

Mobile Learning: Concepts and Applicability

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Introduction

Information and communication technology (ICT) in education has taken the world by storm facilitating learning to occur anywhere and at any time. Mobile learning (mL) has evolved as complementary to e-Learning (eL), rapidly becoming a viable option, revolutionizing distance and distributed learning.

The definition of mL has evolved over the last two decades depending on the purpose, context, technology and content for transfer of information, knowledge and skills. There is much discussion as to whether there is a difference between eL and mL or if the latter is an extension of the former in a different presentation. Clearly, acquisition of knowledge and skills by using mobile devices is central to the learning process. Peters, K., (2007) felt that mL is a subset of eL which transforms learning to an 'educational process that can be rendered just in time, just enough and just for me'. The elements of mobility are valuable to the learner and the educator or instructor in the transformation process involved in mL.

The earlier definition of mL was largely focused on technology i.e. transmitting information or contents that was designed for eL through mobile devices. This definition by MoLoNET (2007) best fits the technology-oriented definition i.e. teaching and learning that is enabled with the assistance of mobile communications which included mobile phones, smart phones, digital audio players, digital cameras, and various handheld devices using wireless. Crompton, H., (2013) defines mL as 'learning across multiple contexts, through social and content interactions, using personal electronic devices' while Crescente, M. L., & Lee, Doris., (2011) appear to develop a seamless approach merging mL as a form

of distance education highlighting three elements i.e. use of mobile devices, educational technology and time convenience. Some expressed views appear from these definitions viz, social interaction and individualism. Kadirire, J., (2009) concurs with the views of Crescente, M. L. et al (2011) that mL is an extension of eL which can take place anywhere and anytime with the help of mobile devices. This techno-centric perspective in regard to 'mobility' refers to mL being 'restricted to small and portable devices' unlike the desktop computer. The size of screens and portability will become vital factors in mL as to its usability and user experience.

Historical Perspectives

While mobile devices are extensively used in social, education, health and defence fields, initial prototypes of mobile devices intended for education were attempts to expose children to the digital age in the 1970s. Due to a lack of technical support this project did not progress till the development of the smart phone in 1994 by Mitsubishi Electric Corp. Current focus of mL is on three aspects i.e. technologically enabling devices that are small enough to be carried around as the smart phone and iPad etc, educational nuggets that can be learned outside the formal classroom setting and mobility of the learner whether it be synchronous or asynchronous learning.

The developed countries exploited the potential of mL through funded projects. Of note are two Leonardo da Vinci Projects focusing on the evolution of eL to mL, the IST project MOBILearn by the UK Learning and Skills Development Agency and a similar project in Genoa, Italy (Cochrane, T., 2013)

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Mobile learning evolved rapidly with technological advances and the development of portable, small and lightweight palm sized devices which have huge memories for installation of programs required for learning. Basically, they have two basic technological capabilities i.e. the device itself and a mobile operating system. Together with the latter, current devices which come in various forms viz, smartphones, palmtops, personal digital assistants (PDA), tablet PCs, laptop computers and personal media players, use several operating systems, the more common ones being Apple's IOS, Microsoft Windows, Google's Android and Nokia's Symbian OS (MoLeNET., 2007) .

Characteristics of Mobile Learning

In order to distinguish mL from eL and conventional learning, specific characteristics of mL are made in the review by Taxler, J., (2009). The core elements relate to the individual's characteristic persona and his/her willingness to learn. This often includes preparedness and individualization of learning. For eL to be effective it has to be personalized, interactive, media-rich, structured and usable to massive learning. Drawn from this model, some unique features in mL are that it should fit the learner's spontaneous needs anytime and anyplace. Apart from attention to courseware and contextual factors in design and development of programs, bandwidth and connectivity are determining elements for effective implementation.

Expanding on these three core factors i.e. (i) individual learning needs (ii) technical issues of connectivity and device characteristics and (iii) courseware and contents that add to the advantages of mL, challenges that we face with mL need to be addressed.

The concept of flexible learning is applicable to mL and it is possible to render education to a large number of students who may learn individually and collaboratively depending on the situation. Situated learning is a theory that supports the idea that learning is unintentional and situated 'within an authentic activity, context and culture' (Lave, J., & Wenger, E.,1990). The environment of learning in mL is ideal for the learner as learning occurs in a safe site which does not have the factors encountered in F2F learning or eL where tasks are teacher-led and controlled (for example when a learning management system is employed.)

Context awareness is defined by Wikipedia, as 'the ability of a system or system component to gather information about its environment at any given time and adapt behaviours accordingly'. In order to guide responses, context-aware computing uses pre-designed software and hardware to gather such information for analysis and decision making. Context awareness is unique to mobile devices since its inception and is applied to various situations of learning including as a collaborative means of working with peers in the 1990s.

Contents for learning in mL will differ to some extent if the concepts of mL are applied. Bite sized information are delivered in mL based on the learning theories as applied to mL. Learning is situated and also informal, for a greater part, with micro-learning becoming an important component.

In determining the contents of mL, reference is made to the broader principles of content-ware and content development for eL and then differentiate what is applicable to mL. Of great importance in mL is 'bite pieces' and 'learner engagement'. Training or learning utilizing a digital device like the smart phone will take

into consideration the learning objectives and this needs to be aligned to the goals of the institution or organization –what are the expected results the organization wants, what is desired of the learner (outcome) and what are the objectives as to tasks and substance that are to be transferred? The instructions need to be designed to support the learner. A rather simplistic definition of ‘e-content’ in the Oxford Dictionary is ‘digital text and images designed to be displayed on web pages’.

In discussing e-Content and learning objects as applicable to mL, it is appropriate to explore further the term ‘providing learning in bite pieces’. Certainly, at the current stage one is clear that content delivery for mL is not about breaking the contents of what is taught in eL into small parts for delivery through mobile devices. In designing contents for mL, we take cognizance of a major difference from eL. In eL, the course content is designed for a longer time duration with the learner often at the desktop computer for much longer hours than when mobile devices are used for learning. In mL the untethered approach of learning anywhere and at any time requires learning modules to be much shorter in duration, often learning objects are delivered in small learning nuggets; which can be learned while in the office or when the learner has some time to spend as commuting in a train or at the job site. An emerging theme that suits mL with regards to content development in meeting learning objectives is micro-learning.

Micro-Learning as a novel application in Mobile Learning

Micro-learning is diverse in its presentation and can vary from SMS texts to much more elaborate contents that is now employed in fields like medicine, industry

and defence. Micro-learning is not a new concept neither is it a ‘one dose solution’. It may not be suitable for every situation but fulfils most core characteristics of mL. The benefits of micro-learning are that it has value and available on demand, targeted and concise and permits the learner to get in and out of the learning process with ease. Being a flexible and personal learning method, it is applicable for mL to foster information, learning and training.

Numerous types of micro-learning are available and appear to be appropriate choices in content development for mL. Animations, GIFs, infographics, simulations, curated resources, concept process maps, videos, digital media and blogs can be portals of learning. With regards to curated resources, with reference to medical practice, often doctors refer to practice guidelines for management of chronic disease and acute sicknesses. Such approaches rest on current evidence and up-to date treatment options. Infographics for use of algorithms for managing clinical diseases are extremely useful in medical teaching and to novice practitioners.

While the applicability of micro-learning is real, we should not lose sight of the core characteristics of the mobile learner, the focus is on the learner and not the device alone.

Micro-learning contents may be employed for mL but is not mL. It is way of teaching contents in a crystallized focused way where information is prescribed in small and specific nuggets of learning. The short format that is delivered appeals to mobile learners and may be capitalized in the design of contents for mL. Attention span required for micro-learning is short and learners can work in their own time and comfort zones

making micro-learning a means of effective learning for those on the move. Marrying micro-learning to mL is a plausible and workable concept (Levoy, Paul., 2016).

Making Mobile Learning Effective

For effective mL, technical issues of connectivity and device characteristics are vital factors that need consideration. Accessibility, immediacy, interactivity, and permanency need to be factored in. Immediacy relates to retrieval of information immediately and any downtime in downloading can impact on mL. As indicated above, social inter-activity is possible and encouraged as collaborative and peer to peer learning enhances learning. Permanency is relevant to mL as information can be accessed as and when it is required unless the learner chooses to delete it. Devices have archiving facilities for learners to access as when such information is needed.

Clearly courseware for mL needs to orient to the learner on the move and differs from eL. There is a need to re-engineer learning with emphasis on learning small concise and focused subjects with the core characteristic discussed above. This makes mL ubiquitous in its own right and can be distinguished from eL.

Potential challenges in implementing mobile learning

Distance learning and mL are intertwined, and two concepts are highlighted by Stead, G., (2006) i.e. safe learning and disruptive learning. The former emphasizes the context of learning relevant to distance learner as being remote from the instructor but with technology, is no longer a barrier to learning. Disruptive learning is pertinent to distance learning and mobile learning as the learner takes control of his learning and promotes active

learning and purposive learning with the instructor playing a passive yet essential role as collaborator, instructional designer, subject material expert and developer (Alexander, B., 2004).

Though the advantages of mL are complementary to conventional learning and perceived as a subset of eL has been presented, arguably this perception must be seen as a dynamic one as technology advances in networks of communication, software development and device specifications will impact this transformation in education. The 'wired learner' of today will require a diverse set of learning methods to suit his characteristic persona and learning styles. Gobind Singh Gure (2016) addresses the issues of barriers or better put, challenges to mobile learning under three main categories though there is considerable overlap in his presentation i.e. (i) physical attributes of mobile devices, (ii) technological attributes and (iii) social and educational challenges.

The physical attributes largely relate to what most mobile phone and similar devices face i.e. small screen size, limited computational capabilities and limited battery life of mobile devices, apart from accessibility to reliable and sustained connections to wireless especially when learning is on-line.

When we discuss distance learning we need to be cognizant of types of mobile devices available to the learner. When courseware contains much rich graphical and interactive features, mobile devices used for learning must be able to support the reception and downloading of such learning contents apart. Battery life will always be an impediment to learning should there be an issue of access to electricity.

Technological attributes are numerous in using mL through distributive and distance learning. Portability of devices are not big issues currently, but connectivity will always pose problems in distance learning.

Social and educational challenges have been alluded to above under the subject of courseware development and technological issues. What surfaces as a challenge is how mobile software and mobile apps relate to the socio-psychological and pedagogic factors that will impact on learning in these situations.

One vital link in establishing mL as a means of education is the buy-in by teachers and administrators. Program designers and educationists need to see the value in mL as an effective and efficient means of learning. Society as a whole will also need to be convinced of the value of mL in comparison to face to face (F2F) learning and eL

The availability of information on mobile devices as in other social networks that employ computing and now, cloud computing will always pose security threats and abuse of information. Teachers and information providers will need to address this issue when both mL and distance learning are employed as portals of learning and knowledge transfer.

The use of curated learning contents and instructional materials of all sorts, when made available for purposes of teaching on computers also will need to address copyright issues. Applicable to children (and also adults) is the issue of social chatting on mobile devices and use of such devices for playing games when they have access and self-control of mobile devices. Parental control and tracking of use of mobile devices are possible but have limitations.

Mobile learning as means of education for all

The transition from traditional classroom F2F teacher-led learning through distance learning with online (e-Learning) to mobile learning has seen the values for each mode of learning and the impact technology has had on learning. The UNESCO driven Education for ALL 2020 has several strategies for making education accessible to all including the vulnerable, geographically located remote and disadvantaged populations without gender or race discrimination. Learning outcomes relate to what learners should achieve at the end of the interactions involved through various interfaces presented to the student. As stated in the UNESCO Education for ALL 2020, mobile learning is one mode of learning which may meet the intended strategies but there is a need for more data to support this approach.

The definition of mobile learning is evolving and should not be another mode of delivery of all online learning materials or objects as one has to address particularities of mobile learning. Sharples, M., Taylor, J., Vavoula, G. (2007) highlighted the need for more research in determining the impact mobile learning projects will have due to two issues i.e. unexpected interactions and unplanned events.

Usability and user experience developed by Nielsen, J., & Molich, R. (1990) relates to user interface and would be appropriate to apply in utilization of mobile apps for learning. Making reference to the heuristics adopted by Neilson, J., (1990), it is timely to use most of the 10 steps to illustrate the 'user experience' in mL.

Mobile Pedagogies: Collaboration, Personalization and Authenticity

Planning for mL though mobile device use does not only rely on learning outcomes and learning objects but need to stimulate change and improve uptake. Vital changes are not confined to technology usage alone, but changes made suitable for mobile learning which include pedagogic assessment and technology in distance learning. Personalization of learning takes into account the audience and their needs so as to be fulfilling and successful. Connectedness between stakeholders and peer-learning are encouraged, so a myriad of strategies needs to be in place unlike conventional classroom teaching. A new paradigm should emerge using the internet and mobile devices so as deliver the curriculum which is appealing to creative self-directed learners (Bjerede, M., & Dede, C., 2011).

Luarillard, D., (2012) states the need for new designs and ways of learning and also how the educational materials should be expanded in developing fluency in using emerging interactive media and including collaborative inquiry-based learning so as to meet the mobile learners needs and wants. Teachers need to be trained in developing appropriate resources like video development, mobile apps and using social networks and Twitter to improve instructional learning materials.

Conclusion

Mobile devices have become the '21st century toy capitalised to be an enabling tool for Education for All thrust by UNESCO. The transition from e-L to mL with mobile devices and wireless communication is now transforming learning with innovations and context ware using wearable sensors and wireless. e-L and Learning Management Systems are now enabling knowledge and

skills transfer, enabling learning contents to be delivered through mobile devices though more research in this area is needed in determining its impact on learning outcomes. Some concerns have been expressed limiting the widespread use of mobile learning. Some of these are due to issue of contextuality and authenticity of course-ware that can be delivered through devices. Many are due to a lack of buy-in and knowledge of the potential of mobile learning among educators and instructional designers. There are concerns that mobile features may be limited and may not allow interaction between users and interfaces. Application of the heuristics of usability and user experience may overcome these issues. Interactivity and offline modes are slowly emerging to ensure use of mobile apps.

Cognitive neuroscience supports the notion that interactions are key to the learning process and so learning theories will play a major role in making learning contents align to learning styles to achieve learning outcomes. The social network can work for or against the use of mL and hence the need for control of the use of mobile devices by the young and inexperienced learner. mL has a greater role to meet the educational and work needs of many. The marginalized population, gender discriminated population and physically challenged people can use mL as a means of acquiring knowledge and skills with provision of appropriate training and devices apart from access to wireless.

In conclusion the potential of mL incorporates pedagogy and technology in content delivery in selected learners. Clearly much needs to be done in enabling learning apart from technology and its ability to reach out to learners. The particularities of devices need to appeal to the learner and user experience is essential for successful implementation.

Key words: Mobile learning, e-Learning, microlearning, technology, pedagogy

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