

Mobile Personal Learning Environments: conceptualization and structure

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ABSTRACT

The popularization and massive use of Web 2.0 tools by students changes the way their academic activities are carried out and therefore also influence the way in which students learn. This has led to many researchers and scholars to study the Personal Learning Environments. On the other hand, most of people have a mobile electronic device (smartphones and tablets) and its use in education evidence some positive results. These two technological trends in our educational contexts allow us to study what is known as Mobile Personal Learning Environments (mPLE). This article conceptualizes the mPLE concept and proposes a structure for further design and implementation in higher education through the use of Web 2.0 tools.

Categories and Subject Descriptors

• Applied computing~Interactive learning environments • Applied computing~Collaborative learning • Applied computing~E-learning.

Keywords

eLearning; Information and Communication Technology (ICT); Personal Learning Environments (PLE); Mobile Learning; Higher Education; Mobile Personal Learning Environments (mPLE).

1. INTRODUCTION

The Information and Communication Technologies (ICT) currently influence the environments where students learn. In the universities it is observed a massive adoption of the Learning Management Systems (LMS) [47, 22, 39]. Nevertheless the use of these educational platforms are not giving the best results, because the students learn from other contexts and across a multiplicity of resources and available tools in the Internet [32]. These spaces where the student learns are known as Personal Learning Environments (PLE) [5, 1, 9]. This is an issue that has attracted attention of many researchers and academics.

These PLEs can be used in multiple contexts such as the mobile environments [25, 16, 17, 29], due to the popularization of such of mobile electronic devices all around the world. For example, according to a 2014 ITU Statistics Report, per 100 inhabitants on the planet, there are recorded a 95.5 of cellular telephone subscriptions [35]. In the case of Ecuador, one of the Latin American country where the study was applied, in 2013 there were 17'541.754 mobile cellular subscriptions [36], a very high number keeping in mind that the population

registered in the country for this year were 16'240.796 according information of the Institute Ecuadorian of Statistics and Censuses [34]. That is in 2013 the number of mobile phone subscriptions exceeded the actual number of inhabitants.

Likewise, the use of resources and Web 2.0 tools such as blogs, social networks, wikis, etc. in higher education shows significant results [23, 45, 19]. Moreover these resources and tools are not only accessed by using computers but also from mobile devices, which means that also these devices can be exploited for educational purposes [42, 28, 13]. In this case one of being the main feature of these innovations, the personalization of learning through these technologies.

The union of these approaches allows the study of this a line of research that some authors call mobile Personal Learning Environments (mPLE) [6, 15, 24, 26]. Taking this into account the aim of this paper is to conceptualize the mPLE, based in previous scientific evidences and to present a possible structure for its implementation at a university in Ecuador. This will strengthen current learning environments of university students, taking advantage offered by mobile devices [33].

The paper is structured as follows: in the section 2, the mPLE approach is conceptualized. In the Section 3 shows the structure proposal of an mPLE and finally in Section 4 some conclusions and future work are presented.

2. CONCEPTUALIZING THE MOBILE PERSONAL LEARNING ENVIRONMENTS (mPLE)

As commented above, students do not only learn from the diversity of resources and tools available in traditional learning contexts, but also in other contexts such as the provided by mobile devices [27, 53].

Thus, some authors understand the implementation of a mobile PLE as a next step after having experimented with implementations of PLE on personal computers with Internet access. Even though these implementations have allowed us to partially manage what is happening in the institutional environment (formal), there are many resources and tools out of the classroom (informal) where students also learn [31]. For instance, the resources available on the Web 2.0 [20, 54]. In fact, the university student prefer to manage these resources by using mobile devices [14, 38, 4].

The authors García Peñalvo, Conde & Del Pozo defined the idea of mPLE as "...a set of mobile services, tools and communication channels that make easy to the learner carry out learning activities outside the institutional environment with the possibility to return to it the outcomes achieved." [26]

A synonym to mPLE is the Mobile Personal Environment concept (MPE), which is studied by Thüs, Akbari, & Schroeder, as an environment where college students can develop their communication skills for learning, enabling them to offer and receive help from peers through features of localization typical of these mobile devices [50]. This is a feature that could not be found in learning environments based only on PC, where information on mobility and the context is very limited or even non-existent.

This vision of mPLE is limited as it considers only the interaction among students as a mediator of learning. No emphasis is given to the immense potential of resources and tools available in mobile applications' repositories. These apps would enhance individuals' personal learning environments.

In a previous work for the improvement of language learning published by Perifanou [46], the possibility of building a Personal Learning Environment Mobile was presented. To do so this work selected different tools from a broad classification of suggested applications for the iPhone. In this way the mPLE was designed as a set of resources and tools accessed from a mobile device, however, despite this initiative works and it is interesting, it is constrained by a specific technology and knowledge area.

At the present time, the participation of students in the design and development of these mobile learning environments is entirely feasible, even some authors mention it as a result of the learning process itself [52]. In addition, the vast majority of mobile devices that are available today have huge customization capabilities in terms of appearance, functionality and applications [6]. This could imply that the device could be by itself a PLE. However, this approach shows learning as an individual process and does not take into account the advantages of interaction offered by mobile technologies.

Contrasting past contributions and according to our analysis we introduce the concept of mPLE as: The toolkit and digital resources accessible through mobile devices, available from a synchronous and asynchronous way and that allow us to plan and develop an autonomous, self-regulated and lifelong learning.

This mPLE must be designed according to a structure, for this reason we present a proposal that aims to be a benchmark for implementing a mPLE at university level, as shown in the next section.

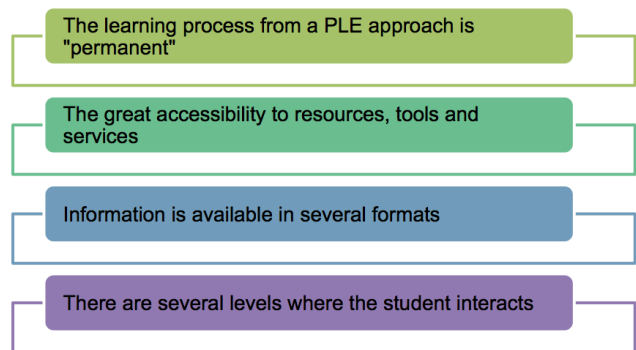


Figure 1. Fundamentals supporting to mPLE structure.

3. STRUCTURING OF A MPLE

The idea of a mobile PLE in the university is allow managing from a mobile perspective all the elements and processes that are part of the students' PLE. Therefore, it should be structured in such a way that the student can manage all resources, tools, activities, networks, etc. In this sense, for researchers García Peñalvo, Conde and Del Pozo, a PLE should have institutional tools, adapted tools and external tools. In these scenarios interaction would occur both with the institutional contexts represented by several LMS, as with other external resources (e.g. some from Web 2.0). So, for these authors the types of tools that should be included in a mPLE, are: 1) tools that interact with the LMS through interoperability specifications, 2) tools used by Web Services of LMS and 3) tools that do not interact with the LMS [26].

However, students in institutional contexts can not always control the resources and tools they employ because the institution define (in different ways) what to use [31]. This means that the tools are not used in a natural and / or self-motivated way. In this sense, Adell and Castañeda present a possible structure of PLE, where the institutional learning platforms would be considered as a resource within the learning environment. Thus, three types of elements are identified at a PLE: 1) strategies and tools for reading, 2) strategies and tools for reflection tools, and 3) strategies and tools to interact with others. Depending on how each of these tools are used they can also be classified in the following categories tools to access to resources, tools for reflection and tools for sharing of information [1, 10, 11].

To perform appropriate structuring of mPLE, the following fundamentals should be taken into account, these are summarized in Figure 1 and are detailed in the following subsections.

3.1 The learning process from a PLE approach is "permanent"

The individuals are continuously learning, from their origin when they discoverer of the surrounding nature and until now, where they have become digital citizen. Taking this into account is not possible to say that people only learn in school, college or university.

This learning process starts from an early age and continues through all stages of human life, but it is specially developed in educational levels and professionalization. This is the reason because governments and institutions promote programs and projects to support the continuous and lifelong learning. For example the European Union (EU) has developed projects such as the Lifelong Learning Programme 2007-2013, which main objective is:

"... Develop and strengthen exchanges, cooperation and mobility so that education and training systems become a world quality reference in accordance with the Lisbon strategy. Thus it is contributing to the development of the community as an advanced knowledge society, characterized by sustainable economic growth with more and better jobs and greater social cohesion." [48]

In this regard there are several programs to encourage and facilitate lifelong learning promoted by the European Union (EU), as the Socrates, Leonardo da Vinci, eLearning programs and the Jean Monnet Action.

3.2 The great accessibility to resources, tools and services

Today there are a wide variety of resources, tools and services that manage information in digital form and can be accessed from a variety of electronic devices.

These devices range from traditional personal computers (PC) to the new watches and smart glasses. It is necessary to point out the great advances of smartphones and tablets that have functions similar to computers but with great mobility features.

The near future is looming with the availability of Internet of the things to receive and send information to and from the network. This makes us think about the new idea of smart cities [8], where the availability of resources and tools everywhere offer immense learning possibilities.

There are currently thousands of tools and resources available either by using a browser or by using mobile electronic devices. For instance Apple iOS App Store (<https://itunes.apple.com/>) or the Android Google Play (<https://play.google.com/store>), that are the two technologies more used around the world [3].

On the other hand, a study by Anderson and Lee of Pew Research Center, asked to 2,558 experts and developers of technology about on their forecasts of our digital live in the 2025 and some interesting issues were found: less effort to access to the Internet and thus to resources, improved global connectivity, the Internet of the things, artificial intelligence, augmented reality and greater higher education coverage with fewer resources expenses [2]. This indicates an increasingly widespread availability of information, resources and tools at all levels.

3.3 Information is available in several formats

The appearance of writing and the subsequent invention of the printing press allowed having books, educational resources that are used in teaching until now.

However, there are other ways to present information as the multimedia resources, where the text can be integrated with elements such as images, photographs, sound, voice, animation and video. The uses in the learning processes show positive effects supported in several scientific studies [18, 40, 12].

This means that currently the information is presented and distributed in different formats and can be accessed from different devices as the mobile electronic devices (smart phones, tablets, smart watches, smart glasses, etc.). It this way, the students have the information and resources in different formats and devices and they should be who decide, what resources are best suited to their way of learning [44].

3.4 The dimensions of student interaction

Another aspect that has been modified with the ICT continuous innovations is the way in which learning actors interact. The old patterns of communication were one by one and one to several that have been the basis of how knowledge is transmitted, first between generational groups and subsequently within the school. Now they have changed to a communication pattern of several to several [7, 37], this influences the ways of interaction and relationship between students. It is possible to identify different kinds of interaction that allow students accessing to one or several areas of knowledge, thanks to the availability of scenarios provided by ICT. Some of these scenarios are shown below.

3.4.1 *Beginners Level*

At this level the student relates to other learners who have a low level of knowledge in a particular area of study, through virtual spaces like social networks, forums, discussion groups, etc. In this exchange of information, the individual will learn to share his knowledge with the group of beginners. In this way it would be possible to enhance situations of learning and reflection, and in some cases, it would be possible to reach a suitable depth on a subject.

3.4.2 *Pairs Level*

These relationships are those interactions between the students and their classmates. The degree of knowledge of the individual would be similar to the rest of the group. This level of relationship is most evident when the student is in a classroom-learning environment, blended or online, where relationships face to face or virtually occurs through technology.

At this level it is where most interaction happens because the teachers or facilitators promote these types of relationships through cooperative and collaborative working both inside and outside the classroom [55, 49].

3.4.3 *Tutor Level*

The teacher - student relationship is present in formal education regulated as in the case of higher education with its various modes of study. This level of interaction is still present in the learning process and should be taken into account when designing the PLE.

On the other hand, there are scientific evidences that recommend the adoption of a new role for teachers in these new educational environments influenced by technology. From being an instructor who that has all knowledge to a facilitator or mediator of the learning process, who validates resources and guides to students [21, 41, 43].

3.4.4 *Expert Level*

One of the biggest advantages of the social web is the ability to access digital identities of the authors of books, scientific articles, journals and other academic and scientific resources. This makes possible to participate in professional or social networks where experts are members and to know first-hand information through their websites, blogs, sites, etc. In some cases you can support a direct interaction at this level, through various tools for synchronous and asynchronous communication.

Taking into account the above considerations, we propose the structure show in Figure 2 to implement an mPLE.

In this proposal it is possible to see that the student is at the center of the learning process, which is divided in four sub-processes: *acquisition, creation, socialization* and *updating*; which are associated with the tasks of searching, editing and reflexion, publishing [11] and information feedback.

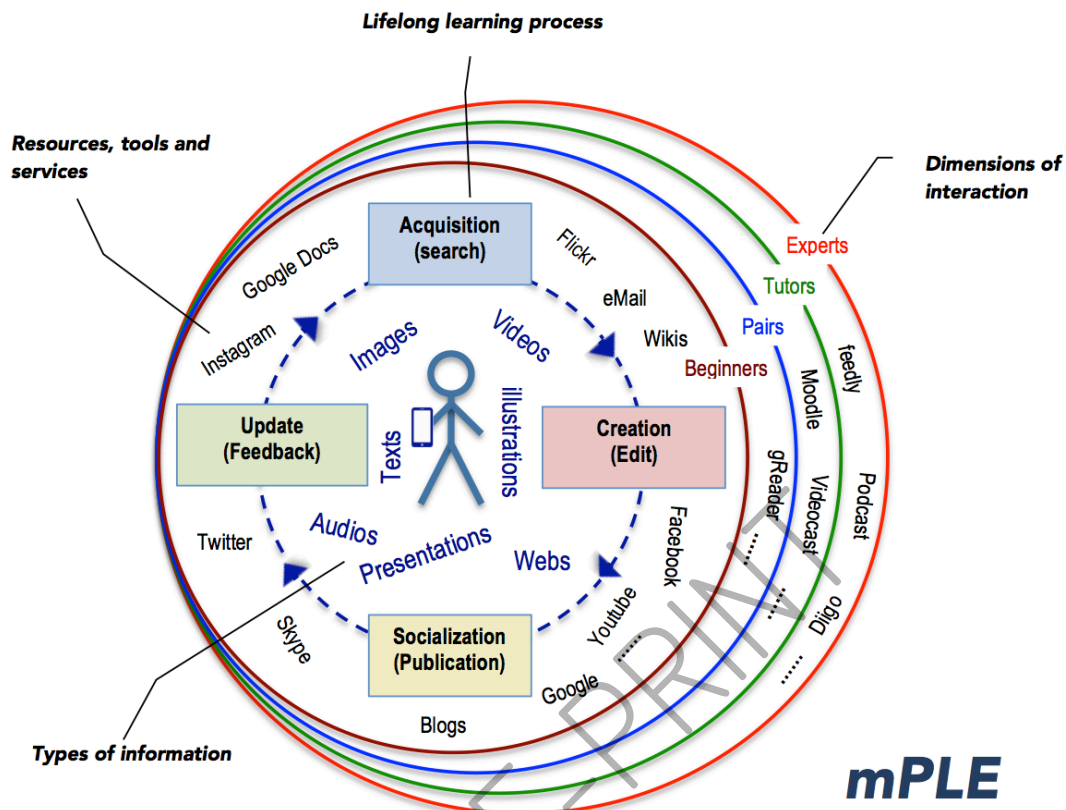


Figure 2. Proposed structure for mPLE.

These processes are developed sequentially and permanently in order to achieve higher levels of learning. As for the information that reaches students on the one hand we have the instrument in this case the mobile device (whether smartphone or tablet) and on the other the content which can be: image, video, text, presentation, etc. In this way is student who must select the resources, tools and / or services available on the network according to his/her preferences, needs, learning style and dimension of interaction.

In fact, the mPLE has countless applications and Web 2.0 accessible sites for mobile devices (Twitter, Flickr, Diigo, YouTube, etc.). In addition they students can use the cloud tools that make possible the edition, publication and/or store of contents.

Finally, we should note that the four interaction levels in this process of acquiring knowledge are identified, and they could be managed separately. However in practice these levels are transparent unless the same student put limits or not, through the options of privacy and accessibility that offer the technological tools.

4. CONCLUSIONS AND FUTURE WORK

Through this document a proposed structure of a mobile Personal Learning Environment (mPLE) is shared with the scientific and academic community. For that, we rely on the work previously done by some researchers; from the concept of what would be an mPLE and taking into account some design proposals.

This contribution is an advance to the development of a doctoral thesis on mobile Personal Learning Environments in Higher Education, developed in the PhD program in Education in the Knowledge Society at the University of Salamanca Spain.

Although its implementation is oriented to higher education, because this is the group with the highest level of penetration and access to technologies [51], its application could be made at any educational level.

Previous works in universities of Spain and Ecuador support the relevance and applicability of this proposal [30, 31], the same that will be implemented in the Latin American university.

It should also mention the importance of a diagnostic study on preferences of college students about electronic devices and Web 2.0 tools, so it was possible to relate their preferences to the various components shown in the proposed design.

In this way the students can design, implement and use their own mobile learning environments, from the proposed structure and according to their usage preferences. The authors of this contribution are currently working with some pilot experiments with a group of engineering students in Ecuador.

Finally it is important to explore the perceptions of students about the use and utility of these educational innovations, and to estimate its contribution to the improvement of learning.

These issues will be studied in the near future, also taking into account the possibility that they can be analyzed in other geographical contexts as in the case of the Spanish universities.

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