The Eurasia Proceedings of
Educational & Social Sciences (EPESS)
ISSN: 2587-1730

The Eurasia Proceedings of Educational & Social Sciences (EPESS), 2016

Volume 4, Pages 1-7

ICEMST 2016: International Conference on Education in Mathematics, Science & Technology

DESIGN ENGAGING MOBILE LEARNING FOR THE GLOBAL AUDIENCE

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ABSTRACT: As technology becomes more portable and mobile learning (mLearning) is adopted more widely, the development of supporting pedagogies and instructional design for this educational delivery method is essential. To these ends, this paper presents an overview of the current state of the art and argues the case for a new and comprehensive model for designing mobile learning materials; The Location, Technology, Culture, and Satisfaction model (LTCS) that we contend overcomes problems that are inherent in earlier models, notably the lack of multi-cultural support for mLearning program designers. In doing this we hope that instructional designers can use the methods derived from this model to synthesize the work of several disciplines into a heuristic model of design that will maximize the teaching capabilities of mLearning and, perhaps trigger some discussion on this rapidly developing area of education.

Key words: Mobile Learning, Instructional Design, Learning and Design Models, cultural diversity

INTRODUCTION

Mobile learning, also known as mLearning or m-Learning, refers to anytime anywhere learning supported by a variety of technologies, including but not limited to mobile devices (Shen, Wang, Gao, Novak, & Tang, 2009; Wang & Shen, 2011). Started mainly as informal and fragmented way to learn, mobile learning has been used in formal settings and is gradually entering the mainstream education, from both K-12 to higher education (Wang, Barone, Simpson, & Leister, 2011; Xiao, Wang, & Li, 2001). Our definition for mLearning focused on the mobility of learners. Researching mLearning from the mobile learner's perspective requires studying: "…how the mobility of learners augmented by personal and public technologies can contribute to the process of gaining new knowledge, skills, and experiences" (Sharples, Sánchez, Milrad, & Vavoula, 2009, p.3). There has been a handful of research on mLearning, from pedagogies to message design, but there is still a lack of research about principles for systematic mLearning design. In particular, guidelines are needed for designing mLearning systems or software and technologies used in supporting college or university classrooms. In addition, mLearning tends to target learners around the world. There is a need to address how to better design learning materials to cater the needs of mobile learners with diverse cultural backgrounds.

By synthesizing previous research and current developments in mLearning, we have created a comprehensive model for designing mLearning materials and activities. Specific recommendations can be derived from this model, on how to design effective mobile teaching and learning, such as: 1) design for different mobile devices, 2) design for learner mobility, 3) design for interactivity, and 4) design for knowledge construction and sharing. In addition, we discuss cultural considerations in mLearning design as well. The goal of this position paper is to

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- Selection and peer-review under responsibility of the Organizing Committee of the conference

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provide an overview of principles and processes of instructional design for mLearning, including materials, devices, and methods.

MOBILE LEARNING MODELS

Shih's Mobile Learning Model

The design model we proposed in this paper builds on Shih's Mobile Learning Model. Thus, we now describe aspects of this model that are necessary to understand our contributions. In this respect an important comment from Shih and Mills (2007) is "While implementing mLearning, it is necessary to consider ... the following aspects of new mobile technologies: a) new learning opportunities; b) potential influence on changing individual's learning styles; c) potential influence on social interaction; and d) how the mobile technology itself will be changed or enhanced" (p.1). In addition, two essential elements that instructional designers should always consider are: how individuals learn and how learning tasks take place.

Following the above criteria, Shih and Mills (2007) created a mLearning model (see Figure 1), which was a variation of Keller's ARCS (Attention, Relevance, Confidence, and Satisfaction) motivational model (Keller, 1983). This model was created to support instructional design for mLearning. It builds on social constructivism and advocates learning methods, such as peer interaction, collaborative discussion, and digital story telling.

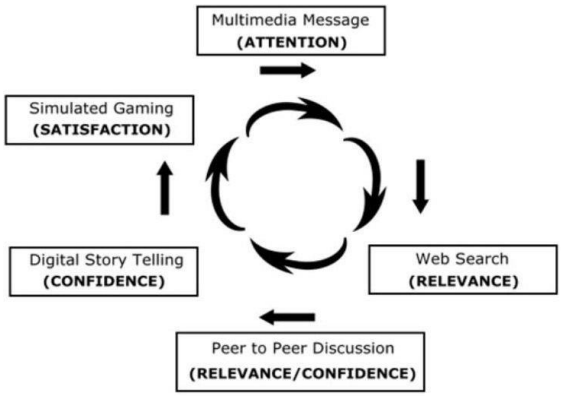

Figure 1. Shih's Mobile Learning Model

The learning cycle in Figure 1 includes activities such as: sending a multimedia message, searching on the web, peer discussion supported by mobile technologies, producing a digital story, and applying learning in a simulated environment. Digital stories have been shown to be especially useful beyond formal learning environments, such as for self-understanding of medical and lifestyle choices (Pavel 2013). Shih's Mobile Learning Model provides a useful contribution to the field of instructional design and mLearning. In particular it serves the purpose of engaging online learners and thus aims to enhance online teaching and learning experiences. This model, however, is highly contextualized and has limited applications. It was created for pre-university schools and was tested with a teacher education class in California.

Given the variety of settings that mLearning is frequently used in, a broader model that applies to teaching and learning in higher education, industry, and other organizations is needed. This broader model should also support different learning theories and situations. The model we propose in this paper (Location, Technology, Culture, and Satisfaction) is such an attempt. Most importantly, it addresses an increasingly influential factor in globalized teaching and learning - cultural differences.

CMM: LTCS Model

In this section we propose an innovative model; the “Comprehensive mLearning design Model: Location, Technology, Culture, and Satisfaction” (CMM: LTCS) that can be used to construct mLearning platforms and that can also be used to design or adapt mLearning materials/resources for global audience. This model draws components from both Keller's (1983) ARCS model and Shih's mobile learning model (Shih & Mills, 2007). Our approach is to synthesize existing models and theories of teaching and learning, augmenting this model in a way that provides support for hitherto neglected areas (e.g., formalized mLearning). We also intend to provide a model and methodology that can guide educators as they develop engaging mLearning materials. Instructional designers can use this collection of methodologies to synthesize the work of several disciplines into a heuristic model of design that will maximize the teaching capabilities of mLearning.

Of particular concern to us is learner attrition and retention, two related factors that have been key issues in eLearning programs for many years (Tyler-Smith, 2006). According to the reported literature, it is evident that

the full scope of the attrition problem is unclear and, consequently, there is a need for educators to collect this information. In formal education, it is imperative to keep learners engaged in learning all the way through to the completion of their learning goals.
In our approach, we argue that educators tasked with developing engaging mLearning material should start their analysis with four learner variables that are particularly important to mLearning, namely: Location, Technology, Culture, and Satisfaction (LTCS). These variables are drawn from a variety of existing models in social sciences, and are familiar to those in the field of Educational Technology. However, mLearning requires instructional designers to understand these ideas through the lens of user-centric design. Placing users at the centre of the design process ensures they are provided with an engaging mLearning experience that they will return to for continued education. More importantly, the variables in the LTCS present an opportunity to combat learner attrition by ensuring that learning is particularized to individuals taking mLearning programs.

High-Level Description of the CMM: LTCS Model

Figure 2 shows the structure of the LTCS Model for Designing mLearning Material, in both informal and formal educational settings. Alignment with the heavy emphasis on learner retention in many online programs, learning resources and learner satisfaction are key focuses of the model. To ensure the highest learner satisfaction, learning materials need to be designed with the consideration of Location, Technology (learning platform, device, and methods), and Culture. Designing instruction for mLearning covers three aspects: pedagogical design, technical design, and usability design. The bottom section of the Model provides an example of "Technology", which is one method that can be used to structure mLearning activities. Learning resources can originate from both live classrooms and informal learning sites, such as podcasts and user driven online video services (eg YouTube). Students will receive such learning resources via different devices and then actively participate in process (study and create). For example, in an English lesson, students will be prompted to record their pronunciation with their cell phones and then upload the recordings to a learning management system (LMS), or to social networking sites. They will then receive feedback from tutors, instructors, or peers. We now describe each element of our Location, Technology, Culture, and Satisfaction (LTCS) model in turn.

Location

Location has twofold meanings. At the macro level, learners' location can be local or global (i.e., distributed around the world). At the micro level, location refers to the specific locations where learners study. And these could include formal settings, such as classrooms, or informal settings, such as Starbucks, teahouses, subways, or airports.

This variable comes as a response to emerging trends in demography, ethnography, and geography. mLearning presents the possibility of broader access to Internet-based classrooms for people from different locations and cultural groups. This promise also requires that instructional designers understand the global distribution of their learners, and design mLearning materials to help facilitate knowledge construction and sharing. In addition to the global composition of a learner group, mLearning program designers in the developing world may need to consider the linguistic differences amongst their learners.

In considering location during an instructional analysis, instructional designers can look for ways to make the mLearning materials more authentic and relevant to the projected learners' day-to-day context. Informal settings can include low-noise places (eg home or coffee shop) and high-noise places (eg streets, airports, or subways). The environment where learners are located will determine the content design. Learning content for formal settings can be longer and more complex, compared to the one for informal settings. Learning material used in places with significant noise needs to be less than 5 minutes, needs to include captions, and needs to consider colour scheme and display lighting setting (Wang, Shen, Novak, & Pan, 2009).

Technology

In our LTCS model, technology assumes a broad definition, including not only regular IT (e.g., computers, devices, networks, and learning platforms) but also educational techniques (e.g., teaching and learning methods). The LTCS Model shows the basic framework for delivering mLearning and for conducting interactive learning. Learners receive the learning content from either formal settings (classrooms) or informal settings (eg websites or online resources). They engage in individual learning and also create materials by using a computer or mobile device. They are then encouraged to upload these materials to a learning management system or social networking sites where feedback will come from the teacher, mentor, or peers. Comments, such as difficulties in using the system, are also feedback into the usability or pedagogical components. This process is an effective way to ensure that the overall system is able to adapt to changing student needs and correct basic design deficiencies.

Mobile devices come in increasingly varied forms, and instructional designers must develop mLearning practices that make the best use of the increasing connectivity, power, and variety of mobile devices. In relation to mLearning curriculum design, new 3G and 4G technologies better enable users to manage their time via facilitating a wider range of devices with added features, such as always-on connectivity, better video displays, speech recognition attributes, and scientific calculators. Also, more applications will be available to more users, and these newer devices tend to have increased memory resources. The current trend of better interoperability and richer interactivity will continue to be an expectation of mobile learners. In support of this, mLearning application designers will need a wider array of tools, models, capacities and standards to work with in developing new education applications.

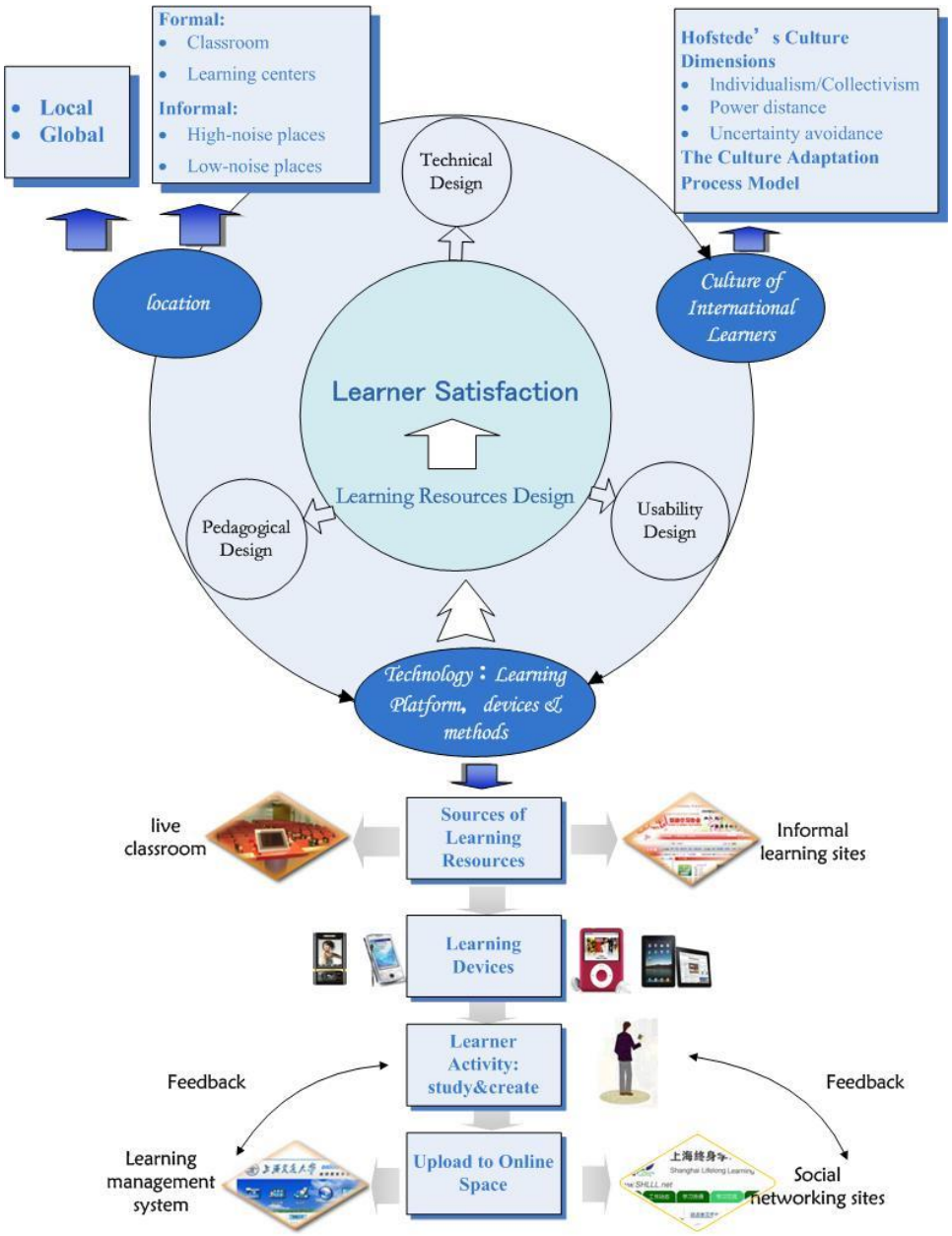

Figure 2. The Comprehensive mLearning Design Model: Location, Technology, Culture, and Satisfaction (LTCS)

Culture

Culture in our model refers to the cross-cultural dimensions of globalized eLearning and mLearning. Here we examine culture from two widely used models in teaching and training: Hofstede's (1991) cultural dimensions, and Edmundson's (2007) Cultural Adaptation Process (CAP) Model: Designing E-Learning for Another Culture.

A handful of studies (e.g., Marinetti & Dunn, 2002; Selinger, 2004; Triandis, 1995; Tylee, n.d.; Wang, 2007) on the influence of cultural attributes on learning derived their variables from Hofstede's Cultural Dimensions, which include five attributes: Power Distance Index (PDI), Individualism (IDV), Masculinity (MAS),

Uncertainty Avoidance (UA), and Long-Term Orientation (LTO). Three of the five attributes are found to be most influential to learning: PDI refers to the gap between the distribution of power and wealth in a country's society; IDV indicates the degree to which a society values individual over collective achievement; and UAI focuses on a society's level of tolerance for new, unknown or surprising situations.

Table 1. Power Distance and Its Influence on Teacher/Student Perceptions

Element	Low PDI	High PDI
Knowledge perception	It is a "truth" accessible for everyone.	It is "wisdom" only transmitted by a guru.
Communication	Two-way communication, students speak spontaneously.	One-way communication, students speak only when invited by the teacher.
Confrontation and criticism	Allowed.	Not allowed.
Preferred age of teachers	Younger teachers.	Older teachers.
Roles perception	Equals. Learned- centred.	Respect. Teacher- centred.
Motivation	Education is a way to facilitate equality.	Education is a way of gaining authority and expertise.

A high uncertainty avoidance ranking indicates low acceptance of unforeseen situations and changes, while a low uncertainty avoidance ranking denotes a society's flexibility, adaptability and acceptance for variations. Table 1 is adapted from Hofstede's (1986) cultural framework and compares elements between low and high Power Distance Index. Edmundson (2007) described the Cultural Adaptation Process (CAP) Model, addressing the issue of designing eLearning for another culture. The CAP model is based on earlier work of Marinetti and Dunn (2002), who proposed guidelines for creating courses of differing degrees of complexity to serve the requirements of students from diverse cultures. The CAP model also builds on Henderson's (1996) earlier work, in which she proposed the Multiple Cultural Model (MCM) that characterized different courses. In essence the CAP model takes the form of a set of guidelines for matching existing elearning courses to the cultural profiles of targeted learners. In theory, this model can also guide the development of culturally appropriate elearning courses and materials, so as to help learners achieve equitable learning outcomes (i.e., acquisition of skills and knowledge). According to Edmundson (2007), the CAP model is supported by an empirical cultural study of eLearning, and also integrates findings from other studies on culture and cultural dimensions (e.g., Hofstede, 1991).

In this model a two dimensional matrix is formed, which characterize the issues involved in adapting an eLearning course to a given culture. The vertical axis shows a set of incremental steps associated with adapting an eLearning course to a given culture. The horizontal axis depicts the course's complexity as a set of four levels of increasingly complexity (1 is the simplest and 4 is the most complex). An interesting observation is that the attributes listed in this matrix follow a similar pattern to the cultural dimensions reported in papers by other researchers.

In our LTCS model (Figure 2), one element of the five design principles is "design for learners with diverse cultural backgrounds". Our model complements the work of the models described earlier in this paper by providing a more "process & device" centric view of the communication elements in the above models. The reason for this is that mobile phone communication is often dominated by the physical and interface characteristics of the device (e.g., screen size, colours, & captioning). In summary, this section has argued that the LTCS model provides a better fit to earlier mobile learning models, especially in respect to the support it provides for incorporating culture and location.

Sample Design Principles Derived from the LTCS Model

Design for different devices: At present, many challenges in the design of mLearning materials stem from the variety of mobile devices used in formal and informal learning. Future educational initiatives will deploy mLearning materials via devices that can be used at home, in workplace, during transportation periods, or during leisure activities. To realize these opportunities, instructional designers will need to develop a basic understanding of the information delivery capabilities of these devices, as well as the appropriateness of each type for different environments and content. For example, network-centred devices such as smart phones can be used to share materials amongst dispersed learners.
Design for learner mobility: Locations where learners will use mobile materials should be considered in instructional design. The following is a tabulation of location-design considerations.

Table 2. Location Considerations in Design

Environment	Types of Design	Example
Subway & bus	visual numerical	short article, strong pictures
Home	auditory-visual-kinesthetic combination	Music, oral material, instructional videos, sports videos
Office	written expressive	PPT, e-books
Café	auditory & visual linguistic	Music, Oral material, Instructional videos

CONCLUSIONS

In this position paper we have argued that existing models of mLearning do not capture the full richness of the mobile student's environment. In response to this we have proposed a new model, the Location, Technology, Culture & Satisfaction (LTCS) model that we have argued provides a better fit mobile learning than do earlier models, producing learning systems that are more effective for a wider range of students, particularly for those with more diverse cultural backgrounds.

Whilst we suggest this model will provide developers of mLearning systems with an effective design framework, we recognise that this model will benefit from refinement based on broader and more diverse samples of mLearning situations and participants which, we hope, publication of this model will enable. For example, going forward, researchers might explore possible solutions for some of the following pressing issues:

- How will learning theories influence the development of instructional design strategies for mobile devices, and vice versa?
- How can instructional designers leverage existing captioning standards into standards that fit the specificities of mobile devices?
- How will developments in network access, device design, and information exchange extend the experiential possibilities of mLearning?

The answers to these questions can help instructional designers form a baseline of knowledge that can guide future data collection. Equally, such answers shoul lead to design and development criteria that will improve mLearning courseware. With this greater store of knowledge, we hope educators will be able to design more satisfying mobile instructional experiences for students. Finally, as the world moves towards an era when almost everyone on the planet has a mobile phone, and our society is becoming increasingly a knowledge based, it's not difficult to see the massive opportunity of delivering mobile phone based education that meet the needs of learners. As Muyinda (2007, p. 102) commented, "In this brave new world, mLearning is well positioned to champion these innovations". Whilst the need and opportunity for such systems is obvious, how to develop and manage such systems has been less clear, and we hope this paper can make a small contribution to achieving those ends.

ACKNOWLEDGEMENT

This paper and the research work associated with it are supported by a grant the Shanghai Municipal Education Commission (TKPY052WMJ).

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