MOBILE LEARNING 2013

Lisbon, Portugal | 14 - 16 March

PROCEEDINGS

Edited by:
Inmaculada Arnedillo Sánchez
Pedro Isaías

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international association for development of the information society

INTERNATIONAL CONFERENCE

MOBILE LEARNING 2013

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE
MOBILE LEARNING 2013

LISBON, PORTUGAL

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Organised by
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FOREWORD

These proceedings contain the papers of the International Conference on Mobile Learning 2013, which was organised by the International Association for Development of the Information Society, in Lisbon, Portugal, March 14 – 16, 2013.

The Mobile Learning 2013 International Conference seeks to provide a forum for the presentation and discussion of mobile learning research which illustrate developments in the field. In particular, but not exclusively, we aim to explore the theme of mobile learning under the following topics:

- Learning analytics and mobile learning
- Cloud computing and mobile learning
- Pedagogical approaches, models and theories for mLearning
- mLearning in and across formal and informal settings
- Strategies and challenges for integrating mLearning in broader educational scenarios
- User Studies in mLearning
- Learner mobility and transitions afforded by mlearning
- Socio-cultural context and implications of mLearning
- Mobile social media and user generated content
- Enabling mLearning technologies, applications and uses
- Evaluation and assessment of mLearning
- Research methods, ethics and implementation of mLearning
- Innovative mLearning approaches
- Tools, technologies and platforms for mLearning
- mlearning: where to next and how?

The Mobile Learning Conference 2013 received 116 submissions from more than 28 countries. Each submission has been anonymously reviewed by an average of 4 independent reviewers, to ensure that accepted submissions were of a high standard. Consequently only 17 full papers were approved which means an acceptance rate of 15%. A few more papers were accepted as short papers, reflection papers, posters and doctoral papers. An extended version of the best papers will be published in the International Journal of Mobile and Blended Learning (ISSN: 1941-8647).

The Conference, besides the presentation of full papers, short papers, reflection papers, posters and doctoral papers also included a keynote presentation from an internationally distinguished researcher. We would therefore like to express our gratitude to Professor Frans Mäyrä, INFIM/TRIM/Game Research Lab & School of Information Sciences, University of Tampere, Finland, for accepting our invitation as keynote speaker. Also a special thanks to Cathie Norris, Regents Professor, University of North Texas, Denton, TX. USA and Elliot Soloway, Arthur F. Thurnau Professor, University of Michigan, Ann Arbor, MI, USA for being our invited speakers and also for presenting a tutorial.

A successful conference requires the effort of many individuals. We would like to thank the members of the Program Committee for their hard work in reviewing and selecting the papers that appear in this book. We are especially grateful to the authors who submitted their papers to this conference and to the presenters who provided the substance of the meeting. We wish to thank all members of our organizing committee.

Last but not least, we hope that everybody has enjoyed Lisbon and their time with colleagues from all over the world, and we invite you all to next edition of the International Conference Mobile Learning in 2014.

Inmaculada Arnedillo Sánchez, Trinity College Dublin, Ireland.
Conference Program Chair

Pedro Isaías, Universidade Aberta (Portuguese Open University), Portugal
Conference Chair

Lisbon, Portugal
March 2013

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KEYNOTE LECTURE

FROM MOBILE GAMES TO PLAYFUL COMMUNICATION: PLAY IN EVERYDAY LIFE

By Professor Frans Mäyrä
INFIM/TRIM/Game Research Lab & School of Information Sciences,
University of Tampere, Finland

Abstract

Especially for the younger generations games are the most important form of media in their lives. According to the recent Player Barometer study, in Finland already 56 % of population (ages 10-75 years of age) are active players of digital games, and the number is rising. The average game player age is 37 years. However, the intensity and forms of play vary much in different demographic groups. It is important to be aware of forms of play and playfulness that are not restricted to the game play in immersive computer and video games. Mobile games are a typical example of small, "casual games" that attract also players who do not typically self-identify as "gamers",and yet are interested to have some kinds of games and play as parts of their everyday life. As the influence of mobile devices and online, connected services increases, there will be both positive opportunities for new, innovative types of games and play, but also an increasing danger of cognitive stress and information overload. This keynote will address the role of "playfulness"in games and (non-game) online media services, and probe into "playful communication" as an important element for the future of information and media literacy.

INVITED TALK

USING MOBILE DEVICES AS ESSENTIAL TOOLS FOR LEARNING IN PRIMARY & SECONDARY SCHOOL

by Cathie Norris, Regents Professor, University of North Texas, Denton, TX. USA and by Elliot Soloway, Arthur F. Thurnau Professor, University of Michigan, Ann Arbor, MI, USA

Abstract

The data suggest that when computing devices are used as essential tools for learning, then – and only then – are increases in student performance observed. By "essential use" we mean used for 50%-70% of the school day – and outside of school – using a variety of productivity tools (e.g., writing, concept mapping, drawing/animating, etc.) and domain specific tools (e.g., science visualization) as well as the Internet. By and large, however, shared computing devices are used in classrooms as supplements, as add-ons, to curriculum. As the cost of Internet-connected mobile devices continues to plummet, it will become commonplace for a student to bring his/her mobile computing device to school. To leverage those "BYOD" – Bring Your Own Device – devices and have them used as essential, not just supplemental to the curriculum, students need more than a few apps. Towards creating the "Linux for educational technology" we have built and are distributing free the WeLearn Mobile Platform that runs on iOS and Android mobile devices. In our presentation, we will report on the use of WeLearn in classrooms in Singapore and the U.S. Finally, computing devices, used as essential tools, will have a significant impact on student performance!

CONFERENCE TUTORIAL

EXPLOITING THE WELEARN MOBILE PLATFORM TO SCAFFOLD SYNCHRONOUS COLLABORATION

by Cathie Norris, Regents Professor, University of North Texas, Denton, TX. USA and by Elliot Soloway, Arthur F. Thurnau Professor, University of Michigan, Ann Arbor, MI, USA

Abstract

In our hands-on tutorial, we will demonstrate how the WeLearn Mobile Platform – a free resource that supports interoperation between iOS and Android devices – can scaffold educators and students in developing and using collaborative learning skills. WeLearn is an end-to-end system, with productivity apps running natively on client devices (e.g., smartphones, tablets) and a Learning Management System on the backend that enables students to sync their artifacts to a teacher-accessible, cloud-based portal.

Attendees will gain first-hand experience with WeLearn and are welcome to use WeLearn in their classrooms.

Full Papers

COMMON MOBILE LEARNING CHARACTERISTICS-AN ANALYSIS OF MOBILE LEARNING MODELS AND FRAMEWORKS

Umera Imtinan, Vanessa Chang and Tomayess Issa
School of Information Systems, Curtin University, Perth, Australia

ABSTRACT

Mobile learning offers learning opportunities to learners without the limitations of time and space. Mobile learning has introduced a number of flexible options to the learners across disciplines and at different educational levels. However, designing mobile learning content is an equally challenging task for the instructional designers. Currently, mobile learning researchers are trying to determine a set of mobile learning characteristics to inform mobile learning design. Besides conforming to the pedagogical requirements, mobile learning instructional designers are also considering the nature of learning activities to engage learners with miniature mobile devices. Similarly, there are a number of mobile learning characteristics which are crucial to mobile learning design in order to harness the power and affordances of mobile devices as well as maintaining the learning element as the main focus. This paper is an attempt to point out common mobile learning characteristics as they appear in key mobile learning conceptualizations, models and frameworks in the literature. These characteristics may be useful for future researchers to inform the mobile learning design process as well as mobile learning conceptualizations.

KEYWORDS

Mobile learning characteristics, Mobile learning design criteria, Usability, Collaboration, Mobility, Mobile learning models and frameworks

1. INTRODUCTION

Mobile learning enables learners to learn anywhere and at any time using mobile technologies (Vosloo, 2012). In order to understand what mobile learning truly offers to the learning environments, a detailed argument is needed more than just a cohort of definitions. In this paper, the key characteristics of mobile learning reflecting the benefits and challenges in this field are discussed. For the purpose of finding the most influential and significant mobile learning characteristics reported by the mobile learning researchers, we have examined a variety of research papers in the research literature of mobile learning; including but not limited to the mobile learning research reports, projects, pilot studies, trials, implementations, conceptualizations, theories, models and frameworks. However, the scope of this review is limited to the studies focusing on mobile learning conceptualizations, models and frameworks in order to identify common and popular mobile learning characteristics. Usability, collaboration, context, content, control (authenticity/administrative checks and teacher's control on learning process), blending with other forms of learning, connectivity (sometimes referred as network access or coverage) and mobility (referred as flexibility and portability interchangeably) have been identified in literature as the key characteristics of mobile learning ((Danaher et al., 2009, Parsons and Ryu, 2009, Frohberg et al., 2009, Chao et al., 2009, Koole, 2009, Denk et al., 2007, Barker et al., 2005, Naismith et al., 2004a). However, all of these characteristics have not been collectively identified in a single research study. Most of the studies focus on only a limited number of mobile learning characteristics. This paper attempts to address this gap; based on the literature review, the researchers have suggested a set of common mobile learning characteristics to be considered for mobile learning instructional design as well as future mobile learning conceptualizations.

2. RESEARCHING MOBILE LEARNING CHARACTERISTICS

For the purpose of researching and identifying set of common mobile learning characteristics, mobile learning conceptualizations, models and frameworks will be discussed in this review. A number of scholarly sources were examined including Science Direct, ACM Digital Library, Proquest (ABI-INFORM) and SpringerLink. Further, the researchers manually consulted several journals that regularly publish mobile learning research. These journals include: International Journal of Mobile Learning and Organizations, International Journal of Mobile and Blended Learning, Computers and Education, Journal of Computer Assisted Learning and British Journal of Educational Technology. Since there are relatively few research articles that focus in particular on the conceptualization of mobile learning, the proceedings of a few popular conferences such as the MLearn series and IADIS Mobile Learning conferences were also examined.

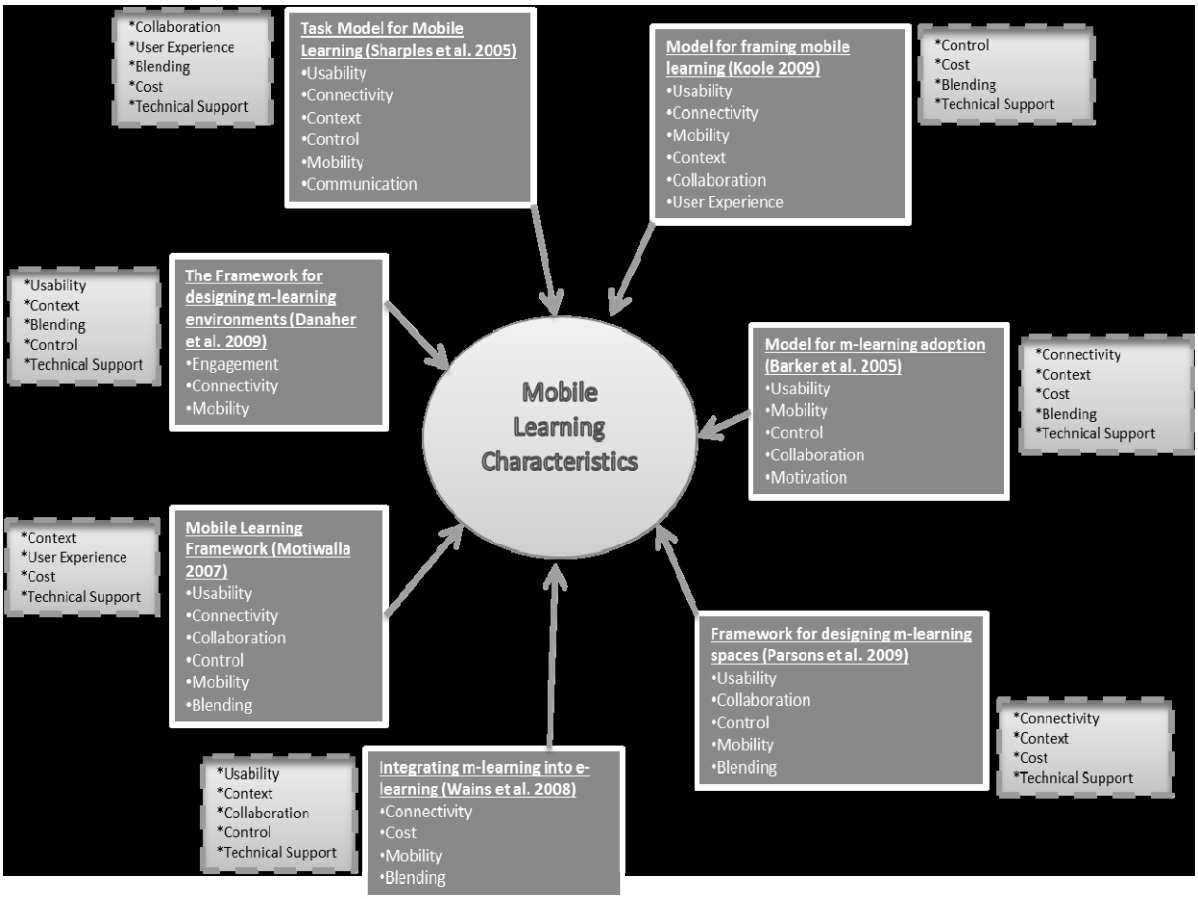

Figure 1. Mobile Learning Characteristics - Literature Snapshot

The above mentioned literature sources from 2005 to 2012 were scanned for the terms "mobile learning models and frameworks" and "mobile learning conceptualization". The initial search yielded around 700 articles using these keywords. Further, a filter term "mobile learning characteristics" was applied; however, it did not yield significant results.

The researchers realized that not every mobile learning researcher used this terminology to classify mobile learning characteristics in their discussion of models and frameworks. Therefore, the researchers decided to examine the resultant articles manually to look for the mobile learning characteristics; these were narrowed down to 19 studies matching the purpose of the review. Mobile learning researchers have discussed mobile learning characteristics in a number of studies; however, most of the studies found in the literature so far did not provide a comprehensive list of mobile learning characteristics in a single research setting.

As shown in Figure 1, the researchers have presented a snapshot of the mobile learning characteristics discussed and not discussed in the most-cited mobile learning studies in the literature, using some of the selected studies to explain how the researchers have analyzed and compared each study for mobile learning characteristics. In Figure 1, the inner rectangles show the main mobile learning characteristics considered in that study; the outer rectangles contain the characteristics which have not been considered in that particular study. Regarding mobile learning characteristics, the findings from the literature showed that most of the studies have focused on a particular set of mobile learning characteristics such as usability, collaboration, flexibility and connectivity (See Figure 1). Some of the characteristics such as context, control, engagement and blending mobile learning with other forms of learning have been used by only a few of the mobile learning researchers while other mobile learning characteristics such as user experience, motivation, technical support and cost have rarely been included and accumulated in most of the mobile learning models and frameworks. This paper compiles the set of common mobile learning characteristics including all of these characteristics mentioned in the extant mobile learning literature. It is also important to point out that different studies may have used different terminology for the same characteristics. For example, 'mobility' and 'flexibility' have been used interchangeably in many studies; the same goes for 'connectivity' and 'network access point' in the same context (Frohberg et al., 2009, Koole 2009). Therefore, the researchers grouped similar characteristics the one name predominantly used in the literature to represent each character or concept and used it in subsequent sections in this paper in order to maintain consistency and avoid confusion for the reader. The next section presents a detailed account of the common mobile learning characteristics as determined in this paper.

3. COMMON MOBILE LEARNING CHARACTERISTICS

Current mobile learning literature shows that mobile learning researchers have been experimenting on a number of mobile learning characteristics. After the rigorous process of scanning and reviewing literature, the researchers have concluded that usability, collaboration, context, control, connectivity, mobility, content, blending, technical support and cost are the common mobile learning characteristics. It appears from the literature that these characteristics have been incorporated and researched in most of the mobile learning studies dealing with the subject so far. The following sub-sections discuss each of these common mobile learning characteristics in detail.

3.1 Usability

Usability relates to the ease of using mobile devices for learning purposes in respect to screen size, battery life, size, weight, memory, processing power, compatible applications and user interface (Koole, 2009, Kukulska-Hulme, 2005b). Other than these basic usability issues, Koole (2009) includes a number of other factors such as aesthetic appeal of the device, simplified display, fewer steps required to perform a task, ease of navigation, customization options and environment or climate of the place where the learner is located. Besides the usability features of mobile devices, Kuen (2006) provides a usability guidelines framework for designing mobile learning portals which focuses on analyzing the learner's usage skills, human-mobile interaction and interface design as main categories to develop usability guidelines for designing mobile learning portals containing mobile learning content and applications. Bearing in mind the fact that current mobile devices, and the ones used in previous pilot projects such as PDAs and smart phones, are not built for learning purposes, it is more likely that learners will face usability problems. Therefore, researchers such as Kuen (2006) recommended guidelines for designers of mobile learning portals. However, as the mobile devices are becoming multi-purpose and more sophisticated in design and functionality, the basic usability problems such as battery life, memory capabilities and screen size limitations, will diminish (Wu et al., 2012, Ambient-Insight's, 2008).

3.2 Collaboration

Collaboration demonstrates the level of communication and interaction between the learner and the teacher as well as among other learners (Parsons and Ryu, 2009). A number of studies around the world have shown

that mobile learning will make learning processes more informal and collaborative (Mifsud, 2002). Collaboration in learning has been proven to enhance learning outcomes. Parsons et al. (2009) argue that collaborative learning gives better understanding of the subject matter to all contributors or group members and this in itself is a good reason for accepting mobile technologies in learning environments. Palfrey et al. (2008, 248) relate mobile technologies to collaborative learning because the former can be utilized the best in order to reap the benefits of "team-based learning". Spikol et al. (2009, 174) refer to Piagetian theories of collaborative learning based on "conversations that can result in cognitive restructuring" and Vygotskian views about "peer-to-peer interaction" which facilitate knowledge sharing and knowledge creation. Mobile learning encourages collaboration among learners, teachers and other stakeholders in learning environments (Barker et al., 2005). A number of mobile learning projects have been implemented around the world showing improved learning outcomes by students when engaged in a range of collaborative activities including field work, group projects and classroom activities. Furthermore, most mobile learning theorists in the current literature have included collaboration or collaborative learning activities as one of the driving factors in the adoption and/or acceptance of mobile learning by education providers at the elementary school level, college level or university level (Danaher et al., 2009, Ford and Leinonen, 2009, Motiwalla, 2007).

3.3 Context

Context refers to the physical environment of the learner or where the learning takes place (Frohberg et al., 2009). Mobile learning presents learners with a variety of contexts where they can learn and experiment in real-world situations (Geddes, 2004). Learners can interact with the environment and make sense of the objects with location awareness of mobile devices such as museum tours; an example is the Tate modern Multimedia tour pilot project and MobiLearn project where learners experienced contextualized learning using mobile devices during the tour that provide information about objects on display (Proctor and Burton, 2003, Bormida et al., 2002). A study by Chen et al. (2003) reporting on the observation of birds on a farm is another example of context in the mobile environment where students, on a field trip, learn about birds by observing the physical activities of birds and use mobile devices to record information and identify objects. The context of the learner can be a classroom or any other controlled learning environment such as a mobile learning study conducted by (Lowery, 2005) where a teacher uses a quiz in the classroom and relies on responses from the students to proceed with the learning session. Spikol et al. (2009, 174) discuss context in relation to collaboration for mobile learning and define context as "information and content in use to support a specific activity (being individual or collaborative) in a particular physical environment". In mobile learning, the context of the learner is a key construct as mobile devices allow the learner to access, navigate and make sense of information where and when it is needed.

3.4 Control

Control refers to the amount of grip a teacher or a learner has on the learning process for smooth continuity and best outcomes (Frohberg et al., 2009). When designing mobile learning environments, it is very important to emphasize the role of the moderator who mediates the learning process, controls it to a certain extent and creates the learning environment which nourishes learners with guided reflection; otherwise, learners may be at risk of losing direction (Sharples et al., 2005). As a theoretical foundation for their mobile learning research, Harrington et al. (2009) discuss the concept of authentic learning where students are able to resolve real-time complex problems in professional environments and by reflection create new knowledge, at times guided by teachers. The teacher's role and intervention in the learning process is of vital importance. Pachler et al. (2010, 160) refer to "the conversational framework for supporting the formal learning process" suggested by Laurillard (2007, 160) which shows the notion of "the world of experience" for the role of teacher in the learning process; they present a further critical analysis of the conversational framework.

"Learning is viewed as a series of iterative conversations with the external world and its artifacts, with oneself, with other learners and, of course, teachers". Frohberg et al. (2009, 317) have categorized mobile learning projects (published up to 2007) from a fully teacher-controlled learning scenario to a fully learner-controlled learning scenario and recommend scaffolding as an optimized option in the middle of the two extremes; their reasons for scaffolding recommendations include:

1. Learners are from a variety of backgrounds and have distinct learning needs.

2. Different phases of the learning process may vary in terms of need for scaffolding.
3. Scaffolding may be very appropriate for individual learning and team-based learning.
4. Learners may encounter unexpected problems or opportunities and may need to take the initiative when making decisions by themselves at times.

In mobile learning environments, it is quite crucial to decide how autonomous a learner should be so that the best learning outcomes can be achieved; therefore, it is important to consider the level of control when designing mobile learning environments.

3.5 Connectivity

Connectivity, in respect of mobile technologies, refers to how mobile devices can connect wirelessly using a variety of cellular and wireless access technologies such as GPS, EDGE, GPRS, GSM, 3Gs, 4Gs, WiMAX, WiFI, WLAN (Roschelle, 2005, Ambient-Insight's, 2008). Mobile connectivity includes voice telephony and internet access for data transmission. Connectivity, as a mobile learning characteristic, relates to how effectively a learner can access the required information or learning material on a mobile device (Koole, 2009). Network access technologies work as an interface between users, mobile devices and learning resources. Learning resources may be accessible through a wide range of mobile technologies and devices. In the mobile learning arena, a few researchers have used the term 'accessibility' for network access capabilities and access technologies; however, accessibility is generally referred to in relation to the provision of proper facilities for the people with disabilities (Rainger, 2005). Connectivity enables mobile learning to be more ubiquitous and portable (Traxler, 2005). As the network coverage continues to expand and develop better quality, more learners are likely to be attracted to mobile learning. Traxler (2005) also differentiates mobile learning from e-learning on the basis of connectivity and presence as he posits that mobile learning provides more opportunities for the learners to discover the knowledge-world in unique ways, which makes it distinct from e-learning and other forms of technology mediated learning.

3.6 Mobility

Mobility is sometimes used as an interchangeable term with flexibility and portability (Koole 2009). It is the ease of accessing learning material and collaborating with peers regardless of time and space (Kukulska-Hulme, 2005a). Mobility is one of the key constructs in the design of mobile learning systems and environments because mobility is, as noted by Sharples et al. (2002), a shared attribute of mobile devices and the conceptions of learning; students learn in different places and different times when mobile devices support them to learn anywhere-anytime (Pachler et al. 2012). Naismith et al. (2004, 4) define mobility as "the ability to link to activities in the outside world also provides students with the capability to 'escape' the classroom and engage in activities that do not correspond with either the teacher's agenda or the curriculum". Koole (2009) has used the term *portability*, meaning mobility, which allows mobile devices to be taken to different locations and environments and even to remote places. Subject to mobility characteristics, mobile learning is called spontaneous, contextual, on-demand, flexible, just-in-time, situated, portable and mobile (Traxler, 2009). Brown (2009) points out that mobility is becoming a way of life as it has made most mobile users keen to access resources and turned them into implicit learners. Further, Brown (2009) recommends that the mobility of the devices should be exploited to enrich the learning experience for learners.

3.7 Blending

Blended learning is a ubiquitous learning solution which combines the benefits of various learning domains such as mobile learning, e-learning, face-to-face learning and contextual learning (Chao and Chen, 2009, Peter, 2007). Ally (2009) defines blended learning as a variety of learning approaches with virtual and physical learning resources combined appropriately. Accessing learning content on mobile devices is advancement in the blended learning arena as it takes the learning experience to be lifelong and informal (Pieri and Diamantini, 2009). Wan and Howard (2007, 187) mention that the ubiquity of mobile devices enables blended learning in terms of resources available on mobile devices and a number of learning activities that a learner can perform such as "concept-mapping, organization, note-taking, writing, researching, reading e-documents, doing worksheets and submitting them for checking, watching animations

and movies, drawing graphs, calculating mathematical problems, data collecting, doing their homework, keeping a reflective log, undertaking recording (voice and stylus) and interacting with simulations and multimedia educational materials. Having access to a hand-held all the time is like having all in one access to the pens, text books or other written resources, cameras, calculators, voice recorders, clocks and Internet." Naismith et al. (2004) also consider that adapting the blended approach to mobile learning is imperative because of its orientation with multiple theoretical and practical perspectives. Literature shows that mobile learning, when blended with other forms of learning, makes the learning experience more fruitful, rigorous and collaborative. Mobile learning provides an opportunity to support and enhance performance of learners and engage them in learning activities. To include mobile learning in mainstream education, blending it with existing learning forms such as face-to-face learning and e-learning is the rational solution for education providers.

3.8 Content

Mobile learning content refers to the learning resources for students in a format compatible with mobile devices (Frohberg et al., 2009). Low (2007) has formulated a set of mobile learning standards in the Australian Flexible Learning Framework for creating, adapting, accessing and modifying learning content or learning material for mobile devices. Mobile learning content development depends on what kinds of learning activities are required for a specific learning scenario. The literature suggests a range of mobile learning activities such as accessing information remotely, file sharing, taking photos, recording and playing audio and video files and sharing these files remotely and creating collaborative content online (Parsons and Ryu, 2009, Naismith et al., 2004b). Traxler (2005, 264) in his definition of mobile learning, calls it "spontaneous, informal, bite-sized, light-weight, context aware, connected, personalized, interactive"; these terms indicate the type of content suitable for mobile learning. Mobile learning content can be custom built by education providers following individual institutional preferences; however, packaged content (usually called mobile learning applications or apps, as activities, are translated to apps by software developers) is also available in the market (Ambient-Insight's, 2008, Parsons et al., 2006).

3.9 IT or Technical Support

Making mobile learning a seamless learning opportunity is not possible without technical support for teachers and students. Chen et al. (2010) suggest that the lack of appropriate technical and administrative support is one of the biggest factors influencing teachers' adoption of mobile learning. In particular, if teachers are digital immigrants and have to redesign courses for mobile learning, they would need quite a lot support to make the content bite-sized. More than the instructional design support, they would require technical support if they face any problems with uploading and maintaining mobile learning content (Chen et al., 2010, Prensky, 2009). Similarly, if students face any difficulties in accessing and downloading learning resources, technical support would be an immediate need. Literature shows that mobile learning implementation at different educational levels such as schools, colleges and universities required extensive IT or technical support to make the mobile learning implementation successful and reliable (Ford and Leinonen, 2009, Motiwalla, 2007).

3.10 Cost

Mobile learning design and implementation produce heavy costs for institutions, and learners may also need to pay for the mobile data usage. Dyson et al. (2009) point out that the cost of mobile learning adoption is a considerable hindrance for many education providers. The cost of mobile technologies for learning has been divided into four main categories by Dyson et al. (2009). Costs are incurred by the education providers and the students in various areas including usage charges, mobile hardware costs, mobile software costs and costs of networks utilized by education providers.

Usage charges refer to the telecom providers' bills for the data usage; these charges are billed to the learners directly and most of the education providers are not willing to approve any grants to cover the usage charges. These charges are quite high and expensive for students even in many developed countries (Scornavacca et al., 2009). Dyson et al. (2009) suggest that students may avoid extensive data charges by

downloading learning material on a PC and transferring it to a mobile device and they would prefer to use WI-Fi networks provided by institutions free of cost; however, avoiding costs for data usage may restrict them to using a number of opportunities provided by mobile learning on the move and outside the institutional premises. The price for purchasing a mobile device for learning is also quite high, but education providers often have funding to purchase mobile devices for research purposes. Interestingly, Economides and Grousopoulou (2009) found that students are willing to purchase even an expensive mobile device with advanced features. Similarly, Lundin et al. (2010) propose that education providers should exploit the students' personal devices for educational uses as they bring them to institutions and already use them for communication and social networking.

4. FUTURE RESEARCH

Most of these characteristics have been discussed in mobile learning conceptualizations and theorizations and been researched through projects, trials and implementations of mobile learning. However, there are a number of mobile learning characteristics which are important but yet to be explored such as the cost associated with mobile learning implementation on the part of all stakeholders involved, how motivated the learners and teachers are in terms of initiating mobile learning in higher education, the impacts of the social and cultural backgrounds of the stakeholders on the success of mobile learning implementations (Pachler et al., 2012, Dyson et al., 2009, Barker et al., 2005). In addition, there is great research potential in investigating the mobile learning characteristics of under-served populations and developing nations and determining whether mobile learning is a convenient and affordable learning option (Traxler, 2009). These are possible future research directions which can extend the current set of common mobile learning characteristics presented in this paper. Currently, a research project is being carried out by the researchers of this paper to investigate mobile learning characteristics of a particular developing country as the first author's PhD research focus. This project involves students, teachers and administrative stakeholders in the higher education sector in an investigation of mobile learning characteristics of developing countries. The review of mobile learning characteristics in extant mobile learning research literature assisted the researchers to build a mobile learning conceptual model for Pakistan to investigate the mobile learning characteristics appropriate for Pakistani university environments in particular and for developing countries in general. The researchers will release a mobile learning conceptual model based on the mobile learning characteristics after the research results have been compiled. However, an initial mobile learning model was developed and published in 2010 (Imtinan et al., 2010).

5. CONCLUSION

In order to include mobile learning in mainstream education, mobile learning design needs to be informed by certain criteria. The criteria for mobile learning design should include mobile learning characteristics such as usability of mobile devices for learning, enhanced collaboration among peers and teachers, learning in multiple contexts, teachers' control over the learning process and independence of learners, costs involved in providing mobile learning for different stakeholders, and mobile learning content design which include appropriate activities and applications in conjunction with the affordances of mobile devices. The mobile learning researchers are investigating these characteristics in conceptualizations and implementations in order to establish criteria for mobile learning design. This paper presents a comprehensive set of common and popular mobile learning characteristics suggested by mobile learning researchers to date; this set of characteristics will provide an input for future research in pursuit of optimum mobile learning design criteria.

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WALKING TOWARDS INSTRUMENTAL APPROPRIATION OF MOBILE DEVICES. A COMPARISON OF STUDIES

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ABSTRACT

The study of instrumental appropriation is considered a relevant outstanding and productive perspective in the arena of Mobile ICT and learning. This paper seeks for the consolidation of this perspective at a theoretical and analytical level. Regarding the theoretical level, two characteristics of mobile devices –flexibility and mobility- are explored in order to make explicit the relevance of the instrumental appropriation. Also, the division of the instrumental appropriation into two levels (external and cognitive) is discussed. Regarding the analytical level, a comparison of European studies are presented, in order to analyze what is the level of application of the 'appropriation perspective' that may be found in the pre-existent studies. Results from this comparison revealed that the consideration of this perspective was limited and unspecific. For a better understanding about the educational impact of the instrumental appropriation more research is needed, specifically regarding the division of the appropriation into the practical level and the human cognitive level

KEYWORDS

Mobile device, instrumental appropriation, educational impact

1. INTRODUCTION: HOW MOBILE DEVICES MAKE EXPLICIT THE RELEVANCE OF INSTRUMENTAL APPROPRIATION IN EDUCATIONAL SETTINGS?

The high mobile technologies penetration worldwide confronts us to an overview around the great impact that the mobile ICT has produce in our contemporary society. Growing studies are analyzing the mobile market share, the mobile advertisement, or the revolution of the mobile applications, among the most relevant (MobiThinking, 2012; Infographic, 2012). However, the mere study of the penetration does not provide enough aid to envisage all their effects, especially at the most profound changes. We are increasingly using the mobile devices for a great number of activities, with a variety of purposes that are changing the way we are used to do the more simple things: reading a newspaper, paying the parking, buying a flight, etc. with strong effects in our instrumental routines. Thus, we need a new perspective for understanding the impact of the uses, because as Bar, Pisani and Weber (2007) pointed out the innovative and long-term effects only happen when users have appropriated the technology, this is, when users has successful and meaningfully integrated it into their activities.

The study of appropriation of instruments, or instrumental appropriation (Wertsch, 1998; Belin, Prié, 2012), is significant for all kinds of technologies; however, we consider this process is particularly outstanding and productive in the arena of Mobile ICT, because of two reasons related to the customization flexibility and the mobility.

First, mobile devices allow personalization both in hardware and software; an example is the digital tablets, which are instruments without predetermined utility. So much so that when the first iPad was born, everyone was asking: ¨what is this? What can I use for? ¨ Appropriation is fundamental in the determination of uses. The own users in their practices create the new technology uses (Salovaraa et al, 2011). Precisely, this context of practice cannot be separated of the understanding of the uses; there is not a main use, the uses