# The construction of knowledge in personal learning environments. A constructivist perspective.

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### Abstract

*This paper presents a pilot research study that aims to examine the suitability of techno-pedagogical design in a specific teaching sequence. Currently, this pilot research study is being developed in the subject of Educational Psychology at the University of Andorra. Students should resolve individual and group issues by creating and customizing their personal working and learning environment (PWLE) following the Problem-based learning (PBL) methodology. As a basic tool of PWLE we used the open source software Elgg. Each student has the opportunity to choose and use different tools and services which they consider most appropriate to solve the problems raised on the subject. Also Elgg has allowed us to create working groups with different tools. Together, these groups and the students of PWLE have become the virtual learning community (VLC) in the course on Educational Psychology.*

*The theoretical framework assumed as a reference is the socio-cultural constructivist conception of learning and the concept of the learning ecology process. This conception considers learning as an active process wherein the subject plays a decisive role in the act of learning as well as sharing the process of social construction. Learning ecology proposes that we are facing new scenarios and new niches in learning which the institutions of higher education should try to connect with. From this perspective we see the university as an institution which connects throughout different contexts, wherein the ecology of learning of each student is an open system of multiple influences.*

*This pilot study is part of a wider research project that aims to examine how ICT are introduced, and specifically, in personal learning environments within two different teaching sequences. Firstly, in the subject of Educational Psychology within the Bachelor in Education Sciences at the University of Andorra, and secondly as a subject within the Master of Psychology education (MIPE) coordinated by the University of Barcelona.*

*From the results of the questionnaire and the teacher's feedback, we can draw some conclusions on for what and how students have used the PWLE and proposals in order to make improvements. Finally we present a series of future actions with the aim to complement the results.*

**Keywords:** *constructivist, Elgg, higher education, learning ecology, personal learning environments (PLE), personal working and learning environments (PWLE), Problem-based learning (PBL), virtual learning community (VLC).*

## 1. Introduction

In the world of education and ICT education, the term personal learning environment (PLE) has clearly emerged.  We can trace the origin of this term to November 2004, when the term gained enough prominence to be a topic of a session at JISC Interoperability conference organized in Oxford, UK. Despite the relative newness of the

term, many researches and PLE applications were developed by computer teams or educational technologists. (Liber and Johnson, 2006; Ress and Metcalfe, 2009; Casquero et al. 2010). But research and applications developed by educational psychologists are still in an incipient state. From the discipline of Educational Psychology and from the socio-cultural constructivism perspective, the conception which this research study is based on, we are interested in personal learning environments, in particular because of two main reasons:

1. Learning is an active process of construction where the subject plays a decisive role in the act of knowing and learning.

This way of conceiving learning as an active process by the student gives relevance to two main characteristics of PLE: personalization and control by the student. These virtual spaces must allow students to add tools, services, contents and relationships that are interesting to solve a particular task. In addition, these virtual spaces should be controlled by the student and must be customized with personal ownership taken.

2. Learning isn't a strictly individual process of knowledge construction; it's a social and shared process.

Despite the personal nature of PLE, we assume that virtual learning communities (VLCs) and PLE are two sides of the same coin as PLE requires the existence of a virtual learning community. We understand VLC as a community of shared interests and participation that shares information and knowledge in order to learn (Coll, 2004). Virtual learning communities (VLCs) must share a number of interests, use ICT and share a learning task or content. In virtual communities of learning all the relevant members are ready to help each other, although there can be teachers or consultants to guide the other members of the community in their learning process. (Coll, Bustos and Engel, 2008) The individual student's PLE gives value to the connected community due to the fact that the raw material of PLE are the people and the relationships established in the network. The close interdependence of PLE and virtual learning communities understand the learning which takes place with ICT as a socio-cultural mediated process, where first we learn with others and later we internalize the knowledge (Vigotsky, 1978).

We don't want to forget the perspective of the *learning ecology* (Barron, 2005). This perspective understands the ecology of learning that occurs in higher education as an open system which has multiple influences. This perspective argues that we are facing new educational settings and learning niches that institutions of higher education should try to connect with. From the perspective of learning ecology we understand the concept of personal learning environments as the virtual learning ecosystems that students create in the network. From this perspective, personal learning environments are more than technological applications or digital tools; PLEs are a different way of learning using the network as a platform (O'Reilly, 2005). "*Personal Learning*

*environments are not an application but rather a new approach to the use of new technologies for learning. PLEs provide learners with their own spaces under their own control to develop and share their ideas. Moreover, PLEs can provide a more holistic learning environment, bringing together sources and contexts for learning hitherto separate. Students learn how to take responsibility for their own learning*" (Attwell, 2007, p. 7).

This way of understanding PLE is a very attractive approach from a theoretical point of view, but it presents some methodological difficulties when we want to get closer to their empirical reality. Therefore, this research paper proposes the introduction and analysis of students' PWLE in a specific teaching sequence.

## 2. Methods

The main objective of this pilot research study is to analyze the suitability of techno-pedagogical design in a specific teaching sequence. Currently, this pilot research study is being developed in the subject of Educational Psychology. Students should resolve individual and group issues by creating and customizing their PWLE following the Problem-based learning methodology. This first pilot research study is part of a more extensive research which chose the case studies as the methodological strategy. In particular, we propose two cases that correspond to two teaching sequences. Firstly, the subject of Educational Psychology of the Bachelor in Educational Sciences at the University of Andorra and secondly, a module at Master of Educational Psychology (MIPE) coordinated by the University of Barcelona.

We should keep in mind that the final goal of this research examines how students create, customize and use their PWLEs in the course of specific learning activities. Its main objectives are: a) to analyze how students construct and give meaning to their PWLE according to a specific task, b) to analyze how students articulate the different levels of privacy and publicity in their PWLE, c) analyzing the reviews and perceptions of students and teachers on their PWLE for performing a specific task.

### *Description of the technological tool used*

A social network using Elgg 1.7.6 as a basic tool has been created in order to become a virtual learning community (VLC) on the subject of Educational Psychology. Elgg not only allows us to create a virtual learning community but also allows each student to create and customize their own PWLE. Within this virtual learning community students can create their own personal learning workspace, create working groups, interact and share content with different community members.

Elgg is a Content Management System (CMS) open source which allows a personalized user experience and a high level of social interaction. It was developed by David Tosch and Ben Werdmuller of Edinburgh University in 2004 (Werdmuller and

Tosh, 2004). It's defined by its founders as a *personal learning landscape.* It aims to be a platform for communication and learning to be used in the university, school and company context. A few universities which use the CMS are*:* Brighton University, Edinburgh University, Leeds University, Graz University of Technology, Massachusetts Institute of Technology, University of Sao Paulo, etc...

During the development of the subject*,* students have had access to 25 tools or services in their PWLE: *Activity, Audio, Blog, Calendar, Chat, Discussions, Favourites, Files, Friends, Groups, Latest photos, Messages, Message Board, Pages, Photo Albums, Profile Progress, RSSFeed, Search, Tag, Talk me in Messenger, Cloud Tags, Twitter, TwitScoop, Online users, Videos.* Each student within their PWLE had to choose, use and personalize the tools considered most suitable for the development of problems*.* We believe these tools and services allow students to perform basic social cognitive processes that all PWLE should include:

- Access, selection and organization of information.
- Creating, editing, presentation and representative information.
- Interaction and communication with others.

In reference to privacy issues, all content that students personalize in their PWLE offers the opportunity to manage their own access. This access is defined by the student*,* whenever the student creates or manages a content or tool. There are five access levels: private, friends, group, network and public.

| Private | Only the person who created the tool or content has access. |
|---------|-------------------------------------------------------------|
| Group | All persons who are members of the group have access. |
| Friends | Friends of the person who created the tool or content have access. |
| Network | All the people who are registered in the network have access. |
| Public | Open access on the Internet |

*Table 1*. Levels of access to content or tools*.*

Another important aspect of Elgg is the possibility to create working groups. Each working group can add an image or photo, the group's name, a brief description, tags and the website of the group. Each group has the following tools available*: Blog, Calendar, Discussions, Favourites, Files, Pages, Photos and Videos.* Another important aspect is that all the contents of each group have five access levels available*.*

Most of the teaching and learning processes have taken place within the virtual learning community created with Elgg. However, some processes such as basic documentation for the course (syllabus, qualifications) were communicated through the virtual learning environment of the UDA based on Moodle.

*Description pedagogical design*

The subject Education Psychology has developed through problem-based learning instructional methodology. In the process of continuous assessment, we have raised four issues that relate to content and learning objectives for each of the modules of the course. In each problem the students have adopted the role of school teachers to respond to a situation or problem scenario trying to be as credible as possible. Firstly, each student individually sought information about the problem and expressed his/her thoughts through his/her PWLE. After the individual work the students created a working group which gave collaborative responses to the problem.

*Instruments for data collection and analysis procedures*

It was decided at the end of the second problem, to support the investigation by a quantitative methodology: a questionnaire addressed to students. This questionnaire aims to explore the uses and attitudes of students regarding their PWLE. Because the population is relatively small, we have decided to give a questionnaire to all students participating in problem 2 (a total of 11 students). Of these students, 10 have finally completed the questionnaire (90.91% of the total). Due to the small population of this study, we have done the data analysis using descriptive statistics by the statistical program SPSS.

3. **Results**

In this section we will first describe the results of the questionnaire and secondly, we will introduce some evaluations from the lecturer-in-charge of the subject of Educational Psychology.

Students participating in this pilot research study are between 18 and 31 years old with an average age of 22.7. In relation to their medium of instruction half of them come from the French education system, 30% come from the Andorran system and the remaining 20% come from the Spanish system. About 70% of these students are placed at average level of ICT use, 20% are at advanced level and only 10% are at the basic level. All students affirmed that they connect to the internet between 5 and 7 days a week and they mostly use it to communicate, find information, do tasks and download music and movies. However, they use the Internet less often for activities such as shopping, selling and playing.
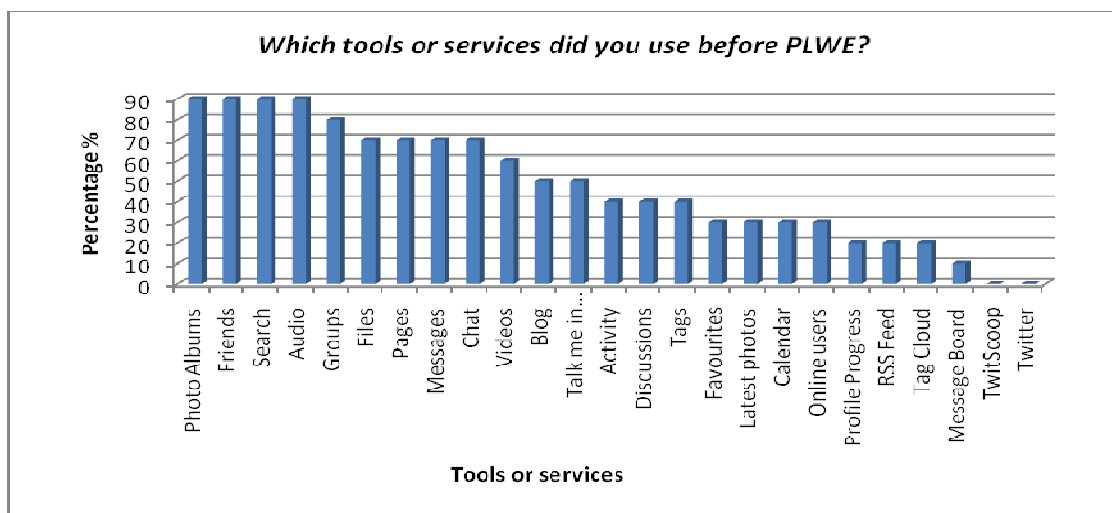
The following graph shows the tools and services that students consider most useful in relation to their learning process. These are mainly: *Blog, Groups, Files* and *Activity*. Instead the less valued tools are *Talk in messenger, Twitter, TwitScoop* and *Online users*.
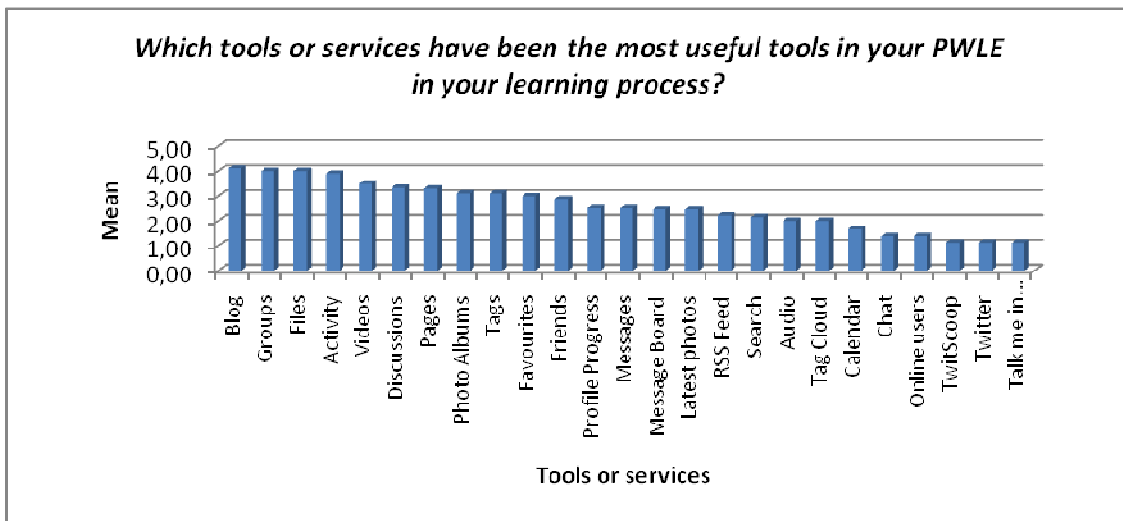
*Figure 1.* **Tools and services most useful for the learning process.**

On the question of if they found something missing in their tool or service in their PWLE, 90% of them responded negatively. One student provided the following observation: "*It would be interesting to create a common space like a forum or blog where everybody can explain things, discuss, talk and give opinions*".

Students reported that they had used the following tools before using PWLE: *Photo Albums, Friend, Audio* and *Search*. 90% of students responded that they already knew them. *Files, Pages, Messages* and *Chat* were known by 70% and *Videos* by 60%. However *Twitter* and *TwitScoop* were not previously used by any student.



*Figure 2.* **Tools and services of water treatment process used previously.**

On the question of which tools will be part of their future personal learning environments, the following graph shows that the tools most valued by a large percentage of students are *Friends, Blog, Files, Activity, Videos, Pages, Search and Chat. Twitter* with *TwitScoop* appearing last again.
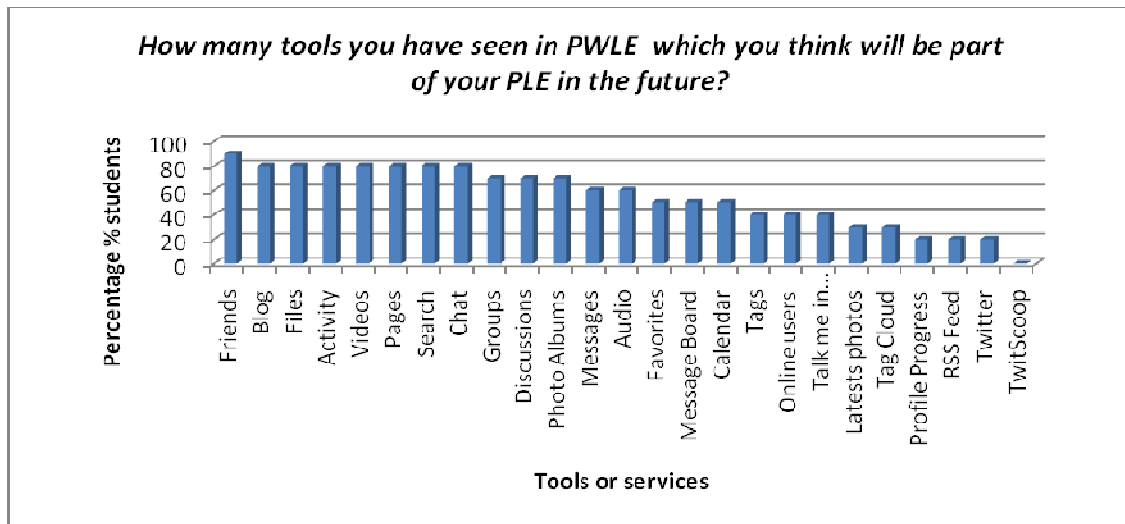


*Figure 3.* **Tools which will be part of students' PLE in the future.**

On the kind of content (Text, Video, Image or Audio) that students use most often in their PWLE in all their interactions (Select, Create, Share and Work) the results are similar. The kind of content that appears most often when we compare the arithmetic mean (with an answer range of 1-5) is Text, followed by Video and Image. However Audio is used less frequently.

| Actions | Contents | | | |
|---------|------|-------|-------|-------|
|         | Text | Video | Image | Audio |
| **Select** | 4,4 | 3,8 | 3,6 | 1,8 |
| **Work** | 4,5 | 3,9 | 3,5 | 1,8 |
| **Create** | 4,7 | 3,9 | 3 | 1,4 |
| **Share** | 4,7 | 4,1 | 3,1 | 1,6 |

*Table 2.* **Arithmetic mean of different types of content.**

When we asked the students which of the five levels of access (Private, Group, Friends, Community or Public) they have selected more often, we see in the following graph that Public has been chosen systematically by 70% of students. In contrast 60% of students responded that they have never chosen Private.
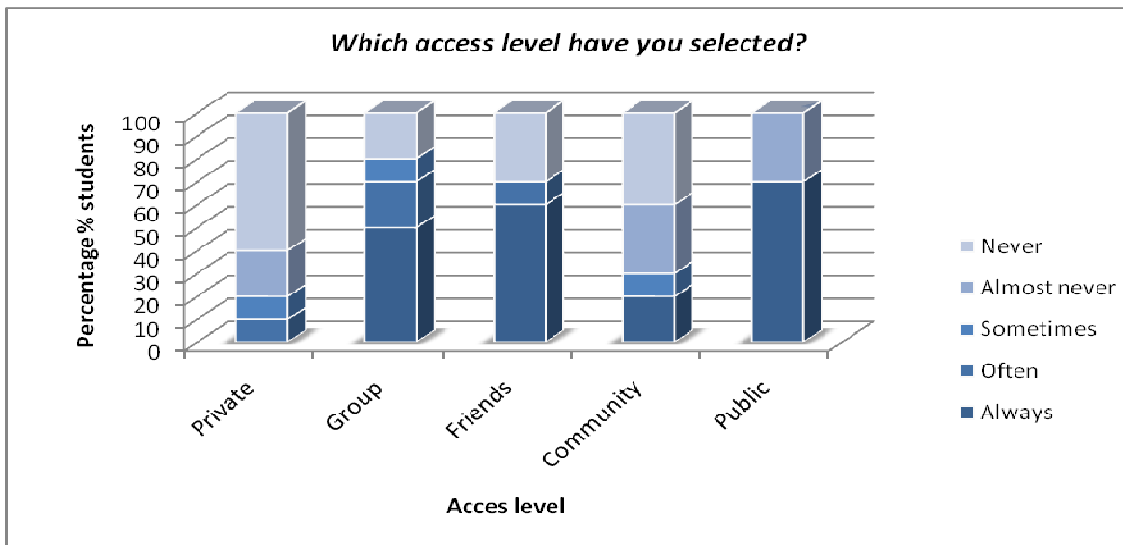
*Figure 4.* **Level of access selected**

In relation to the different tasks that allow PWLE, students appreciate the possibility of doing individual tasks, presenting information and working through the PBL methodology. However students appreciate least the organization of their own work space and setting their own learning schedule.
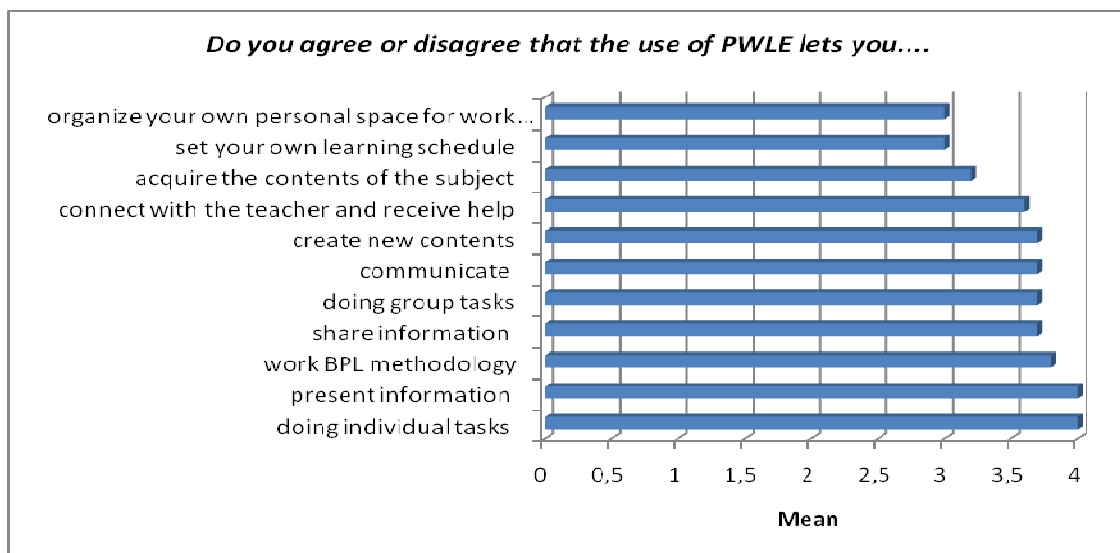


*Figure 5.* **Students' opinion on how to do tasks in their PWLE.**

Students show a good opinion on what they had learned to solve the problem. 40% of students answered that their learning had been acceptable and 40% higher. Only 10% of them answered lower or higher.

With regard to the facility or difficulty of using PWLE we observe that the majority of students think that PWLE is moderately difficult and 10% consider it difficult. Students show an acceptable level of satisfaction (50%), high (10%) and very high (10%). By contrast 20% of them revealed a low level of satisfaction.

We want to conclude the results of the questionnaire with some observations made by students. They agreed that "*it has been a good experience, a new way of working and is useful to complement the learning process in a subject for its ease of use*, *comfort and motivation*". They also noted that "*it's good for sharing information but not for presenting papers*".

In general terms, the assessment of the lecturer-in-charge of the course towards the techno-pedagogical design has been very satisfactory. Although it is considered that using Moodle and Elgg at the same time created some duplication. This has resulted in the common space of VLC being little used. In addition it is necessary to revise the problem statements to concretize individual and group tasks better as well as adapt the timing of the course better.

## 4. Discussion of results

From the results of the questionnaire and the teacher's feedback, we can draw some conclusions on for what and how students have used the PWLE and proposals in order to make improvements.

Students consider the most useful tools in relation to their learning process are *Blog, Groups, Files* and *Activity*. In general, they are not missing different tools that are available in their PWLE. The most valuable tools are not exactly the tools that students have previously used. This indicates that students have discovered useful tools in their learning process. In reference to the tools that will be part of their PLE in the future, we note that tools such as *Friends* and *Groups* are the most valued. This shows us that the interactions established in the network are an important part of their present and future PLE. Despite the personal nature of PLE, interactions that are established in the network play a key role in the formation of PLE and the construction of knowledge.

One of the surprises has been that students have little used and valued *Twitter*. We consider this data in the context of attendance in the subject where students are in class every day, and they don't need synchronous communication tools like *Twitter*. This data relates to the comment of a student who works and studies at the same time. In particular, she appreciates PWLE because she can work at home at her own pace. We suggested that the introduction of PWLE would be appropriate especially, in virtual or blended learning processes.

Another interesting finding is the primacy of text and video over image and audio in selecting, creating, working and sharing contents. It would be interesting to complement these data with an in-depth interview using a representative pair of students, in order to investigate why text and video have preponderance, and what difficulties students have found when they worked with image and audio content.

In relation to students who have used PWLE, they appreciate the possibility of doing individual tasks and presenting information found on the Web better. On the other hand, we observed a low valuation to actions such as organizing their own work space and setting their own learning schedule. This issue concerns us particularly because we believe that one of the main features of PLE should be to allow the organization of the contents and tools as the student decides. This low rating was due to some technical aspects, implicit in the installed version of Elgg. This version doesn't allow us to offer students the possibility to create tabs or sub-windows in order to organize the contents and tools. It would be advisable in future editions to include a version that allows the creation of tabs or sub windows where you can organize your information.

In this section we want to emphasize that PWLE is appreciated by students as an appropriate space to work through problem-based learning methodology. This has occurred because Elgg allows creating different comfortable spaces for individual and group activities. This duality is one of the most enriching aspects of PWLE. We also emphasize that the PWLE lets us create a virtual learning community by creating a common space for all members of the community. This would be one aspect to improve in future editions, thereby avoiding duplication and including all processes of learning within a unique virtual community of learning.

In regard to the issue of *how* students have used PWLE we want to highlight the aspect of Privacy management. We note that a minority of students have chosen the private access option. On the other hand, *individual tasks* has been one of the best appreciated tools used. It would seem that students have not thought of individual work as private work. In contrast, in most cases they have been made Public within the community and on the Internet. These results are very interesting and it would be appropriate to collect more information using qualitative techniques such as interviews. The goal is to find an explanation to this fact which could be caused by various reasons. On the one hand, students could have difficulties managing privacy on the Internet, or it could be that the formulation of the problems caused the students to understand the space more as shared, rather than as individual space.

On the use of the tool, we observe it to be moderate. Considering that students generally feel they have an average level in the use of ICT, we can conclude that at

the time of introducing PWLE in a didactic sequence, it is necessary to plan scaffold actions to support the implementation, as well as make continuous assessments.

Finally, we would like to add that this pilot research study is still in progress. We have planned future interviews with the aim of putting special emphasis on students using PWLE in relation to different social-cognitive processes.

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## References

Attwell, G. 2007. Personal learning environments-the future of eLearning? *E-Learning Papers*, vol 2, no. 1 January 2007  ISSN 1887-1542

Barron, B. 2005. Learning ecologies of Digitally Adept Youth: Implications for seeding the development of technological fluency for all. Presentation at the Power Users Conference in San Jose, Costa Rica. August, 2005. Sponsored by Education Development Center (EDC).

Casquero, O., Portillo, J., Ovelar, R., Benito, M. and  Romo, J. 2010. iPLE network: An integrated eLearning 2.0 architecture from university's perspective. *Digital Education Review*, no. 18

Coll, C. 2004. Las comunidades de aprendizaje. Nuevos horizontes para la investigación y la intervención en psicología de la educación. Paper presented at  *IV Congreso Internacional de Psicología y Educación. Simposio: Nuevos horizontes en Psicología de la Educación*. Almería, April 2004

Coll, C., Bustos, A., Engel, A. 2008. Las comunidades virtuales de aprendizaje. In *Psicología de la educación virtual. Enseñar y aprender con las tecnologías de la información y la comunicación*, ed. Coll C. and Monereo C., 299-319. Madrid: Morata

Liber, O. and Johnson, M. 2006. Personal learning environments. Final report. http://www.jisc.ac.uk/whatwedo/programmes/elearningframework/cetisple.aspx (Accessed June 26, 2010)

O'Reilly, T. 2005. What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software. Communications & Strategies, no. 1, p. 17.

Ress, R., and Metcalfe, M. (2009). Ravensbourne leaner integration final project. http://www.jisc.ac.uk/whatwedo/programmes/elearningcapital/tsle/ravensbourne.aspx (Accessed April 20, 2010)

Tosh, D. and Werdmuller, B. (2004). Creation of a learning landscape: Weblogging and social networking in the context of e-portfolios. *Retrieved July, 16*, 2004.

Vigotsky, L. S. (1979). El desarrollo de los procesos psicológicos superiores. Madrid: Critica. (published in english 1978)