions are highly technology oriented. These technology oriented definitions tend to oversimplify the concept of mLearning and its implications. First, mLearning is more than replacing the e of e-learning by an m, although it is true that mLearning borrows some features of e-learning so that mLearning enables education to be provided independently of time and place. Second, mLearning is not only about providing location and context dependent knowledge.More learner-centred definitions of mLearning have been proposed: e.g. “any sort of learning that happens when the learner is not at a fixed, predetermined location,or learning that happens when the

learner takes advantage of the learning opportunities offered by mobile technologies" (Franck,2008).

Mobile phones have achieved significant penetration in developing nations over the past decade. At the end of 2010, the ITU estimates that there were 5.3 billion mobile and geographically hard to reach. The use of mobile devices is transforming the cellular subscriptions worldwide, including 3.8billion in developing countries. Access to lives of many low-income people and a mobile network is now available to 90% of the world's population, including 80% of the population living in rural areas (iheed,2011).

Digital training content for health workers can now be easily and rapidly distributed due to the global explosion of mobile devices and smart phones. Six billion mobile connections exist worldwide, almost 5 billion of which are in developing countries.

It is estimated that another 4 million health workers are currently required to meet the world's basic health needs.iheed's digital training content and blended learning approaches will enable these workers to be trained better, faster and cheaper than ever before, keeping them upskilled and supported in the field (iheed, 2012).

Health worker shortage in Sub-Saharan Africa derives from many causes, including past investment shortfalls in pre-service training, international migration, and career changes among health workers, premature retirement, morbidity and premature mortality. Recent studies including in Ethiopia indicated that the health workforce shortage in Africa is even more critical than

previously estimated and indicated that with current workforce training patterns it would take 36 years for physicians and 29 years for nurses and midwives to reach WHO's recent target of 2.28 professionals per 1000 population in Africa (SMP II,2009-2014).

There is a growing body of evidence to show that sound implementation of information and communications technologies (ICTs) can benefit development goals. However these benefits are still far from reaching those who are most impoverished. In part, this lack of effectiveness is attributed to a lack of clarity in the theory and practice of ICT for development (Adam Blake,2012).

In Africa, most mHealth interventions, especially those targeting general populations rather than health or data workers, have used relatively simple mobile technology and equipment. While the field of mHealth is still young, there have been promising early results and lessons from the dozens of pilot programs that have been conducted in a variety of geographic and health-system settings, many of which may be instructive in attempting to address the needs described above. Ethiopia has thus made progress in creating the conditions necessary to support a program of mHealth interventions in its health system.

Ethiopia continues to have one of the lowest rates of mobile phone ownership on the African continent, with only about 8% of the total population having a subscription, many living in urban areas. The state-owned Ethio Telecom is the sole telecommunications provider, and the resulting lack of competition is likely a significant factor in the country's low mobile phone ownership rate. Reception and network congestion problems are chronic. In rural areas, very

few kebele-level facilities (including health posts) have electricity, limiting the ability to recharge mobile phones (Vital Wave, 2011).

Mobile technology is one potential avenue for doing so. Throughout the world, health service providers and decision makers are trying to capitalize on the revolution in mobile communications to strengthen health systems and boost efforts to extend the reach of health workers into underserved communities (Vital Wave, 2011).

mLearning provides training opportunities without forcing learners to be in a bricks-and-mortar classroom, allowing students the freedom to personalize their own learning schedule. Further, mLearning has the ability to inform and keep current workers who are in remote locations (Heiphetz, 2012).

This study is designed to investigate potential role of mLearning for the training of health workers in Ethiopia. That is, the study assesses the mLearning policy framework, identifies the drivers and barriers of such a medium and eventually adapted a mLearning model for Health Science Colleges in Ethiopia.

1.2. Statement of the Problem

The government of Ethiopia is committed to providing its population with quality health services. But the health sector in Ethiopia is suffering from mal-distribution of health workers in favor of urban areas, a migration of workers to the private sector, low levels of motivation and performance in the public sector, and a lack of supportive supervision. There are not enough health workers; they do not have the right skills and support networks; they are often not in the right place; they are overstretched and overstressed (AHRH, 2006).

Worldwide ICT statistics (Acharya & Teltscher, 2010) provide a compelling argument for investigating the potential of wireless mobile devices (WMDs), and in particular mobile phones and smart phones, as these devices have by far the highest ownership of any computing or connected devices (Valk, Rashid, and Elder,2010**)** .

This potential for innovation is both driven and hampered by the rate of change in mobile technologies. Although the rate of change of mobile technology is very high the choice of a pedagogical framework and foundational pedagogical theory can guide the appropriate pedagogical use of future WMD developments (Cochrane,2011).

mLearning, when used as an alternative training for healthcare workers, addresses the issues of health worker to population proportion; by opening the way to training health workers at preferred times and locations, thereby minimizing or eliminating interruption of healthcare delivery. When soundly designed, mLearning addresses effectiveness and technical competence with its embedded assessment of performance.

Unlike personal computers, mobile devices can provide instant access: they can be always on and ready to run, and their portability is also motivating. Their size means that they can be concealed for privacy, if not stylish enough, or alternatively displayed to show off coolness.

Regardless of the role mobile devices could play in the training of health workers, little has been achieved so far in Africa and especially in Ethiopia.

The potential drivers and barriers as well as success factors are not defined in the policy framework of the education sector. Moreover, there is no model that is exclusively established for mLearning in the context of training health workers in Ethiopia.

Although the government of Ethiopia has acknowledged the necessity of mobile learning for health workers, the current trend of training health workers is mainly targeted through the conventional face-to-face training approach that demands the inadequate number of health workers to remain at a training institution full time.

However, the appropriate use of mobile technology for the teaching learning process would have provided the opportunity both for the health workers to gain knowledge and skill in a highly interactive way at the same time providing service to the community as it allows them to learn while in the work place.

1.3. Objectives of the Study

The general objective of the study is to assess the potential role of mLearning for the training of health workers in Ethiopia.

Specifically, the study is

1. to assess the policy framework on mLearning for the training of health workers in Ethiopia;
2. to identify the drivers, and barriers of mLearning; and
3. to develop mLearning model for Health Science Colleges by adapt existing models.

1.4. Significance of the Study

This thesis is of significance to the domain of educational technology as it explores the role of a contemporary and debatable research topic of mLearning. This study is designed to assess the policy framework with regard to mLearning in the health workforce and hence would provide a comprehensive knowledge on the strength and weakness for interested stakeholders. The identified drivers and barriers from this study would also be used by governmental and non-governmental organizations working in the field of human resources for health.

The findings are beneficial for HSC trainers in utilizing technology as a tool to aid teaching and learning where it highlights the importance of mLearning model aligning the implementation of technology with changes in curriculum and delivery methods.

The significance of this study is to AMREF, my current employer organization, which at present is finalizing mLearning project implementation for health workers as a means for continuous professional development starting from August 2013.

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Hence, the mLearning model adopted by this study will directly be taken for implementation for the training of health science colleges. As the study respondents has been Health Science College trainers and health workers from health science colleges, the value of the study is immense to build the existing knowledge base and in the mean time solving the barriers associated pedagogical approach, infrastructure and skill application.

The purpose of this study was to examine the potential role of mLearning for the training of health workers in Ethiopia, provide appropriate recommendations for policy makers and practitioners, identify the barriers and drivers of mLearning and adapt improved design for mLearning for health workers training and further knowledge of mobile learning in the context of the country.

1.5. Delimitation of the Study

Due to the large number of potential participants in the study population, the population involved in the current study focused only on health workers attending upgrading training in Dr Tewelde, Debrebirhan and Shashamane Health Science Colleges.

1.6. Limitation of the Study

Due to the mid level of health workers' training offered in the Health Science Colleges included in this study, it might be difficult to generalize the findings of the study to all health workers training institutions. The other limitation was that health workers from Shashamane HSC are not included in this study as they

were assigned for apprenticeship in different health centers during the data collection.

1.7. Definition of Operational Terms

The following definitions are provided to ensure common understanding of these terms throughout the study.

Potential Role: refers to the expected capability if used with whole scale effort

Health Workers: refers to the health extension workers who have served atleast five years in the health facilities.

1.8. Organization of the Study

The thesis is organized in to the following five chapters: Chapter 1 has presented the introduction, statement of the problem, significance of the study, definition of terms, delimitation and limitations of the study. Chapter 2 contains the review of related literature and research related to mLearning theories, perspectives, models as well as barriers and drivers. The methodology and procedures used to gather data for the study are presented in Chapter 3. The results of analyses and findings emerged from the study are contained in Chapter 4. Chapter 5 contains conclusions drawn from the findings, and recommendations for practice and further study.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1. Introduction

This chapter surveys relevant literature works from the major subject fields underlying the project to justify its various conceptual foundations. It presents the relevant literature pertaining to mLearning.The purpose and role, theoretical models, perspectives as well as the barriers and drivers of mLearning are reviewed in this chapter.

2.2. What is mLearning?

Mobile learning (mLearning) is defined differently by different people. Early perspectives of mLearning were focused on technology, and defined as the delivery of training by means of mobile devices such as mobile phones, PDAs and digital audio players, as well as digital cameras and voice recorders, pen scanners, etc. For example, MoLoNET (2007) defined it as “The exploitation of ubiquitous handheld technologies, together with wireless and mobile phone networks, to facilitate,support,enhance and extend the reach of teaching and learning.” Another view of mLearning focuses on mobility. Keagen (2005) suggests that mLearning should be restricted to learning on small and portable devices. According to him, mobile devices could be carried everywhere. For example, a lady can carry in her handbag or a gentleman can carry in his pocket. So this definition also relates to a technocentric perspective because of concentrating on the size of mobile devices.

Some researchers characterize mobile learning as an extension of e-learning. For instance, Kadirire (2009) defines mLearning as a form of e-Learning, which can take place anytime, anywhere with the help of a mobile communication device such as a mobile phone, a personal digital assistant (PDA),iPod or any such small portable device. But new mobile learning perspectives accept mLearning as a paradigm change. One of these perspectives is the learner-centred perspective. It asserts that mLearning is any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning opportunities offered by mobile technologies (O' Malley et al, 2003).

2.3. The Role of Mobile Device for Learning

Throughout the world, health service providers and decision makers are trying to capitalize on the revolution in mobile communications to strengthen health systems and boost efforts at extending the reach of health workers into underserved communities. The severe shortage of trained health workers in many developing countries makes the idea of using mobile technology for this purpose even more appealing. In low-resource settings throughout Africa and the developing world, governments, non-governmental organizations (NGOs) and private-sector actors have piloted programs in which health workers and patients use mobile technology to transmit and receive information that allows them to make better decisions(Vital Wave Consulting,2012).

In a global population of nearly seven billion people, the total number of mobile phone subscriptions globally is an astonishing 5.4 billion. Given that individual subscribers may have multiple and/or inactive SIM cards, the actual number of individual mobile subscribers worldwide is estimated at around 3.9 billion (Informa Telecoms and Media 2011). Latest figures indicate that mobile phone penetration rates stand at almost 45 percent in low-income countries and 76 percent in lower-middle-income countries (ITU 2011a). Given that entire villages in poor and/or rural communities will often share one or two cell phones, it is also estimated that 80 to 90 percent of people in some poor countries have at least minimal access to a cell phone (Zuckerman 2009). Furthermore, close to 80 million mobile subscribers, most of them in developing countries, have no access to the electrical grid — and yet use a mobile phone (UNDP, 2013).

The Arab Spring arguably ranks among the most significant informal mobile learning phenomena in 2011 because of the way thousands of youth used social media, accessed via their mobile phones, as a space for expression, self-identification, self-assertion, contestation and mobilization around human rights, democratic ideals and civil liberties. Social media also played an essential role in shaping the stories of these uprisings, as growing numbers of young people used social media platforms to share their experiences and make their voices heard. From a mobile learning perspective, this phenomenon enabled people to share knowledge about their individual and collective social, historical and cultural conditions, and to forge collaborative peer networks enabled by new media. The Arab Spring took the world by

surprise,which suggests the need for practitioners and policy-makers to be mindful of how the social, economic, cultural and political structure of society may be altered under the influence of rapidly advancing mobile technologies (UNESCO,2012).

It has already been noted that some mHealth interventions have focused on health workers, while others are aimed at members of the community at large. In Ethiopia, considerations about the appropriateness of large- scale interventions center on the fact that about 90% of HEWs own mobile phones, compared to only 8% of the Ethiopian population (FMOH,2011).

Table 1: Intervention Objective, Benefit and Impact

HEW Need	Objective	Intervention	Benefits or Impact
Referrals	Identify and refer mothers and newborns to the most appropriate facility quickly and ensure they receive care at arrival	Allow faster communication of referral need through voice or text	Reduce delay in receiving care
Training & Education	Reinforce HEW training and procedure while performing current duties such as pneumonia CCM	Allow access to quizzes or checklists/algorithms during service provision	Improve skills and knowledge while reducing time away from post
Supply Chain Management	Ensure consistent and adequate supplies of needed drugs, kits and equipment	Allow notification and recording of supply needs as well as notification of receipt	Fewer stockouts of critical supplies
Data Exchange	Collect, transmit and receive critical patient and population health data	Facilitate electronic data entry and receipt at post level	Improve data accuracy and timeliness
Consultation	Speak with more highly-trained medical professionals in cases of emergency or urgent treatment	Allow real-time consultation with higher level medical staff	More effective and immediate aid

Source: mHealth Framework: Ethiopia. Page 12.

For example, assuming the FMOH wish to deploy an mHealth program and needed to make use of ET resources at the national, regional, zonal, woreda or kebele levels, it would make such a request and detail its needs to the MCIT. Those services that can be provided under Ethiopia's e-government program would be provided directly by MCIT, and those that can only be provided through the national telecommunications infrastructure (networks, call centers and data centers) would be passed to ET by MCIT on behalf of FMOH. This triumvirate would thus cooperate to facilitate mHealth projects (FMOH,2011).

That is in part because mobile technologies offer portable, real-time, communication and information access for people who previously had little to no access to affordable communication channels. Mobiles have relatively low physical infrastructure requirements and can reach remote areas in a more cost-effective fashion than other ICTs such as the Internet or fixed phone lines. In some places, mobile devices are simply the only option available. And mobile phones require only basic literacy, making the barriers to entry much lower than with other modern ICTs (UNDP, 2013).

Mobile technologies are starting to have an indelible impact on human development, enhancing democratic governance and other development areas such as health, education, agriculture, employment, crisis prevention and the environment. For instance, studies have suggested that increased mobile ownership is linked to higher economic growth (Vodafone, 2005; Vodafone and ICRIER, 2009).

Results from current mLearning projects indicate that wireless technologies are emerging as a portable solution that enables learners to engage in collaborative and interactive learning activities. Considerations that need to be taken into account when exploring the adoption of wireless technologies in education range from limitations of the wireless technologies themselves, to broader issues such as safety and security, and training and support considerations (Andrea Barker et al, 2010).

Their study also indicates that mobile learning can be effective for providing short information (feedback on assignment, important dates, grades and results). The same study indicates that SMS is the favoured mode of communication, rather than mobile Web-browsing. Finally, the authors concluded that mobile learning could help overcome some of the issues in student retention (e.g.absence of interaction with fellow students (Franck,2008).

Many governments have adopted some form of national ICT in education policy. However, many of these policies were developed in the 'pre-mobile' era. The few policies that do refer to mobile devices either reference them obliquely or, in some cases, ban them. Overall, there is a dearth of considered and thorough mobile learning policies. To address this vacuum UNESCO will develop a set of guidelines for mobile learning policies to help national governments and educators create environments in which mobile learning can flourish (UNESCO, 2012).

2.4. Why Mobile Learning?

mLearning objects could be delivered in traditional classroom environments, could be used for online performance support to guide a learner working through a task, could be used for augmenting classroom instructions and other learning materials and could be used as instructions for operating a given device [36]. The size, presentation and scope of a mLearning object is dependent upon the capacity of the mobile device in question and how a given institution conceptualizes a learning object. In a software component is regarded as a mLearning object. In developing countries where learners own mainly low end mobile phones, text based learning objects are more feasible than resource heavy learning objects such as software modules (Paul Birevu et al,2011).

A number of early mLearning pilots involving the use of mobile devices were conducted by ALPS to assess the readiness of the partner institutions to adopt mobile technologies for H&SC practice placement learning and assessment. These pilot studies demonstrated that the benefits of m-learning for students were improved lecturer and peer support, better access to information and resources, and the ability to record and reflect on their clinical experiences in real time(Taylor et al,2010). Where mobile devices were used for assessment, students valued the increased student-centeredness of the process (Sandars & Dearnley,2009).

Student retention is an issue that needs to be discussed in the context of social inclusion. Some studies show that retention in distance learning is low compared to traditional education (Pierrakeas et al., 2004). Factors such as lack of time/time management issues, poor guidance/feedback, course load and high expectations are often the cause for students to withdraw from their courses. Fozdar and Kumar (2007; Fozdar et al., 2006) conducted a survey (n=67) in order to study students' perceptions of the effectiveness of mobile learning in relation to retention at the Indira Gandhi National Open University in India. Their results indicate that mobile learning can be an effective method of learning as it can (i) provide immediate support, (ii) bring new opportunities of learning, (iii) provide learning anytime, anywhere,(iv)improve communication between teacher and student,and (v) provide quicker feedback (Franck,2008).

Mobile phone technology usually includes equipment such as handsets, computers,servers,and software and bandwidth connectivity - components involved in the data collection, transfer, storage, transformation and management of information. It includes the main function of voice communication and supplementary functions such as SMS, imaging and video. Mobile phone technology uses different systems or "protocols" for communicating signals. The different protocols may have different capabilities (and costs) in terms of the type and amount of data they transmit, and some may depend on having more advanced devices, such as smart phones. The protocols include Global Positioning System (GPS),General Packet Radio Service GPRS),Unstructured Supplementary Service Data (USSD),

Bluetooth, web browsing and cell broadcasting. There are a variety of health-related software applications that use different combinations of these functions and communication systems (Mechael et al. 2010).

The interest in mobile learning has come from a number of places (Schofield,West and Taylor, 2011):

- Advances in technology and high levels of mobile phone penetration have made mobile devices the ideal targets for mobile learning applications;

- As well as these advances in technology reshaping learning, the characteristics and behaviors of Generation Y , and the environment they have grown up in mean that Generation Y are driving changes in learning design for all generations;

- It is as important to have behavioral change as well as technological change: social norms are rapidly evolving and for most people the benefits of the mobile phone now outweigh its disadvantages – educators need to tap into the new behaviors and technologies rather than trying to change or resist them.

- Mobile learning offers many benefits for learning:

  – ‘Just enough’ learning – highly applied, easily digestible learning for increasingly busy executives;

  – ‘Just-in-time’ learning – convenient, flexible and relevant learning at the exact moment learning is required;

– ‘Just-for-me’ learning – learner-driven learning in a suitable format;

– Technology – mobile learning can be cost effective and using a learner’s own mobile device eliminates technological barriers to accessing learning.

The study revealed a number of prospects for the development and growth of mLearning. The prospects lay in the existence of possible learning activities that could be ported onto mLearning. mLearning was found to be suitable for out-of classroom direct learning activities or activities meant to plan and support direct learning activities. While outside the classroom, learners participated in collaborative and interactive learning (41.0 Percent), co-curricular/extra-curricula activities (20.0Percent), independent research (16.0 Percent), completed theoretical, practical and field coursework and assignments (8.0 Percent), watched/listened to educative and entertaining music, news and movies (6.0 Percent), engaged in work related activities 208 P.B. Muyinda et al. (4 Percent), consulted their lecturers (7.0 Percent), acquainted themselves with the university environment (1.0 Percent) and took computer lessons (1.0 Percent). All these learning activities can be variously supported through mLearning to accomplish various learning processes (Paul Birevu et al, 2011).

Through voice calls, the study showed that pull and push synchronous and asynchronous audio communication was practiced and preferred on low end mobile phones because voice calls imposed no character length limitations inherent in text messages. In the use of audio mLearning objects on low end mobile phones is reported. In the mLearning project in learners learn how to

pronounce and spell English words by listening in to a word from the Hadeda system before being required to type it out. If a learner correctly types the word, the system congratulates him/her, otherwise it gives him/her the correct spelling. In the mLearning project in a mobile audio-wikipedia system is reported. In this system, learners use their mobile phones to dial into it and listen to a definition of a given word. If the definition does not exist, the learner is given a chance to dictate a definition to the system (Paul Birevu et al, 2011).

2.5. mLearning Perspectives

Some researchers characterise mobile learning as an extension of e-learning. For instance, Kadirire (2009) defines mLearning as a form of e-Learning, which can take place anytime, anywhere with the help of a mobile communication device such as a mobile phone,a personal digital assistant (PDA), iPod or any such small portable device. But new mobile learning perspectives accept mLearning as a paradigm change. One of these perspectives is the learner-centered perspective. It asserts that mLearning is any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning opportunities offered by mobile technologies (O' Malley et al, 2003).

The other perspective focuses on individualism. According to this perspective, mLearning is defined as any activity that allows individuals to be more productive when consuming, interacting with, or creating information, mediating through a compact digital portable device that the individual carries on a regular basis, has reliable connectivity, and fits in a

pocket or purse (Wexler et al, 2008). There are some researchers who associate mLearning with ubiquitous learning, as well (Ng et al, 2009).

There are many different mLearning perspectives in the related literature. Each definitions focus on the different features such as mobile technologies, mobility, individualism, ubiquitous, or e-learning.

In theory, mLearning increases access for those who are mobile or cannot physically attend learning institutions – those who would not otherwise be able to follow courses in a traditional educational setting due to the constraints of work, household activities, or other competing demands on their time. mLearning makes education more accessible in that it enables learners to pursue their studies according to their own schedule. The portability of mobile technology means that mLearning is not bound by fixed class times; mLearning enables learning at all times and in all places, during breaks, before or after shifts, at home, or on the go. Interestingly, however, while mLearning is portable, it is not necessarily associated with physical movement. According to a study conducted by Vavoula, few people actually utilize the time spent in transit to learn (Taylor, & Vavoula, 2005).

Hence, it is possible to deduce that there are varied perspectives on mLearning and the widely agreed one is the use of mobile device for the learning process. The mobile technology focused perspective is more pronounced and thus the researcher adopted this perspective throughout the study.

2.6. Theories of mLearning

A first step in postulating a theory of mobile learning is to distinguish what is special about mobile learning compared to other types of learning activity. An obvious, yet essential, difference is that it starts from the assumption that learners are continually on the move. We learn across space as we take ideas and learning resources gained in one location and apply or develop them in another. We learn across time, by revisiting knowledge that was gained earlier in a different context, and more broadly, through ideas and strategies gained in early years providing a framework for a lifetime of learning. We move from topic to topic, managing a range of personal learning projects, rather than following a single curriculum. We also move in and out of engagement with technology, for example as we enter and leave cellphone coverage (Mike et al, 2005).

In theory, mLearning increases access for those who are mobile or cannot physically attend learning institutions – those who would not otherwise be able to follow courses in a traditional educational setting due to the constraints of work, household activities, or other competing demands on their time. MLearning makes education more accessible in that it enables learners to pursue their studies according to their own schedule. The portability of mobile technology means that mLearning is not bound by fixed class times; mLearning enables learning at all times and in all places, during breaks, before or after shifts, at home, or on the go. Interestingly, however, while

mLearning is portable, it is not necessarily associated with physical movement (Valk, Rashid, and Elder,2010).

While learning, learners collaborate, interact and communicate with each other to accomplish group or individual learning activities. Collaboration, interaction and communication are functions that can be accomplished using mobile communication technologies. These learning tenets are inherent in the Social Constructivist Learning Theory, Conversational Learning Theory, Behaviorist Learning Theory ,Learning and Teaching Support Theory ,and Informal and Lifelong Learning Theory(Paul Birevu et al,2011).

The summary of current mobile learning theories is indicated in the following table with definition and focus providing pertinent examples with mobile technologies.These are: Behaviorism, Cognitivism, Constructivism, Situated Learning,Problem-Based Learning,Context Awareness Learning,Socio-Cultural, Collaborative Learning, Conversational Learning, Lifelong Learning, Informal Learning as well as Activity Theory, Connectivism,Navigationism, and Location-based learning.

Table 2: mLearning Theories

Theories	Definitions	Examples with mobile technologies
Behaviorist	Learning has occurred when learners evidence the appropriate reinforcement of an association between a particular response and stimulus(Smith and Ragan,2005)	English learning applications SMS, MMS, Voice recorder softwares, Mobile Response System: Qwizdom, Turning Point Response System
Cognitivist learning	Learning is the acquisition or reorganization of the cognitive structures through which humans process and store information (Good and Brophy, 1990)	Multimedia (text, video, audio, animation, images) SMS, MMS, e-Mail Podcasting, Mobile TV
Constructivist	Learning is an activity process in which learners construct new idea or concepts based on their current and past knowledge (Bruner, 1966)	Handheld games, Simulation,
Situated Learning	Learning is not merely the acquisition of knowledge by individuals, but instead a process of social participation (Brown et al, 1989).	Natural science learning, Medical education, Multimedia museum, Virtual experts by artificial intelligence tech.
Problem-Based Learning	Learning aims to develop students' critical thinking skills by giving them an ill-defined problem that is reflective of what they would encounter as a practicing professional (Koschmann et al, 1996)	Medical education Business administration Nursing, Simulations SMS, MMS, Voice responded systems
Collaborative Learning	Learning is promoted, facilitated and enhanced by interaction and collaborations between students	Mobile Assisted Language Learning Mobile **R**esponse System collaborative learning Forum, Web 2.0 tools, e-mail, mobile portal, games
Connectivism	Learning is process of connecting specialized nodes or information sources (Siemens, 2004).	Social networks (Blogs, Wikipedia, Twitter, Podcast ,E-mail, Mobile Forums

(Nilgun and David ,2011.Page 202-3)

The Social Constructivist Learning Theory is an extension of the Constructivist Learning Theory. The Constructivist Learning Theory recognizes learning as an active process in which a learner constructs new ideas or concepts based on his/her current and past knowledge. The Constructivist Learning Theory takes an individualistic angle that negates the fact that learning occurs in social settings. Consequently, critiques of the Constructivist Learning Theory such as have argued for the Social Constructivist Learning Theory. The Social Constructivist Learning Theory proponents posit that knowledge creation is shared rather than an individual experience. Their position is in line with that of who contends that knowledge is constructed through interaction of a number of minds and not just one. Hence knowledge is a social product. Tools and raw materials for creating this social product can arise from technologies that encourage interaction and collaboration. The mobile phone is a good example of such technologies. Mobile teleconferencing and SMS can scaffold learning in communities of practice (Paul Birevu et al,2011).

2.7. mLearning Models

Today there are three main forms of mobile learning being practiced. The Web model of mobile learning requires “students” of all types to access blogs and websites via their hand-held device. mLearning forms, through the reading of website content, 3D simulations,and the watching of videos. These are all examples of mobile learning using the Internet and websites as the main tools. In the App model of mobile learning, users download apps or applications – basically, software programs designed for mobile devices – that provide a very specific function such as a foreign language exercise, mathematics flashcards or a visual logic exercise for learning and development. The use of graphic QR codes to access apps for various exercises is another example of an evolving technology used to speed- up processes and procedures. The cellular model of mobile learning incorporates the use of the cell phone’s basic features for a learning exercise. “Telephony” functions such as listening to audio broadcast messages or engaging in text message-based testing procedures are examples of cellular mobile learning (Andrew,2013).

Mobile learning enables learners to address varied learners using a pedagogy which best suits the learning requirement and the student’s need. Below are some common educational pedagogies that mobile learning easily adapts to, to make education more effective (Emantras,2013)

a. Assessment

A traditional method of measuring comprehension, educators traditionally create pre- and post-assessments for students and tailor learning to the

specific needs of the students. Mobile learning can be used to create similar assessments which measure comprehension, and benchmarking.

b. Remedial

Additional exercises are often required to reinforce some lessons to students who fare poorly. By providing access to visual guides, repetitive exercises and practical examples. Mobile learning can help provide remedial learning inputs to students who need it.

c. Test Prep

Mobile learning can be easily adapted to design multiple choice tests and fill-in-the-blank answers. By constant review of test prep material, students can ensure better preparation for exams.

d. Index

Mobile learning being accessible anywhere, anytime, is gainfully used in providing easy access to lists, indices and how-to guides. These serve as an excellent quick reference for learners to get immediate answers to questions pertaining to their subjects.

e. Guides

Most educative materials comes with some memorization requirements be it formulae, dates, or diagrams. Creating guides which can be revised separately before an exam, or reviewed in conjunction with learning material can enable better comprehension.

f. Collaborative

Mobile learning can help students exchange and share information using

technology. But facilitating this, learning can be through sharing between peer groups, experts, and mentors.

g. Supplemental

Supportive material inputs like examples, and case studies which supplement the main chapter can be introduced for further reading and better understanding of the key subject. Mobile learning delivers content in small nuggets making it ideal for supplementary content delivery.

According to Becta (2004), there is evidence that the use of wireless technologies can help to increase collaborative learning and communication, as well as independent learning among learners, because of the mobility and capacity of the devices. Stead (2004) states that in every mLearning project trial, the learners engaged the most with the learning that they could do together, either by sharing the wireless technologies or by passing data between the devices, consequently learning should be built around this. The results of the Zurita et al (2004) research show that wireless technologies solve the weaknesses of coordination,communication,organisation, negotiation, interactivity and mobility encountered in collaborative learning (without technology) in education (Andrea Barker,2010).

2.8. MLearning Policy: Global and National Perspectives

Mobile technologies are starting to have an indelible impact on human development, enhancing democratic governance and other development areas such as health, education, agriculture, employment, crisis prevention and the environment. For instance, studies have suggested that increased mobile

ownership is linked to higher economic growth (Vodafone 2005; Vodafone and ICRIER 2009).

Because of the rapid growth in access to mobile phones around the world and in the AME region in particular, much attention has been given to the potential of mobile learning to improve teaching, learning and institutional efficiencies and to enable national education system transformation (UNESCO,2012).

Any analysis of the appropriate mHealth interventions in the Health Extension Program must take into account the telecommunications and physical infrastructure in Ethiopia, as well as the user attributes that determine the sort of interventions that could make an impact on health outcomes. Ethiopia has, over six years, developed an unusual but extensive mixed-capability ICT infrastructure that provides a blended coverage of 85% of the country's population, with the potential to serve 90% of its population. This infrastructure is multivariate and uses CDMA and GSM (2G and 2.5G/GPRS) mobile and fiber technologies – each stand-alone yet interoperable (Vital Wave Consulting, 2012).

In Africa, most mHealth interventions, especially those targeting general populations rather than health or data workers, have used relatively simple mobile technology and equipment. Ethiopia has thus made progress in creating the conditions necessary to support a program of mHealth interventions in its health system. Significant challenges remain, however. Ethiopia continues to have one of the lowest rates of mobile phone ownership on the African continent, with only about 8% of the total population having a subscription, many living in urban areas. The state-owned Ethio Telecom is the sole

telecommunications provider, and the resulting lack of competition is likely a significant factor in the country's low mobile phone ownership rate. Reception and network congestion problems are chronic. In rural areas, very few kebele-level facilities (including health posts) have electricity, limiting the ability to recharge mobile phones (Vital Wave, 2011).

2.9. Barriers and Drivers of mLearning

The technical limitations of mobile phones, especially in poorer communities, form other barriers to mobile learning in the region. Connectivity is restricted in many areas by the cost of data and the limited availability of high-speed third generation (3G) networks. When learners own or have access to mobile phones, they are often older or lower-end handsets with limited functionalities and small screens. More expensive, higher-end handsets with data capability are only useful in areas where the mobile network can service them, and where the cost of data access is not prohibitive. The absence of industry standards also serves as a further barrier to mobile learning. Issues include a lack of standards for screen size and resolution; inconsistent support for Java, Flash, and various types of audio and video formats; incompatible internet browsers; and a wide array of memory sizes. All of this fragments the mobile platform landscape, rendering the development of mobile learning applications a significant challenge. As a result, there is a dearth of mobile phone-based educational content and applications, which poses a further impediment to mobile learning in the region. This is especially true in poorer communities where people predominantly possess lower-end phones, for which little

educationally-rich content and few educational applications have been developed (Freedom House, 2012*)*.

An acute shortage of healthcare workers is a major challenge facing developing country health sectors. Training new cadres of health professionals and empowering current workers in order to increase job satisfaction and reduce attrition are essential to meeting human capital needs (Vital Wave Consulting,2009).

Any analysis of the appropriate mHealth interventions in the Health Extension Program must take into account the telecommunications and physical infrastructure in Ethiopia, as well as the user attributes that determine the sort of interventions that could make an impact on health outcomes. Ethiopia has, over six years, developed an unusual but extensive mixed-capability ICT infrastructure that provides a blended coverage of 85% of the country's population, with the potential to serve 90% of its population. (Vital Wave Consulting,2012).

Ethiopia's telecommunications infrastructure is among the least developed in Africa and is almost entirely absent from rural areas, where about 85 percent of the population resides. In 2011, only 829,000 fixed telephone lines were in actual operation (a decrease from 908,000 lines in 20109), serving a population of 83 million for a penetration rate of less than 1 percent, according to the International Telecommunication Union (ITU). Similarly, the end of 2011, internet penetration stood at 1.1 percent, up from 0.75 percent in 2010.Mobile phone penetration in 2011 was higher at roughly 17 percent with a little over 14 million subscriptions, up from an 8

percent penetration rate in 2010. While all of the above reflect very slight improvements in access compared to 2010 (except for fixed-telephone lines), such penetration rates represent extremely limited access to ICTs by global comparison (Freedom House,2012).

According to a study conducted by the MasterCard foundation in 2011, most young people in the study had access to a mobile; the barriers to ownership for many of them should not be underestimated. The single most important obstacle was the cost of a handset, which was cited by 20% of those who did not have a phone. Clearly affordability will be an important issue to address as the mobile industry develops future mLearning services. The second most important barrier was social in nature: the disapproval of a spouse or other members of the family was cited by 25% of respondents. Women were more likely to face this barrier, although it also varied between the countries surveyed: 14% of young people from Ghana cited this as a barrier, compared to 28% in Uganda.

CHAPTER THREE

3. RESEARCH METHODOLOGY

This chapter includes a description of the study area, research method and design appropriateness, a discussion of the population and sample.

3.1. Study Design

The study is a cross sectional study that used both quantitative and qualitative data collection tools. Health Worker Trainers/instructors as well as policy makers were randomly selected for the quantitative study and in-depth interview has complemented this study to a significant extent. Document review of the health workers training strategy like UNESCO policy guideline for mLearning,the United Nation Foundation-mHealth for Development, Ethiopian mHealth Strategy, HSDP and other related educational strategy documents have also been conducted.

In this study, the researcher used the descriptive method of research describing the data collected.

3.2. Description of Study Area

The study was conducted in Dr Tewelde Health Science College (Mekelle) and Debrebirhan Health Science College. Policy makers from Federal Ministry of Health were also targeted as a leading national coordinating organ for the training of Health Workers.

3.3. Study Population and Sample

The sample for this study consisted of forty (40) health workers enrolled in the HEWs Upgrading Program,thirty (30) instructors in the Health Science Colleges and 10 government policy makers from FMOH. The total population of this study has been 40 HEWs from which 20 were sampled and 15 trainers out of which 10 were included in the sample from Dr Tewelde HSC. From Debrebirhan HSC, 20 HEWs were selected out of a total population of 58 and 10 trainers out of 15. Moreover, 10 trainers were also included form Shashamane HSC out of a total population of 13 trainers. The HSCs were selected due to their prior exposure for mLearning project.

Students enrolled in the program were invited to participate in the study and provided informed consent. The methods for this study were reviewed and approved by the respective HSC Deans to ensure the ethical treatment of study participants.

Random sampling method has been implemented to select study respondents from the health workers and trainers category. This sampling took in to account variations across different institutions and infrastructure. In the third category of respondents, purposive sampling was used and for the qualitative data, the number of respondents has been determined by points of redundancy and saturation of information.

3.4. Data Collection Tools and Procedure

Self administered data collection tool has been developed and trainers of health workers, health workers as well as policy makers were oriented by the

researcher to fill the data. The questionnaire for the three respondent categories has been hand delivered for 75% of the respondents and through email for the rest. Indepth interview guide and observation checklist has also been prepared and used by the researcher.

The data collection instrument has been developed after reviewing all the necessary documents that could help to respond to the research question by generating adequate data. The source of item for the instrument were information gathered from review of related literature. The instrument for the three respondent categories was developed based on the research question and it had three parts that addresses the role of mLearning, barriers and drivers as well as the policy context.

The instrument has been critically commented and then field tested based on which all the necessary feedbacks and corrections were made before the actual data collection to ensure validity and reliability of the data. The questionnaire consisted of both open-ended and closed questions.

In addition, to clarify and validate data, the researcher also included indepth interviews with key informant policy makers from Federal Ministry of Health.

3.5. Data Analysis

Descriptive statistics has been used to analyze the data. Accompanying notes of the major issues addressed has been taken note. The data collected has been thematically analyzed in to: the role of mLearning, the policy framework, barriers and drivers of mLearning and mLearning model for HSCs.

3.6. Validity and Reliability

The validity of data, which is about responses being accurate, correct and honest, has been addressed by designing the questionnaire in this thesis with great care to avoid asking questions that lead to particular answers. Sentences were carefully structured using simple language and questions were kept clear and short. The questionnaire was pre-tested to the trainers, health workers and policy makers avoid threats of instrumentation and testing.

Reliability concerns the consistency with which research procedures deliver their results (Seale 2004).In order to ensure the reliability of data the design of the questionnaire considered limiting the questions that are affected by respondents characteristics such as memory, knowledge and experience so that another researcher would get the same results if this study will be carried out at the same time and with the same respondents.

3.7. Ethical Considerations

Written consent was taken from Addis Ababa University, Institute of Educational Research mentioning the purpose of the research, based on which verbal consent has been obtained from each research participant.

The questionnaire also was very clear that participation was voluntary and confidentiality of study participants was also guaranteed to each of the participants.

CHAPTER FOUR

4. DATA ANALYSIS AND INTERPRETATION

This chapter deals with analysis and interpretation of the findings of the study on the potential role of mLearning for the training of health workers in Ethiopia focusing on three health science colleges namely Dr Tewelde(Mekelle), Debrebirhan and Shashamane.It also discusses the data obtained from policy makers from Federal Ministry of Health. All study participants were willing to participate and hence the distributed questionnaire has been filled and returned.

On the basis of the given responses by the participants, the main analyses of the study are presented in the following manner. The first part of this chapter focuses on the characteristic of study respondents and then the analysis and interpretation follows.

4.1. Demographic Characteristics of Study Participants

The sampled trainers for this study were health professionals engaged in the teaching of mid level health workers. In the first category of target respondents, out of the total thirty trainers sampled 77% were male and 23% were women.The second category of respondents was health workers that are currently studying in Dr Tewelde (Mekelle) and Debrebirhan HSCs. These are health workers who have been working in the health facilities atleast for three years and currently they are being upgraded in those HSCs. All of the health worker respondents were women as it has been the Government’s strategy to recruit and train women HEWs.

The demographic characteristics of the participants of study are presented in the following table.

Table 3: Demographic Characteristics of Participants of the Study

Category	Response Item	Number	Percentage
Trainers	Sex	Men(23)	77%
		Women(7)	23%
	Age	20 -29(11)	27%
		30-39(19)	63%
		40-49(0)	0%
	Education level	Degree(13)	43%
		Master(17)	57%
	Marital status	Single(18)	60%
		Married(12)	40%
		Divorced(0)	0%
Trainees	Sex	Female(40)	100%
	Age	20 – 29(30)	65%
		30-39(10)	35%
		40-49(0)	0%
	Education level	Certificate(20)	50%
		Diploma(20)	50%
	Marital status	Single(9)	22.5%
		Married(31)	77.5%
		Divorced(0)	0%

More than one third of the trainers are male and twenty three percent of them are reported as women trainers. However, all of the trainee health workers are women which are a result of a deliberate government policy to recruit and train women health workers as HEWs.

As it is summarized in the table above, 43% of the trainers were first degree holders, and 57% of the respondent trainers were Masters Degree holders. Half of the respondent trainees were in certificate level and the rest were Diploma holders.

4.2. Type of Mobile Phones Trainees and Trainers own

The type of mobile phone determines the future role of mLearning proposed in the Health Science Colleges. Hence, both health workers and their trainers were asked to fill which type of mobile brand/application they own. The following table indicates the type of mobiles phone that health workers and trainers own included in the study.

Table 4:Type of Mobile Phones both trainees and trainers own

Variable	Response	Percentage
Type of Mobile owned by health workers	Nokia	85%
	Samsung	10%
	Tecno	5%
	Android	-
	Smartphone	-
	Other (specify)	-
Type of mobile owned by trainers	Nokia	50%
	Samsung	20%
	Tecno	20%
	Android	-
	Smartphone	10%
	Other (specify)	-

As illustrated in the table above, nearly all of the sampled health workers own Nokia apparatus (85%), Samsung (10%) and Tecno (5%). There was no one who did not own a mobile apparatus. Apparently, their trainers who are living in

a relatively better network coverage area do also own mobile phones Nokia (50%),Samsung (20%),Tecno (20%)and smart phone(10%).

The mHealth Road map and mHealth Strategy of FMOH report of 2011 indicated that 90% of HEWs have mobile phones that can potentially facilitate the continuous professional development as well as knowledge and skill improvement (Vital Wave, 2011). This study indicated that 100% of HEWs own mobile phone implying even the better potential for mLearning for health workers training.

It was observed that the model of almost all mobile apparatus owned by the respondent trainees have camera which they use to aid learning activities by taking a picture from their book, demonstration doll, a simulator etc.

4.3. Potential Role of mLearning

It is only twenty two percent of the health workers which replied that their mobile apparatus does not get connected to the internet. The rest seventy eight percent confirmed that their mobile supports the internet connectivity.

Table 5: Respondents mobile device that can be connected to the Internet

Question	Trainees Response		Trainers Response	
	Yes	No	Yes	No
Do you own a mobile device that can be connected to Internet?	*78%*	22%	97%	3%

Similarly when asked if their mobile apparatus supports the use of memory card implying the great possibility for mLearning in their training while in the

training institution as well as a means for continuous professional development after they are placed in the health facilities.

Therefore, mLearning has the potential to improve the knowledge and skill of health workers both from the pedagogical content wise where students can watch/hear to a recorded audio and/or video lecture as well as a means of communication with their trainers though text message.

Table 6: Trainees and Trainers use of mobiles to access internet

Question	Trainees	Trainers
If you answered "Yes" to #8 above, how often do you use your device to access internet?		
a. Daily	18%	43%
b. 2-3 times per week	30%	20%
c. Once per week	10%	23%
d. Every few weeks	20%	10%
e. Monthly or less	-	3%
f. Other(Specify)___	-	-

As cited in the table above,43% of those trainers who can access internet on their mobile phone access can browse internet daily and out of those trainees whose mobile support internet can browse internet 30% use their mobile 2-3% per week to access the internet. Whereas 10% of those trainees access the internet once per week on their mobile, 23% of the trainers access the internet once per week on their mobile.

More than ninety percent of the health workers and ninety eight percent of the trainers believe that mLearning has the potential to revolutionize the health workers training with the apparent impact of better service provision. In their reply to the questionnaire provided by trainers, it was indicated that the best strategy to be through online learning and offline through audio-visual productions loaded on their mobile memory.

It is observed that there is a high teacher-student classroom ratio which in this particular study ranged from 1:96 in Shashemene HSC to 1:40 in Dr Tewelde HSC. Visionaries believe mobile learning offers learners greater access to relevant information, reduced cognitive load and increased access to other people and system (Marguerite,2011). Hence, in addition to supporting the classroom based theoretical sessions, mLearning would also help greatly in the practical skill demonstration sessions using audio-visual productions and using server administered self assessment questions for health workers.

When asked about how mLearning would play an important role in the future of health workers training, trainers indicated saying 60% though Short Message Service(SMS),25% cited connecting to the internet and 15% suggested watching audio-visuals loaded on learners mobile memory card.

With regard to the question of “For what purpose do you mostly use your mobile phone?” the sampled health workers response is summarized in the following diagram:

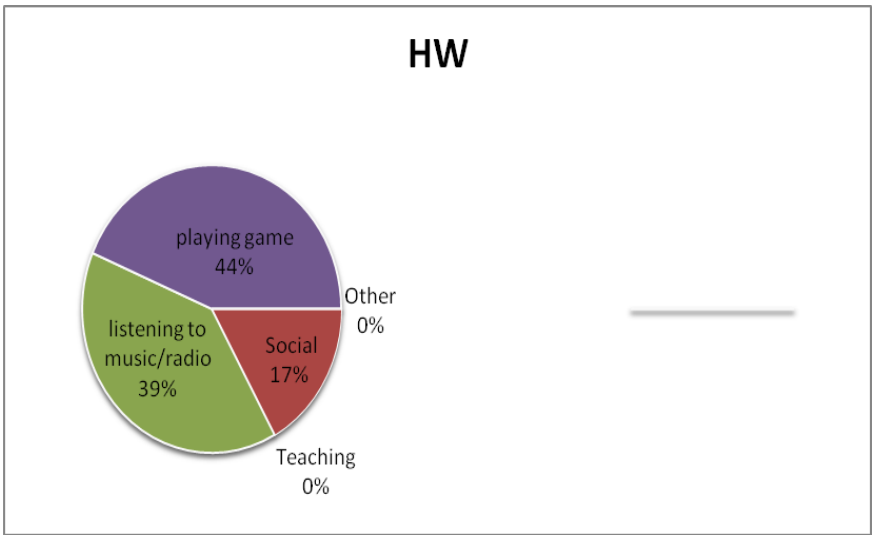


Figure 1: Stated use of Mobile phone by Health workers

The figure above showed that trainees used their mobile phones for playing game (44%), listening to music (39%) and social purposes (17%). This implies that apart from using the mobile for communicating with their social ties, trainees do have the passion to utilize their mobile or additional purposes which could support their knowledge and skill.

As the world is advancing in technology supported education, especially Africa's development is rising to a promising level. According to mHealth Ethiopia report by Vital Wave Consulting in 2011,the situation is highly promising as Ethiopia has, over six years, developed an unusual but extensive mixed-capability ICT infrastructure that provides a blended coverage of 85% of the country's population, with the potential to serve 90% of its population. This infrastructure is multivariate and uses CDMA, GSM (2G and 2.5G/GPRS) and fiber technologies – each stand-alone yet interoperable. Over 500 cities have been connected and every regional capital municipality has fiber connectivity with up to 2Mbps connectivity, according to officials at MCIT.

As indicated on Figure 2 below,trainers have also demonstrated confidence on the effectiveness of mLearning where seventy percent of them agreed on its effectiveness and the remaining remained undecided due to their thought on the variation of network coverage and availability of electricity in from village to village.

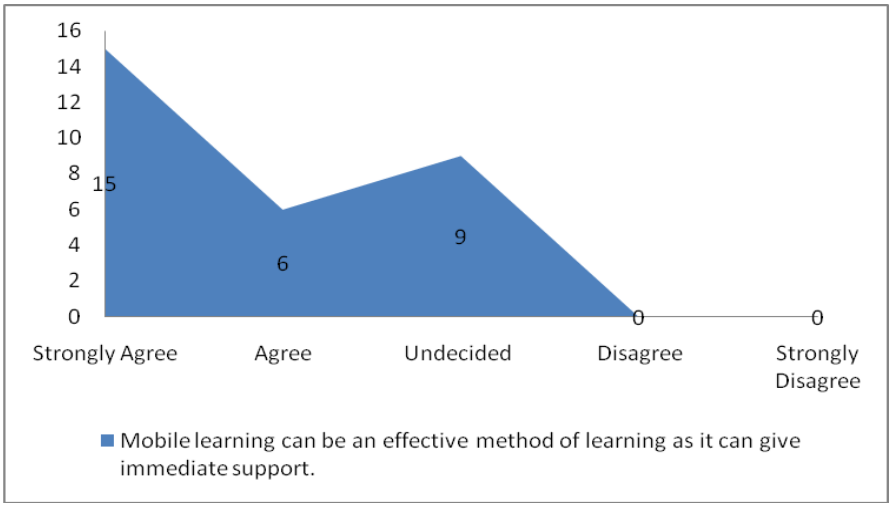


Figure 2: Trainers' view on Effectiveness of mLearning'

In addition, as depicted below on figure 3, more than ninety percent of the trainers included in the study indicated their agreement that mLearning will bring new opportunities of learning once it is introduced in their training institution.

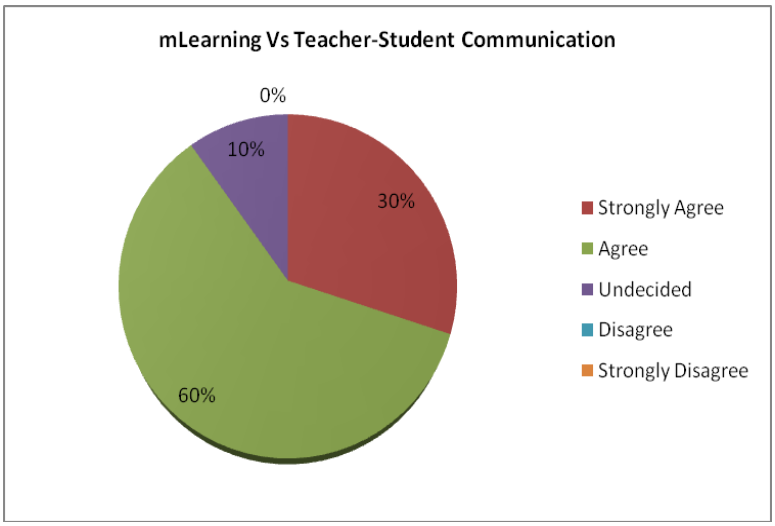


Figure 3: Students' Response to mLearning will improve communication between student and teacher

Cognizant of the potential role of mLearning, the Federal Ministry o Health Ethiopia has aligned mobile supported training and education as part of the national mHealth strategy. Regardless of this, this study revealed that sustainable implementation of mLearning initiatives for health workers in Ethiopia seems to be limited by the absence of equally strong government leadership and co-ordination in the area.

The explanation of policy makers included in this study mentioned the unquestionable importance of mLearning and stressed the problem associated with ensuring sustainability of such innovations due to the expensiveness of smart phones that are most preferable for mLearning.

4.4. Policy Framework for mLearning in Ethiopia

The respondent policy makers included in this study showed the commitment of the Ethiopian government, especially FMOH which is manifested through its various initiatives underway in collaboration with development partners and training institutions. In addition, the key informant from FMOH has issues mLearning roadmap and mHealth strategies that are currently being used as a policy guidance documents.

The key informants from FMOH has emphasized the need to widely utilize ehealth including mLearning to meet MDG 4 and 5 which, according to key informants can only be met through implementation of mHealth and related innovative, cost effective and rapid approach to attain the MDG goal by 2015. One key informant has also emphasized the great role mLearning could play for post MDG goals by equipping health workers with the up-to-date knowledge in the field.

Ethiopia has thus made progress in creating the conditions necessary to support a program of mHealth interventions in its health system (Vital Wave,2011).

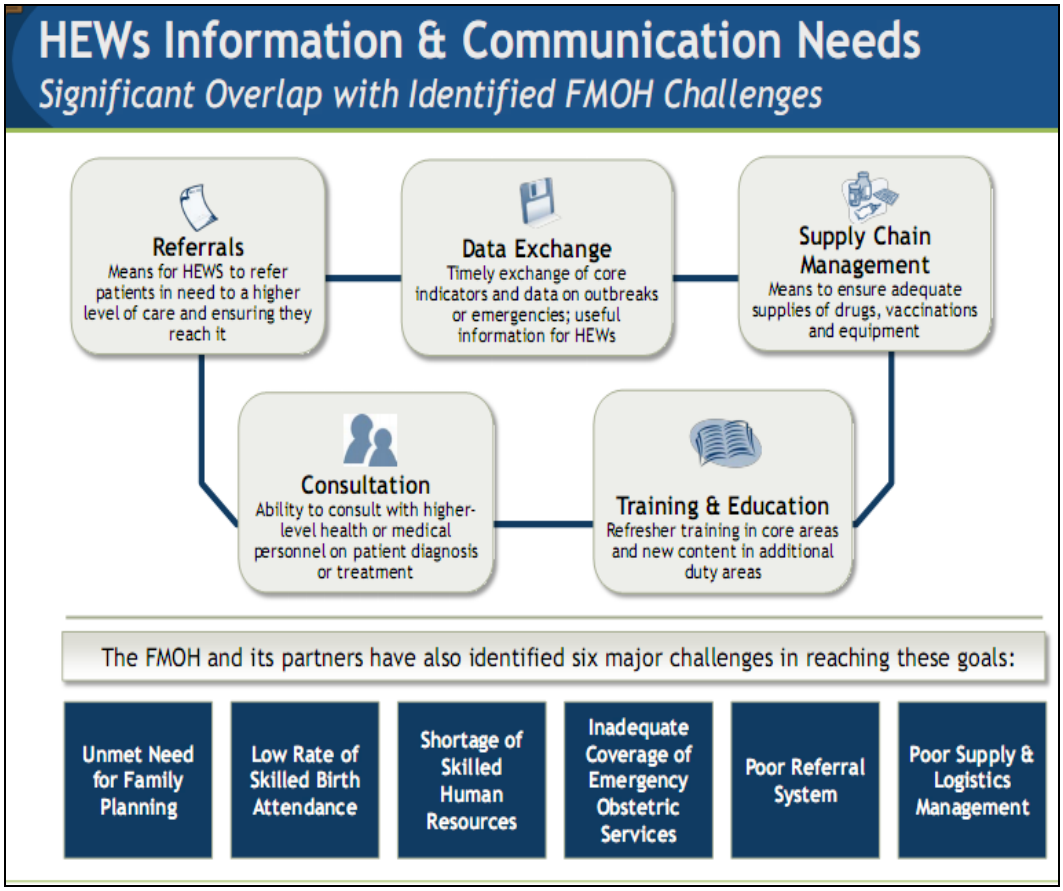


Figure 4: Health Extension Workers ICT Needs and Challenges

Source: National Framework for mHealth: Ethiopia, 2011.Page 8

As cited by the figure above, training and education in the form of refresher training and new content in additional areas is one of the information and communication needs identifies for HEWs through mobile devices.

4.5. Barriers and Drivers of mLearning

The response of trainers when asked about the possible barriers of mLearning in the current context, they indicated that the driver out ways the barriers. For instance, where as 54% disagree/strongly disagree about the unavailability of mobile phones among health worker/student as a barrier to mLearning, only

32% indicated their agreement with the statement and 14% remained undecided.

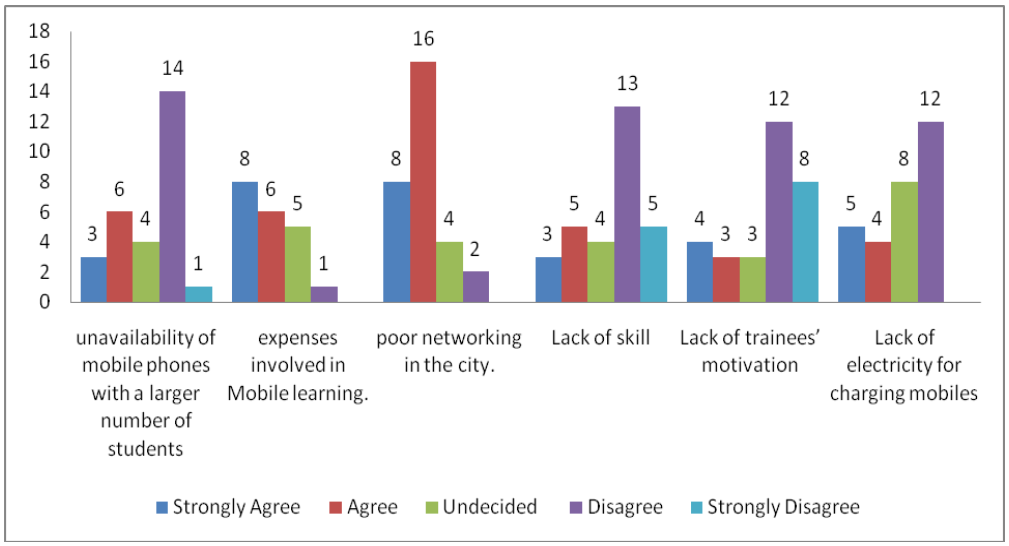


Figure 5: Trainers' View on Barriers to mLearning

The national framework for mHealth,Ethiopia (2011) indicates that among the barriers to implement the new mobile device supported education and training are shortage of human resources. Through this study it was evident that atleast two information technology experts are hired in the Health Science Colleges that can efficiently coordinate the application of mLearning for trainees while they are in the institute.

Trainees viewed mobile phone's short battery life and the size of the device as barriers that hinder achieving learning objectives in certain contexts.Esra's (2008) study on mLearning showed that mobile technologies can be easily used to subvert learning and engage in activities that distract from learning in both formal and informal settings. This is due to the devices' properties which enable engaging in various activities without being noticed.

Ethiopia continues to have one of the lowest rates of mobile phone ownership on the African continent, with only about 8% of the total population having a subscription, many living in urban areas. The state-owned Ethio Telecom is the sole telecommunications provider.

Researchers like Bonwell and Eison (1991), Taylor (1986) and Alexiou-Ray et al. (2003) showed that some students feel confusion, anxiety, tension and loss of confidence when they try something new. These feelings are also a result of the conflict between students' past educational experiences and the new practices which require a shift in their conception of what learning involves.

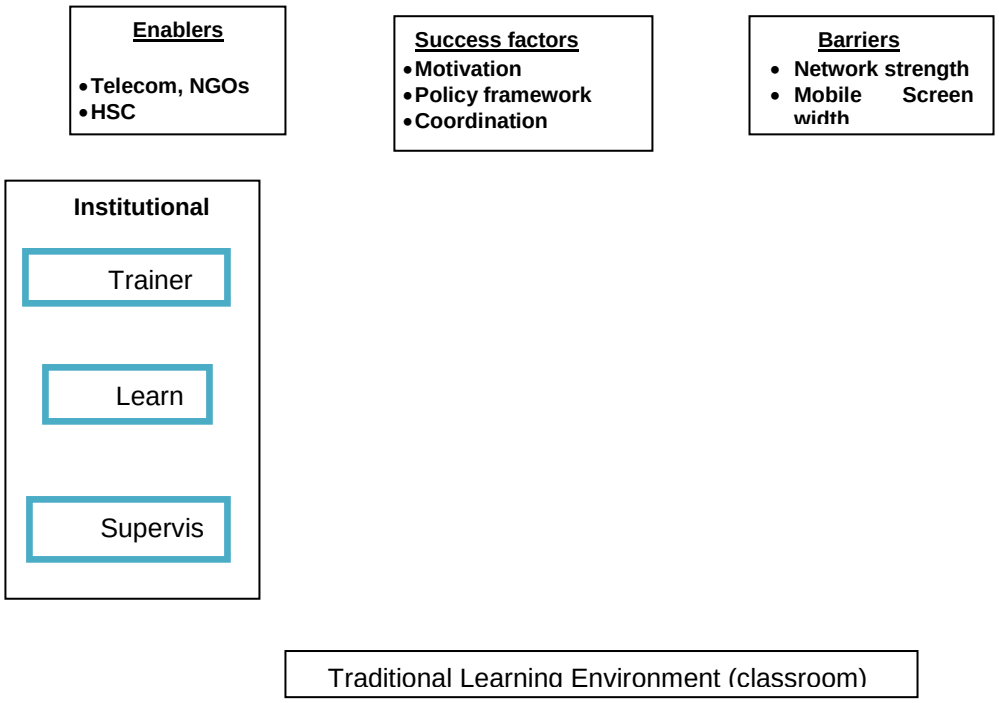
Through indepth interview, it was found out that there is a serious problem of brain drain from HSC institutions to Universities sector, and other government and private sectors that offer better remuneration and benefit packages. This is thought to be a barrier for the teaching-learning process in general and to mLearning in particular whereby six trainers have resigned in one Health Science College within the past 12 months.

Study participants have cited many driving factors for mLearning; among the major ones, infrastructure expansion, encouraging policy both at the federal as well as regional levels and motivation of participants comprise the biggest proportion.

4.6. mLearning Model for Health Science Colleges

The proposed theoretical model for m-learning adoption in a developing country emphasizes the importance of taking a systems view of all the elements that need to be in place in an m-learning environment, including the necessary stakeholders and key elements (communication infrastructure, mobile devices, learners and teachers),in order to ensure the effective adoption of wireless technologies in education (Andrea 2010).

Both health workers and trainers were asked various questions based on which a model that could help to adapt/develop mLearning model for the health workers training in Ethiopia taking all the drivers, barriers, enablers and success factors in to consideration. Thus, the researcher here with adapted the following model for mid-level health workers training:



Adapted from Andrea,2010

Figure 6: mLearning Model for Health Science Colleges

The proposed model demonstrates that the mobile devices can be used as a study tool, a communication means between trainers and learner, online assessment tool, providing course content and access to the Internet. The proposed model for HSCs could also enable peer learning by facilitating learner-to-learner communication.

The pressing need to improve the delivery of health services in order to better the health of the population and reduce the unacceptable prevailing morbidity and mortality rates is a public secret in Ethiopia. These rates are influenced by many factors, but among the basic ones, availability of skilled health worker is the building block. The flooding policy of FMOH that aims to train a large health work force has opted for the utilization of mLearning approach. Thus, implementing the policy at a wide scale is repeatedly suggested as a challenge by the study respondents from trainers and policy maker's category.

Eventhough the government policy aligns mLearning and mHealth as a training and educational approach for the training of health extension workers, and while the overwhelming majority of HEWs now own mobile phones and use them in the course of their duties, they complain of low mobile reception and an inability to charge their devices at their HPs. Interviews conducted during this study indicate that they typically spend 10-20% of their monthly income on airtime, 50% of which was used for work-related calls and messaging.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATIONS

This chapter concludes the study, and makes recommendations for practice and further research.The questionnaire, review of literature and indepth interview data produced conclusions based on analyzed and interpreted data.

5.1. Conclusion

Based on the findings of the study, the following conclusions were drawn. mLearning for health workers training is widely believed to have a great potential for the training of health workers in Ethiopia. This has been strongly reflected both from the health worker trainees and the trainers themselves. As the respective line ministry, FMOH is committed in such innovative ways of teaching delivery and towards its sustainability as well as replicability by providing policy guidance and strategic framework on mHealth.

In decreasing order, the researcher concludes that offline mLearning followed by text message and web based mLearning would work as a good match to deliver skill based effective training for mid- level health workers training in the Health Science Colleges as well as at a work place that could help as a cost effective means for continuous professional development of health workers.

5.2. Recommendations

The researcher would like to provide the following recommendations based on the findings of the study. These recommendations are a response to the challenges raised and are based on analysis and interpretation of indepth interview and responses from the questionnaire

- Mobile Learning has to be an integral component of the five years Health Sector Development Program. Right at this point in time, the country is in mid- term of the five years HSDP that will soon be followed by mid-term evaluation of the program achievements and progress made so far.Thus, it is high time that the government with its line Ministry especially Ministry of Health and Ministry of Education shall incorporate mLearning as an explicitly strategy to especially ensure the quality of health education by supplementing the face-to-face classroom traditional teaching which currently is back stacked by a number of challenges one of which is characterized by un proportionate teacher-student ratio in the Health Science Colleges.

- The infrastructure of Ethiopia, especially telecommunications need to be upgraded and contextualized to meet the increasing need for mLearning. Some of this upgrading and contextualization recommended by the researcher are: the recently booming mobile assembly industry in Ethiopia shall be oriented to produce mobile phones that could possibly support mLearning by considering the screen size, battery duration, solar charger production, good memory card capacity, data storage etc. As a

public institution, Ethio Telecom shall also have community service strategy which is inclusive of a ‘no-cost’ mobile browsing policy for health workers and other students in higher education institutions.

- Government commitment is important for creating an environment conducive to the innovation, development and effective implementation of mLearning. Instead of advocating intractable about the sustainability of such innovations, the government shall establish its own framework to ensure the sustainability of mLearning. This could best be ensured by coordinating the effort of NGOs and telecommunications providers to have a common goal and understand how a partnership between them could contribute significantly to the health of the people of rural Ethiopia by improving the knowledge and skill of health workers and in the meantime creating a CPD mechanism.

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APPENDICES

Appendix 1: Consent Letter

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INSTITUTE OF EDUCATIONAL
RESEARCH
ADDIS ABABA UNIVERSITY

Tele: 00(251)011/239654

Fax: 0111 239654/0111239714

Date: May 31 2013

Ref.#: IER/ 374/03

TO WHOM IT MAY CONCERN

Mr./Mrs. Tedla Mulatu Temesgen ID.No. 0275/03
is a postgraduate student at the Institute of Educational Research. He/she is writing a thesis paper for a course entitled The Potential Role of Integrated for the Training of Health Workers and wants to make use of your organization as a resource of information.

This is, therefore, to kindly request your office to give for the student the necessary support

Thank you.

Derebssa Dufera (Professor)
Director, Institute of Educational Research

Appendix 2: Questionnaire for Policy Makers

ADDIS ABABA UNIVERSITY

INSTITUTE OF EDUCATIONAL RESEARCH

QUESTIONNAIRE FOR POLICY MAKERS

GENERAL DIRECTIONS:

Dear Respondent,

This questionnaire is designed to undertake a study on the potential role of mLearning for health workers training in Ethiopia. The information that you provide will help us to give better understanding about the role, barrier and drivers of mLearning in order to adapt a relevant model for health science colleges on mLearning. We would greatly appreciate if you would respond to the questions sincerely and honestly. Your responses and information will be kept strictly confidential and only used for the study purpose.Please put a tick mark '✓' in the pace provided or circle the appropriate item that corresponds to the responses you select. When you are asked to provide information, please write your responses in the space provided. You do not have to write your name in any part of the questionnaire.

Thank you very much for your cooperation.

1. Gender

☐ Male ☐ Female

2. Age

☐ Below 20 years ☐ 40 - 49 years

☐ 20 - 29 years ☐ 50 & above

☐ 30 - 39 years

3. Marital status

☐ Single ☐ Married ☐ Divorced ☐ Separated

4. What qualifications do you have?

a. Degree level qualification b. Masters
c. PhD d. Post graduate level
e.Teaching Certificate f.Other (please specify)_____

5. Work Position_____

6. How long have you been involved in health workers training program?
    b. 0 - 3 years
    c. 3 - 5 years
    d. 5 - 10 years
    e. 10 + years
7. Is the Ethiopian government supporting the use of mobile phones in health workers training?

☐ Yes, through initiatives by institutions and engaged individuals
☐ Yes, through specific projects or programmes with dedicated public funding
☐ Yes, through specific projects or programmes with dedicated private funding
☐ Yes, through government initiatives including specific measures and incentives
☐ Yes, otherwise. Please specify
☐ No, not really
☐ Do not know

8. Who are the main stakeholders involved in the use or prevention of the use of mobile phones
in education in your area?

Stakeholder	Use	Prevention of use	Not applicable
The government			
Regional educational authorities			
Local educational authorities			
Telecom providers			
Mobile phone makers			
Teachers			
Students			
Parents			
Education specialists			
Other (please specify)			

9. With reference to use of mobile phones, what would you consider to be the main:

    Driver(/facilitating factors):

    Enablers:

    Barriers:

    Success factors:

10. Is there reference to the use of mobile phones in education in any government or state/regional educational strategy, educational technology plan or similar documents?

No:

Yes. Please specify the title of the document and the page reference:

Title of Policy document 1:

Title of Policy document 2:

Title of Policy document 3:

11. Does the Ministry of Education (or another public agency from the education sector or a different area of government) have a clear strategy or policy regarding the use of mobile phones in education?

- ☐ Yes, in operation
- ☐ Yes, in development
- ☐ Not yet, but under discussion
- ☐ No, with no preparations yet
- ☐ No, we do not anticipate this in the future
- ☐ Don't know

12. Please identify and describe any government-level policies or sample policies disseminated to the local governments or schools regarding the use of mobile phones.

_____
_____
_____
_____
_____

13. Why is learning with mobile phones a consideration or an option in your country? And, if learning with mobile phones is not actively encouraged – if it is not an option – why not?

_____
_____
_____
_____

14. Do you have any additional comments?

_____
_____
_____
_____

Appendix 3: Questionnaire for Trainers

ADDIS ABABA UNIVERSITY

INSTITUTE OF EDUCATIONAL RESEARCH

QUESTIONNAIRE FOR HEALTH WORKER TRAINERS

GENERAL DIRECTIONS:

Dear Respondent,

This questionnaire is designed to undertake a study on the potential role of mLearning for health workers training in Ethiopia. The information that you provide will help us to give better understanding about the role, barrier and drivers of mLearning in order to adapt a relevant model for Health Science Colleges on mLearning. We would greatly appreciate if you would respond to the questions sincerely and honestly. Your responses and information will be kept strictly confidential and only used for the study purpose. Please put a tick mark '✓' in the pace provided or circle the appropriate item that corresponds to the responses you select. When you are asked to provide information, please write your responses in the space provided. You do not have to write your name in any part of the questionnaire.

Thank you very much for your cooperation.

PART I. BACKGROUND INFORMATION

1. Gender

☐ Male ☐ Female

b. Age

☐ Below 20 years

☐ 20 - 29 years ☐ 40 - 49 years

☐ 30 - 39 years ☐ 50 & above

3. Marital status

☐ Single ☐ Married ☐ Divorced ☐ Separated

4. What qualifications do you have?

a. Degree level qualification ☐ b. Masters
c. PhD d. Post graduate level teaching
e. Teaching Certificate f. Others (please specify)_____

5. How long have you been involved in health workers teaching?
   a. 0 - 3 years ☐ c. 5 - 10 years ☐
   b. 3 - 5 years ☐ d. 10 + years ☐

6. Which of these devices do you own?
   a. Nokia ☐
   b. Samsung ☐
   c. Android ☐
   d. Smartphone ☐
   e. None of them ☐
   f. Others (specify)_____

PART II. THE ROLE OF MLEARNING

7. Which of the following definition represents your understanding of Learning?
   a. The approach of learning while in a mobile situation
   b. Utilization of mobile technology for teaching-learning
   c. If any_____

8. Do you think mobile learning will play an important role in the future of health workers training?
   a. Yes
   b. No

9. For what purpose do you mostly use Mobile Technology?
   a. Social c. playing game
   b. Teaching d.listening to music/radio
   e. Browsing the internet f. If Others (Specify)_____

10. Are you aware that Mobile Technologies are widely used in training institutions?
   a. Yes
   b. No

11. Do you think Ethiopian health worker training institutions should increase the funding for the use of Mobile phones for teaching?
   a. Yes

b. No

12. Having seen the technological advancement in the past few decades, would you like to have the opportunity to experience mLearning?
    a. Yes
    b. No

13. If mobile learning is to be accepted as a valid form of training provision, can the health learning objectives can be met by mobile learning?
    a. *Yes*
    b. No
14. If the reply to the above questions is yes, which learning objectives (key skill areas?)Pleaseexplain_____
    _____
    _____
15. If your reply to #13 is 'No', what are the barriers? Please explain?_____
    _____
16. Which category of health workers do you think are the most feasible category to be trained via mlearning?

    a. Health extension Workers
    b. Midwives
    c. Clinical Nurses
    d. Public Nurses
    e. Others(specify)_____

17. How will mobile learning will play an important role in the future of health workers training?
    a. Through text message
    b. connecting to the internet
    c. By watching learning audio-visuals loaded on the mobile
    d. Any other_____
    e. It doesn't help at all

PART III. BARRIES AND DRIVERS OF MLEARNING

Please put a tick mark '✓' in the box that corresponds your answer

SN	Details	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
18	Mobile learning can be an effective method of learning as it can give immediate support.					
19	Mobile learning will bring new opportunities of learning					
20	Mobile learning will be more flexible method of learning as it can be done anytime, anywhere.					
21	Mobile learning will improve communication between student and teacher.					
22	Mobile learning is a quicker method of getting feed back in teaching.					
23	Mobile learning cannot be used for learning due to:					
23.1	unavailability of mobile phones with a larger number of students					
23.2.	expenses involved in Mobile learning.					
23.3.	poor networking in the city.					
23.4.	Lack of skill					
23.5.	Lack of trainees' motivation					
23.5.	Lack of electricity for charging mobiles					

Appendix 4: Questionnaire for Health Workers

ADDIS ABABA UNIVERSITY

INSTITUTE OF EDUCATIONAL RESEARCH

QUESTIONNAIRE FOR HEALTH WORKERS

GENERAL DIRECTIONS:

Dear Respondent,

This questionnaire is designed to undertake a study on the potential role of mlearning for health workers training in Ethiopia. The information that you provide will help us to give better understanding about the role, barrier and drivers of mLearning in order to adapt a relevant model for health science colleges on mLearning. We would greatly appreciate if you would respond to the questions sincerely and honestly. Your responses and information will be kept strictly confidential and only used for the study purpose. Please put a tick mark '✓' in the pace provided or circle the appropriate item that corresponds to the responses you select. When you are asked to provide information, please write your responses in the space provided. You do not have to write your name in any part of the questionnaire.

Thank you very much for your cooperation.

PART I. BACKGROUND INFORMATION

Please tick (/) or circle the appropriate response.

1. Gender

☐ Male ☐ Female

2. Age

☐ 20 - 29 years ☐ 40 - 49 years

☐ 30 - 39 years ☐ 50 & above

3. Marital status

☐ Single ☐ Married ☐ Divorced ☐ Separated

4. What qualifications do you have?

a. Certificate b. Diploma

b. Degree level qualification d. Masters

f. Other (please specify)_____

18. How long have you been working as health worker?

a. 0 - 3 years c. 5 - 10 years

b. 3 - 5 years d. 10 + years

19. Which of these mobile phone do you own?

a. Nokia

b. Samsung

c. Tecno

d. Android

e. Smartphone

f. Other (specify)_____

PART II. THE ROLE OF MLEARNING

20. Do you own a mobile device that can be connected to internet?

a. Yes
b. No

21. If you answered “Yes” to #8, how often do you use your device to access internet?

a. Daily
b. 2-3 times per week
c. Once per week
d. Every few weeks
e. Monthly or less
f. I do not use my device to access web content

9. Do you have a mobile phone that can accept memory card?

a. yes
b. No

10. Which of the following definition represents your understanding of mlearning?

a. The approach of learning while in a mobile situation
b. Utilization of mobile technology for teaching-learning
c. If any_____

12. How will mobile learning will play an important role in the future of health workers training?

a. Through text message

b. connecting to the internet
c. By watching learning audio-visuals loaded on the mobile
d. Any other_____
e. It doesn't help at all

13. For what purpose do you mostly use your mobile phone?
    a. calling relatives and colleagues b. browsing the internet
    d. Game d. watching movie
    e. All f. If Other(specify)_____

14. Which category of health workers do you think are the most feasible category to be trained via mlearning?

    a. Health extension Workers b. Midwives
    c. Clinical Nurses d.Public nurses
    e. Others(specify)

PART III. <u>BARRIES AND DRIVERS OF MLEARNING</u>

Please tick (✓) or circle the appropriate response

SN	Details	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
18	Mobile learning can be an effective method of learning as it can give immediate support.					
19	Mobile learning will bring new opportunities of learning					
20	Mobile learning will be more flexible method of learning as it can be done anytime, anywhere.					
21	Mobile learning will improve communication between student and teacher.					
22	Mobile learning is a quicker method of getting feed back in teaching.					
23	Mobile learning cannot be used for learning due to:					
23.1	unavailability of mobile phones with a larger number of students					
23.2	expenses involved in Mobile learning.					
23.3	poor networking in the city					
23.4	Lack of skill					
23.5	Lack of trainees' motivation					
23.5	Lack of electricity for charging					

Thank you for your cooperation.

DECLARATION

I hereby certify that I am the sole author of this thesis and that no part of this thesis has been published or submitted for publication.

I certify that, to the best of my knowledge, my thesis does not infringe upon anyone's copyright nor violate any proprietary rights and that any ideas, techniques, quotations, or any other material from the work of other people included in my thesis, published or otherwise, are fully acknowledged in accordance with the standard referencing practices.

Declared by:

Name: _____

Signature: _____

Date: _____