Requirements for M-Learning Activities

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Abstract: *To investigate different requirements related to m-learning projects, is important for the development and analysis of them. In this sense, this paper has presented the results of a literature review on requirements for mobile learning activities. Thus, it was selected as purchases related to the central scope of this study, through the scientific examination of articles, theses and national and international dissertations without the Bank of theses and periodicals of the Coordination of Improvement of Higher Education Personnel. Those identified and mapped can help teachers and other professionals to use m-learning more effectively in the educational context.*

Keywords: *Requirements, M-learning, Activities.*

1. INTRODUCTION

Mobile learning or m-learning is the expression used to designate a new educational "paradigm", which is based on the use of mobile technologies. Thus, it is possible to call m-learning any form of learning through any small format devices, with autonomous and small size power supply, that is possible to accompany people anywhere and at any time (Moura, 2009, p.39). Educators are challenged today to search for teaching tools that can be used within the classroom as interactive methodologies that make the educational environment increasingly digital (Prensky, 2012). Gómez (2015, p.29) reinforces that "it is necessary to reinvent the school so that it can develop knowledge, skills, attitudes, values and emotions." The Unesco report (2014) presents the benefits that the use of mobile learning provides, among them we can facilitate individualized learning, provide immediate feedback and evaluation, ensure the productive use of time in the classroom, support learning outside the classroom to bridge the gap between formal and non-formal learning, to expand education in different places, to make it easier for students with disabilities, to enable learning anywhere and at any time, to build different learning communities and to improve communication among students and between students and teacher. According to Sharples et. al., (2007) mobile learning does not replace formal education at all, it simply provides support within and outside the classroom for the conversations and interactions of everyday life. For Vavoula & Sharples 2002, we learn through space as we take learning ideas and resources acquired in one place and apply or develop in another. We also learn through time, reviewing previously acquired knowledge, ideas and strategies in a completely different and broader context. When we move from topic to topic, we manage a variety of learning rather than following a unique curriculum. In this sense, it is important to investigate different requirements related to m-learning projects, to improve the development and analysis of them. Thus, this work analyzed some proposals regarding the requirements and principles found in the literature, such as: Parsons, Ryu & Crenshaw (2007), Uden (2007), Koole (2009), Peng, Su, Chou and Tsai (2011), Schmitz, Klemke, & Specht (2012), Abdullah, Hussin, Asra, & Zakaria (2013), Ng & Nicholas (2013), Taylor, Sharples, O'Malley, Vavoula, & Waycott (2004), Zurita & Nussbaum (2007), Huang, Lin, & Chuang (2007), Yau & Joy (2010), Chang, Yan & Tseng Sharples (2009), Sha, Looi, Chen and Zhang (2012), Herrington, Herrington & Mantei (2009) and Churchill, Fox & King (2016).

2. METHODOLOGY

This work is based on a rigorous synthesis of all related research in a particular issue. It is different from the traditional one, since it uses a rigid methodology of search and selection of researches;

analyzes the legitimacy of what was found; collects, synthesizes, and interprets data from investigations (Rother, 2007). In order to select research related to the central scope of this study, it was admitted the scientific survey in the thesis and periodicals database of the Coordination of Improvement of Higher Level Personnel, searching for the articles considered most important by specialists in their field of activity. In a first step, the keywords "requirements for mobile learning" were defined for search criteria, with only peer-reviewed articles being used. In the second stage, a filtering with the same criteria for the selection of national and international theses and dissertations was carried out, in order to collect more information about the topic. At the outset, the journals pertaining to the main issue were pre-selected by reading their titles, abstracts and keywords. Then all the pre-selected were evaluated and each of them was identified as the keywords were revealed, applied and worked out. Then, the data from the studies provided answers to the question from this review. Searches that were in more than one database were removed to avoid duplication. Finally, the data collected were synthesized to present the results.

3. REQUIREMENTS AND PRINCIPLES FOUND IN THE LITERATURE

Table 1 presents the main requirements and principles found in the literature related to m-learning projects.

Table1. *Mobile Learning Models and Frameworks, Adapted From Hsu & Ching (2015)*

Author	Proposed Framework or Framework
Koole (2009)	Framework Rational Analysis of Mobile Education (FRAME) based on three fundamental components of mobile learning: device, student and social
Peng, Su, Chou e Tsai (2009)	Omnipresent conceptual framework of knowledge
Park (2011)	Transactional distance theory framework
Schmitz, Klemke, & Specht (2012)	Conceptual framework to analyze the results of learning games
Abdullah, Hussin, Asra, & Zakaria (2013)	Framework with focus on language learning
Ng & Nicholas (2013)	Person-centered framework for sustainable learning in schools
Taylor, Sharples, O'Malley, Vavoula, & Waycott (2006)	Working model for mobile learning
Motiwalla (2007)	Framework for developing applications for collaborative learning
Parsons, Ryu, & Cranshaw (2007)	Requirements framework for mobile learning environments
Uden (2007)	Framework that uses the Theory of Activity for Mobile Learning
Zurita & Nussbaum (2007)	Framework MCSCL (based on Engedrom's Expanded and Activity Theory Model)
Huang, Lin, & Chuang (2007)	Acceptance Model (Framework / model proposed in the context of mobile learning that adds pleasure and mobility value)
Yau & Joy (2010)	Mobile learning model
Chang, Yan, & Tseng (2012)	Acceptance Model (in the context of mobile learning adding perceived convenience)
Park, Nam, & Cha (2012)	Student Acceptable Model for Mobile Devices
Vavoula & Sharples (2009)	3-level Mobile Learning Assessment Framework
Sha, Looi, Chen e Zhang (2012)	Learning model (SRL) of the mobile phone
Herrington, Herrington & Mantei (2009)	Principles of design for m-learning in higher education
Churchill, Fox & King (2016)	Framework that addresses practical aspects of the context of teachers considering the pedagogical use of mobile technology

Next, each of the proposed Model or Framework was detailed, aiming to identify gaps in the literature in order to provide future directions for research on mobile learning.

3.1. Peng, Su, Chou e Tsai

Peng, Su, Chou, and Tsai (2009) propose a ubiquitous conceptual framework of knowledge. Knowledge can be anywhere, including moving with mobile devices. It consists of a hierarchical structure with 1) mobile learners and ubiquitous computing tools that serve as a foundation (digital educational divide, classroom management, network literacy, and building partnerships for pedagogically sound educational tools); 2) pedagogical methods with a focus on constructivism and

lifelong learning; and 3) vision on how to attain a ubiquitous construction of knowledge. This discussed the ubiquitous learning issues that need to be addressed in order to reach out and expand the ubiquitous knowledge building for mobile learning.

3.2. Park

Park (2011) created the transactional distance theory framework, dividing mobile learning into four types, which includes: 1) socialized m-learning of high transactional distance; 2) individualized transactional high-distance m-learning; 3) socialized transactional low-distance m-learning; and 4) individualized transactional low-distance m-learning. These four types of learning are mediated by mobile devices, with the goal of helping instructors.

3.3. Schmitz, Klemke e Specht

Schmitz, Klemke and Specht (2012) propose a conceptual framework to analyze the results of learning games. This is formed by two components: 1) the mobile game design standards established by Davidsson, Peitz, and Björk (2004); and (2) Bloom's (1956) taxonomy on learning outcomes involving affective domain and cognitive domain to analyze learning games on mobile devices.

3.4. Abdullah, Hussin, Asra e Zakaria

Abdullah, Hussin, Asra and Zakaria (2013) propose a framework focused on language learning. Its goal is to enable students to take advantage of mobile technologies with the help of those who have the most skills. The proposed adapted framework includes five stages: 1) access and motivation; 2) socialization of the network; 3) exchange of information; 4) context and knowledge construction; and 5) development. Its framework did not present an innovative structure, but it did highlight the unique aspects provided by mobile technologies and mobile learning. These unique aspects are 1) network and connectivity between mobile devices, systems, applications and people; and 2) mobility and the corresponding changing learning of contexts. The most capable (adults or peers) can and should help learners.

3.5. Ng e Nicholas

Ng and Nicholas (2013) propose a person-centered framework for sustainable learning in schools. It has a holistic view on how to ensure mobile learning, making stakeholders work together in an inclusive and communicative way. They argued that teachers are central to the success and sustainability of mobile learning. There are other stakeholders who are also important as: directors, coordinators, parents, students, technicians and community. Non-personal components include pedagogy, mobile devices, infrastructure, and interactions between stakeholders. They argued that the following aspects need to be addressed for a sustainable and successful mobile learning program: developing positive attitudes toward students in the program, providing sufficient technologies (hardware and software) and real-time technical support, ensuring stakeholder communication, especially with regard to consultation and feedback to avoid growing tensions and misunderstandings, delegating responsibilities with the trust of the management team to teachers as well as teachers to students. Trust will help members open up and be willing to communicate. In addition, all stakeholders need to develop a sense of ownership of the mobile learning program.

3.6. Taylor, Sharples, O'Malley e Vavoula

Taylor, Sharples, O'Malley and Vavoula (2006) propose a work model for mobile learning, which synthesized theoretical approaches that included sociocultural theory (Vygotsky, 1978), system of activity / theory (Engeström, 1987) and theory of conversation (Pask, 1976). The model has adapted the three components of Engeström: control (prior rules), context (previously community) and communication (formerly division of labor), which opens the way to add layers of spaces to help capture the complicated dynamics of mobile learning activities. The contribution of the model is to add the layers of technological space (communication protocol) and semiotic space (social rules), and emphasize the conversational / dialectical relationship between these two spaces. The task model also includes examples of each component and the spaces in the context of mobile learning systems. It can be useful for evaluating, modifying or creating mobile learning systems.

3.7. Motiwalla

Motiwalla (2007) discussed his experience of transforming e-learning into mobile learning by harnessing wireless connectivity and mobile devices. Its structure consists of requirements that must

be considered when developing mobile applications to complement classroom or distance learning. He proposed a relatively simple framework to address the technical capabilities that enable content delivery, customization, and collaboration in mobile learning. In the content delivery dimension, pedagogical agents and mentors need to be able to take the learning materials or information to the students. Students need to be able to get the information they need (scheduling, notes, learning content, etc.) to their devices. On the other hand, the m-learning system needs to be able to support both personalized learning (alert assignment) and collaborative learning (chat room, discussion board, instant messaging, etc.).

3.8. Parsons, Ryu e Crenshaw

Parsons, Ryu and Cranshaw (2007) propose a requirements framework for mobile learning environments. Its model is divided into four perspectives: 1) generic issues of the mobile environment (role and user profile, mobility, mobile interface design, media types, communication support); 2) learning contexts (identity, student, activity, spatial-temporal, mobile devices, collaboration); 3) learning experiences (organized tasks, results and feedback, goals and objectives, representation or history, conflict, competition, challenge, opposition, social interaction); and 4) learning objectives (expanded skills, new skills, social and team skills). This structure also incorporated the interaction dimension that examines the different needs of individual and collective learning. Compared to the Motiwalla framework (2007), this framework is more sophisticated and comprehensive because it included and discussed more factors and subcomponents of each factor.

3.9. Uden

Uden (2007) proposed a framework for a mobile application that supports conscious and contextual learning. This structure is based on Engeström's Theory of Activity (TA) (1987). Uden argued that TA had advantages to substantiate the use of mobile applications in learning because it recognized the importance of various components and the interaction of those components that make learning (mobile) and successful learning possible. These topics include (students), objects (developed artifacts), goals (learning gain reflected in performance or test results), and tools. Tools, such as computers or mobile devices, can help mediate activities between the participants themselves (communication) and between subjects and objects (achieving the desired learning outcomes). The subjects also interact directly with the tools through the user interface of the tools (mobile devices). It is worth noting that with the emergence of mobile computers and technologies, tools can be integrated (chat / text and video communication via mobile devices) and become even more powerful in mediation. It is a very complete methodology, which addresses issues related to technology, social interactions, organization and development of activities, considering TA as theoretical support for the m-learning project. This methodology seeks to: clarify the purpose of the activity, establish a system of collective activity, giving context and meaning to seemingly random and individual events, make clear the relevant context in which activities occur, analyze the activity system, using activity diagram of Engestrom, analyze the structure of the activity, externalization / internalization of activities and analyze potential primary and secondary contradictions in the scope of m-learning.

3.10.   Koole

Koole (2009) proposed a framework that is intuitive and easy to apply. The Koole framework provides a practical checklist to assist educators in mobile learning. Koole's Rational Analysis of Mobile Education (FRAME) is based on three fundamental components of mobile learning: device, student and social. Koole pointed out that the intersection of the components include: device usability (device + student), technology (device + social) and interaction in learning (student + social). The FRAME model provides an intuitive and concise way to consider and design mobile learning activities. This model can be used: in the development of mobile devices, in the elaboration of learning materials and in the conception of teaching and learning strategies in the context of m-learning. The device aspect refers to the physical, technical and functional characteristics of a mobile device. The student aspect, considers cognitive ability, memory, prior knowledge, emotions and motivations. The social aspect considers the processes of social interaction and cooperation, communication, exchange of information, acquisition of knowledge and cultural practices. The Device / Student aspect, contains usability attributes such as comfort and user satisfaction, access to information and mobility. The Device / Social aspect concerns social technologies, describing how mobile devices enable communication and collaboration. The Student / Social aspect presents the

interactions in learning, with the theory or theories of learning adopted, emphasizing social constructivism. The Device / Student / Social aspect is the main intersection, which allows students to evaluate and select relevant information, define their objectives and reconsider their understanding of concepts, given the context of increasing and changing information, being constantly reformulated by the interaction between the three aspects of the model.

3.11. Herrington, Herrington e Mantei

Herrington, Herrington & Mantei (2009) propose design principles for m-learning in higher education, based on the analysis of the articles in the book "New Technologies, New Pedagogies: Mobile Learning in Higher Education" Herrington et. al. (2009). The principles include: working with authentic situations, exploiting the potential of devices in contexts in which students are moving, enabling the exploitation of the resources of obile technologies, merging mobile and non-mobile technologies, using m-learning to mediate the construction of knowledge, encourage the spontaneous use of mobile devices, use m-learning in non-traditional learning spaces, promote individual and collaborative activities, employ the students' own mobile devices whenever possible, encourage the search, production and sharing of meaningful and understand and exploit mobile technologies. These principles are recommendations, which may be useful in designing m-learning activities in higher education, but which, by being very general, can be adapted without difficulty in other contexts.

3.12. Churchill, Fox & King

Churchill, Fox & King (2016) propose a framework that addresses practical aspects of the context of teachers considering the pedagogical use of mobile technology. Previous studies have pointed to different models for implementing mobile technologies in educational settings. However, few of them recognize the specific reality of an educational environment and the difficulties that must be assumed by teachers in the design and implementation of mobile education. Three different ways of integrating mobile devices into the teaching-learning processes were introduced. The first is to do so in support of the ongoing process developed by the teacher, including new communication channels. The second concerns its use as a source of the ongoing process developed by the teacher's activities, which may not be done in the classroom by the students, and which provide the supply of their educational processes. The third and last is to incorporate a new learning strategy in such a way that the teacher innovates his teaching practice. The framework is divided into six stages: Recognition (m-learning resources, Users and functions, Technical and development resources, Communication process), Analysis (Benefits of m-learning, Inclusion Scenarios, Educational Practice Analysis, Pedagogical Innovation), Identification (Supply, Support, New Educational Experience, Incentive, Feedback Processes), Bases (Coherence with Established Pedagogical Bases, New Experiences, Learning Objective, Context Characteristics, Pedagogical Approaches), Design (Cognitive Processes, Context Functions , Content, Functions, Device Functionality, Objectives, Feedback, Interaction) and Implementation (Context Resources, Required Products, Device Features, Educational Resources, Evaluation). Each of them was designed as part of a process to be followed by the teacher and / or tutor to create effective strategies for mobile integration. This process mainly aims to respond to their educational context needs.

4. FINAL CONSIDERATIONS

Due to this lack, this research had the objective of reviewing the literature on requirements for mobile learning activities, aiming to identify gaps in the literature in order to provide future directions for research on this subject. Thus, this work addresses the main requirements and principles found in the literature related to m-learning projects.

This study contributes to demonstrate, based on the literature review: the main aspects and attributes of m-learning, the needs for the establishment and evaluation of m-learning, the possibilities and potential of m-learning for the teaching and learning processes. The identified and mapped criteria can help teachers and other professionals to use m-learning more effectively in the educational context.

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