NEW APPROACHES IN EDUCATIONAL RESEARCH
Vol. 2. No. 1. January 2013 pp. 39–44 ISSN: 2254-7399 DOI: 10.7821/naer.2.1.39-44

ORIGINAL

Assessing Personal Learning Environments (PLEs). An expert evaluation

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Received on 26 October 2012; revised on 29 October 2012; accepted on 5 December 2012; published on 15 January 2013
DOI: 10.7821/naer.2.1.39-44

ABSTRACT
On the basis of the Research Project funded by the Spanish Ministry of Education under the title "Design, production and evaluation of a 2.0 learning environment for faculty training in the use of Information and Communication Technologies (ICTs)" (EDU2009-08 893), experts have used the external competence coefficient to evaluate the different dimensions of Personal Learning Environments (PLE), namely: technical and aesthetic aspects, ease of navigation, or quality of the didactic elements that make up the environment. A quantitative methodology along with a questionnaire prepared by the author served this purpose. The results obtained highlight technical environment operation, the tools forming the PLE, or the learning object repository as being "very positive." In conclusion, experts emphasise the user-friendliness of environment and tools alike, as well as the educational aspects of the contents available in materials guides

KEYWORDS: PERSONAL LEARNING ENVIRONMENT, TEACHER TRAINING, HIGHER EDUCATION, INTERNET RESOURCES, INSTRUCTIONAL TECHNOLOGY

1 INTRODUCTION

University teacher training stands out as one of the most commonly discussed topics in studies or papers about the incorporation of Information and Communication Technologies (ICTs) into higher education (Cabero, 2006; Bozu & Canto, 2009; Bullón *et al*., 2009; Mehdinezhad, 2012; Reilly, Vandenhouten, Gallagher, & Ralston, 2012; Terantino & Agbehonoou, 2012; Vázquez, Alducín, Marín, & Cabero, 2012). There is no doubt whatsoever at this stage that the degree of success or failure of some models and tools used in teaching-learning processes largely depends on the good, bad or non-existent training of teachers for the correct technical and didactic utilisation of the aforesaid models and tools (Imbernón, 2008).

The degree of peculiarity associated with the social web or Web 2.0 tools, which characteristically are born, grow and disappear at great speed (Bennet, Bishop, Dalgarno, Waycott, & Kennedy, 2009; Castaño, 2009; Roig & Laneve, 2011; Navas, 2012) could be added to all of the above. On certain occasions, teachers might actually not have enough time to be trained on how to use them or even to become familiar with them.

All of this implies a formal change for teachers both in terms of mind-set (Cabero, Marín, & Infante, 2011) and with regard to action design, planning and implementation, which in turn forces us to stop pondering so much about how things are taught and to place more emphasis on how people learn, though never losing sight of the link that connects both areas. In short, it involves the development of teacher competences such as those described by Valcárcel (2003) in the following terms:

- Cognitive competences specific to teacher duties in a particular discipline. They involve appropriate training –i.e. a broad knowledge of the specific discipline and pedagogical field that can permit to develop relevant training activities to support student learning.
- Meta-cognitive competences that allow teachers to become reflective professionals who are self-critical with their teaching for the purpose of revising it and ultimately improving it in a systematic way.
- Communicative competences, closely related to the proper use of scientific languages (numerical, alphabetical, graphics, etc.) and their different registers (articles, reports, essays, lectures, lessons, etc.).
- Managerial competences related to the efficient management of teaching and teaching resources in different situations and learning environments.
- Social competences connected to actions of leadership, cooperation, persuasion, teamwork, etc., thus promoting training and willingness of their students in this area, as well as their own professional development, primarily within the European Higher Education Area.
- Emotional competences ensuring attitudes, motivations and behaviours that contribute to a responsible way of teaching committed to the achievement of the desired learning objectives.

Society is currently immersed in what has come to be known as the social web (O'Reilly, 2005; Downes, 2007; Selwyn & Gouseti, 2009; Brown, 2010; Castañeda, 2010), the most defining traits of which are summarised and defined below (Castaño, Maíz, Palaci, & Villaroel, 2008):

a) The web as a platform: dynamic applications, collaborative applications, and simple, intuitive tools.
b) Programming and composition become easier: AJAx technology, transition towards XML, separation between design and content; ease of interoperability, standards and software not limited to a single device.

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c) Software as a service: online services and applications from the browser, interoperability between services and applications, standards.
d) Making the most of collective intelligence.
e) Everyone is an author who can publish: reading and writing networks, simple and powerful tools (blogs, wikis, photos, videos, podcasts, etc.)
f) Content management: creation and sharing of knowledge, micro-contents, using metadata, syndication, as well as tagging and folksonomy.

All in all, this more socially connected Web allows people to contribute as much as they can consume (Anderson, 2007). Most of the tools and resources available (wikis, blogs, YouTube, social networks, bookmarking, etc.) focus on enabling and promoting user-generated content that can be later distributed through the participation, interaction and collaboration of everyone –hence its "social" label.

The most significant aspect from an educational standpoint is perhaps that this change involves not only a variation in the tools or resources incorporated: it must go further and promote a change of attitude where students have the chance to assume an active role in the teaching and learning process of which they are an essential part by means of self-regulated learning. In turn, the teacher owns the different skills and abilities needed to modify the design and planning of instructional situations in the context of teaching.

Several principles can be associated with everything related to the social web (Palomo, Ruiz Palmero, & Sánchez Rodríguez, 2008): a) An attitude against technology: Web 2.0 has consistently had a strong impact on the field of knowledge; b) The permanent Beta: the tools and resources are continuously developed, new features are often added, distributing the software as a service rather than a product; c) The right to mix a number of reserved rights: Creative Commons (Kapitzke, Dezuanni, & Iyer, 2012) devised a new licensing system for content distribution and use that allows users to share their knowledge without violating privacy rights; d) Emergent: free software which contains mechanisms favouring intrinsic patterns and structures in interactions between individuals; f) hackbility: or the ability to experiment with various data sources, mixing them to create a new product.

It is within this specific context that the concept of Personal Learning Environments (PLEs) appeared some years ago as a new way to understand how students learn as well as how educators teach (Attwell, 2007; Schaffert & Hilzwnsauer, 2008; Adell & Castañeda, 2010; Santamaría, 2010; Modritscher *et al*., 2011; Barroso, Cabero, & Vázquez, 2012; Cabero, 2012).

PLEs appeared as "a new construct in the e-learning literature which finds its support on social media and steadily gains ground in the e-learning field as an effective platform for student learning" (Dabbagh & Kitsantas, 2012).

It could be understood as a possibility to incorporate the tools described above as "social" or "2.0" to the instructional process from a new perspective that took as its reference the student's acquisition of new ways to work in the virtual learning context.

At the same time, and from a first perspective, Barroso et al. (2012) include authors such as Fiedler & Pata (2009), Amine (2009), Reig (2009) or Henri, Charlier & Limpens (2008) as the ones who consider PLEs a self-defined collection of resources, services, tools and devices which can help teachers and students shape their personal learning and knowledge networks.

From this perspective, they are presented as an option, sometimes in contrast and sometimes as an added option, to the traditional learning platforms. Nevertheless, from a different perspective, the same authors (Barroso *et al*., 2012) highlight that the emphasis lies on the educational application component and its consideration as a new educational methodology: "we could say that the concept of PLE includes integrating elements of both formal and informal training in a unique learning experience, as well as the use of social networks that can cross institutional boundaries and the use of network protocols. Here the focus is on the students and on the decisions they make to customise and self-regulate their learning."

It is from this idiosyncrasy that the need arises to design and implement a study combining these two concepts or themes: teacher training and PLE.

This was the challenge assumed in the research project "Design, production and evaluation of a learning environment for faculty training in the educational use of Information and Communication Technologies" (DIPRO 2.0), funded by the Spanish Ministry of Education (EDU2009-08893EDUC), and directed by Dr. Julio Cabero (University of Seville), of which some outstanding results have already been presented in different publications (Cabero *et al*., 2011; Cabero & Marín, 2012).

2 OBJECTIVES

Even though the development of this research revolved around four basic objectives that interested readers can find in other published works (Cabero & Marín, 2012), the present article has as its main aim:

a) To validate the telematic learning environment, regarding both the contents proposal and the different communication tools (blogs, wikis, etc.) created.

The first step taken to achieve that aim was the construction of a personal learning environment that can be found in the following address: http://tecnologiaedu.us.es/portal/, to which another environment had to be added for the management of materials and contents, also known as learning objects: http://tecnologiaedu.us.es/dipro2.

3 MATERIAL AND METHODS

An instrument was developed within the project to carry out the PLE evaluation process; it could collect information about the two environments developed, both independently and jointly. The instrument simultaneously incorporated questions aimed to obtain some background information about the experts, such as: qualification, institution where they worked, specific job, etc. The total number of items in the instrument was 38, of which 29 were intended to collect information from the environment. The remaining nine focused on obtaining information about the most relevant features of expert evaluators.

A number of previous instruments used in other research studies were taken into account for the construction of the instrument used in this study (Cabero, 2006; Vázquez *et al*., 2012).

This strategy based on using experts in educational research for the evaluation of teaching materials is quite usual (Salinas, 2004; Barroso & Cabero, 2010) since it has three advantages: the theoretical quality of the responses achieved; the level of depth in those responses; and the possibility to obtain detailed information.

As for the ways in which the strategy can be implemented, several options exist:

a) Individual aggregation of experts (it implies obtaining the information individually from different experts without them being in contact);
b) Delphi method (which individually and anonymously collects the experts' opinion and gives back to them the collective proposal for their review and agreement) (Malla & Zabala, 1978; Romero, 2012);
c) Nominal group technique (experts contribute with their information individually, after which an agreement is reached in a group meeting);
d) Consensus method (the selected experts reach an agreement as a group and all together).

The first option was adopted for our study; that is, selecting and aggregating each expert individually. Different criteria may guide this process (Brill, Bishop, & Walker, 2006; García & Fernández, 2008) but these were the ones followed in the present study:

a) Work experience in the field of Educational Technology, Information Technology and Communication Applied to Education, or e-learning
b) Experience in virtual training, e-learning and PLE
c) Training experience of over five years
d) Belonging to different Spanish and Latin American Universities
e) Having previously collaborated on other research works

A total of 84 experts were invited to participate in the evaluation, 70 of whom responded in time for the data collection. The "expert competence coefficient" or K coefficient (García & Fernández, 2008; López, 2008; Blasco, López, & Mengual, 2010; Mengual, 2011) was applied on them in order to narrow our selection. This coefficient has already been incorporated in numerous works: Cuesta and Godinez, (2008); López, Stuart, and Granado (2011, 2012); Góngora, Hernández, García, and Sánchez (2009); González and Vidaud (2009); Betancourt, Cobelo, and Zabala (2010); Herrera, Iglesias, Contreras, López, and Sánchez (2010); Mengual (2011); y Zayas (2011).

The coefficient is obtained by applying this formula:

$$K = ½ (Kc + Ka)$$

where *Kc* is the "coefficient of knowledge" or information that the expert has about the topic or problem. Its calculation is based on the evaluation made by the expert on a 0-to-10 scale, multiplying it by 0.1; in turn, *Ka* is the "coefficient of argumentation" or the foundation of the expert criteria, and it derives from assigning a number of ratings to different argumentation sources that the expert might have used.

The values obtained after the application of the formula permitted to establish that experts with values below 0.8 should not be used for the study, as a result of which 17 of them were removed from the group, leaving a total number of 57 experts.

Regarding the academic titles of the experts that finally took part in the study, 47 (82.5%) were doctors, 8 (14.0%) had a master's degree, 1 (2.9%) had a bachelor's degree, and 1 did not fill in this item.

Most of them (*f*=56, 98.2%) developed their professional activities in universities, and only one of them (1.8%) did not. The vast majority were teachers (*f*=51, 89.1%), followed by those who carried out management as well as teaching tasks (*f*=4, 7.0%); only 2 of them exclusively carried out management activities (*f*=2, 3.5%). As for whether they had taught any subjects related to ET and ICTs, most of them claimed that they had (*f*=55, 96.5%), and also that they had published or taken part in a publication related to this research topic (*f*=54, 94.7%).

4 RESULTS

First of all, Table 1 shows the mean values and standard deviations achieved in the three main dimensions that constituted the data collection instrument. For a correct interpretation of them, note that the answering options were: "MP (*Muy positivo*) = Very positive / I strongly agree (6)" to "MN (*Muy negativo*) = Very negative / I strongly disagree (1)", and all of them had six response options.

Table 1. Mean values and standard deviations carried out by experts in the environments perceived all together and separately

Dimensions	*M*	*SD*
(1) Assessment of both values jointly	5.21	.62
(2) Quality of environment (a) to create a PLE	5.16	1.05
(3) Quality of environment (b) to create a PLE	5.07	.67

The mean values achieved show that the experts gave the environments a positive assessment both jointly and individually. Moreover, the low standard deviations indicate that there was a high degree of similarity between the answers.

The scale used to rate the two modules together collected data about three sub-dimensions at the same time: technical and aesthetic aspects; ease of navigation and scrolling through the environment; and program's tutorial/guide. The results obtained can be seen in Table 2.

Table 2. Mean values and standard deviations carried out by experts within the environments in three sub-dimensions

Joint assessment of the environments	*M*	*SD*
(1) Technical and aesthetic aspects, ease of navigation	5.19	.9
(2) Scrolling through the environment	5.18	.81
(3) Program tutorial/guide	5.38	.82

The results offered below show the values achieved in each of the items for the instrument developed, grouped by different dimensions, where the technical and aesthetic aspects formed part of the first dimension. Table 3 provides the results obtained.

Table 3. Expert evaluation of technical and aesthetic aspects in both environments

Technical and aesthetic aspects	*M*	*SD*
(1.1) Correct operation of the links between the different parts of the environment (there are broken links):	5.21	.94
(1.2) The letters' size and font type is:	5.02	1.03
(1.3) The size of the graphics, texts, animations, ... is:	5	1.02
(1.4) The text page length is:	5.14	.92
(1.5) In general, the aesthetic of the environment could be considered:	5.05	1.01
(1.6) In general, the technical program operation is:	5.44	.68
(1.7) In general, the time to access the different program parts is:	5.39	.73
(1.8) In general, the information display on the screen is:	5.19	.88

Expert evaluation shows that the values obtained were slightly above positive regarding the following elements: correct operation of the links between the different parts of the environment, letters' size and font type, graphic sizes, texts, animations, text page length, environment's aesthetic design, technical program operation, time to access the different program parts, and information display on the screen. Mean scores below five ("positive") were observed in none of the items, the evaluation ("In general, I would rate technical program operation as:") being close to the option "very positive" (5.44) in some of them.

As for the dimension ease of navigation and scrolling through the environment, the values obtained (Table 4) were also situated above 5. More specifically, this indicated that their appreciation of the following areas was positive: ease of use and management of the environment for the user, user's understanding of technical environment operation, recognisability of the overall design in the web environment developed, environment accessibility/usability, and environment flexibility.

Table 4. Expert evaluation on ease of navigation and scrolling through both environments

Ease of navigation and scrolling through the environment	***M***	***SD***
(2.1) In general, the ease of use and management of the environment for the user is:	5.37	.7
(2.2) In general, user's understanding of technical operation of the environment is:	5.19	.77
(2.3) From your point of view, the recognisability of the overall design in the web environment developed is:	5.16	.77
(2.4) From your point of view, the environment accessibility/usability is:	5.16	.9
(2.5) In your opinion, the environment flexibility is:	5.02	.92

The environment included a support "guide/tutorial" and the experts evaluated it as well. In this sense, the values obtained were highly positive, both regarding the ease to understand it and its simplicity (Table 5).

Table 5. Expert evaluation of the program's "Guide/Tutorial"

Program guide / tutorial	***M***	***SD***
(3.1) In general, the tutorial's usefulness and understandability when trying to know how the environment works is:	5.32	.91
(3.2) The tutorial is simple and understandable	5.37	.77
(3.3) How would you rate the tutorial's ease of use?	5.42	.78

Below are the results obtained for the environment defined as "Personal learning environment (a)." As shown in Table 6, the data was highly positive, especially regarding the following items:

— From your point of view, the environment developed features the most common tools used to create a personal learning environment (blog, social networks, wikis, ...) (5.29), and
— Rate from an educational point of view the quality of the different tools that are incorporated into the environment (5.23).

Table 6. Evaluation of the environment developed

Quality of the environment (a) to create a PLE	***M***	***SD***
(4.1) From your point of view, the environment developed includes the most common tool to create a PLE (blogs, social networks, wikis, etc.)	5.29	.97
(4.2) How would you rate the integration in the environment of the different tools (blog, wiki, LMS, etc.) which help to create a PLE?	5.16	.16
(4.3) How would you rate the usefulness of the tools used to build a PLE?	5.17	.06
(4.4) Rate, from an educational point of view, the quality of the different tools that have been incorporated to the environment	5.23	.98
(4.5) How flexible is the environment?	5.03	1.17
(4.6) Do you think the environment can be useful for the educational practice and help the students to build their own PLE?	5.1	1.11

Finally, Table 7 presents the values obtained regarding the additional environment which could be considered as a "learning object repository." Its assessment was also positive, the highest scores corresponding to the following items:

— It is easy to understand how the environment works (5.21).
— Enough materials or learning objects are offered for each unit (5.19).
— Rate from an educational point of view the quality of the different tools that are incorporated in the environment (5.11).

In keeping with these results, it must be recognised that the scores obtained were significant in the rest of the items too: The activities which are presented in each unit suffice for the acquisition of the skills that it establishes (4.94); The structure in which the "materials guide" has been developed can be considered as (4.91); The structure in which the "activity guide" has been developed is, in relation to the objectives that need to be reached: "(4.91); and The procedure to transfer the different learning objects is quite easy (4.90).

Table 7. Evaluation of the environment developed

Quality of the environment (b) to create a PLE	***M***	***SD***
(5.1) It is easy to understand how the environment works	5.21	.98
(5.2) Enough materials or learning objects are offered for each unit	5.19	.94
(5.3) The activities which are presented in each unit suffice for the acquisition of the skills that it establishes	4.94	1.03
(5.4) Assess, from an educational point of view, the quality of the different tools that have been incorporated to the environment	5.11	.95
(5.5) The structure in which the "materials guide" has been developed can be considered as:	4.91	.05
(5.6) The structure in which the "activity guide" has been developed is, in relation to the objectives that need to be reached:	4.94	1.05
(5.7) The procedure to transfer the different learning objects is quite easy	4.9	1,14

5 CONCLUSIONS

Even though this stands out as one of the reference topics in education at a higher education level, both nationally and internationally, it is difficult to find studies and research that can help build a theoretical/conceptual framework around it, or about the practical part of PLE development and incorporation into teaching. Therefore, some of the results already obtained in the investigation and previously mentioned in this article must be emphasized as being relevant.

It should be noted, in conclusion, that the significance of the findings revolves around two main issues: first, the creation of the two environments personally designed and built for the development of a PLE in order to guide university teachers' training in ICTs. This becomes even more significant considering that a rigorous procedure has been followed throughout the present study to select experts evaluating the "a" and "b" environments, and in all the different stages that make up the project itself: 1. Virtual learning environment design, production and evaluation; 2. Pilot study; and 3. Virtual environment presentation.

References have already been made to the progressive abandonment of emphasis on telematic learning platforms towards more flexible and customisable models (from server-based to distributed environments and laptops). A remarkable application of this approach appears in Durall, Gros, Maina, Johnson, and Adams (2012, 2011) who used the project itself as an example of a PLE in practice through the Horizon Project. They actually conceive this perspective as an application of tools from the field of education within a scope of two to three years: "Project DIPRO 2.0 provides university teachers with different online environments to access learning objects, guidelines and criteria for the evaluation of activities: http://tecnologiaedu.us.es/portal/".

As for the results of expert evaluation, and regardless of the positive reviews found both for the technical and the aesthetic aspects, or those referring to ease of navigation and the proper operation of all the environment parts, one particular aspect acquires relevance from a more technical perspective: the suitability of combining OKI (Open Knowledge Initiative) and Moodle, since this has been configured as a combination of tools which can be easily mixed to construct a PLE, hence contributing to its use in formal learning contexts.

At the same time, the design model consisting of materials guides, organised as learning objects in different formats, may be of interest for university teachers interested in the development of materials. With a clear focus on e-activities, it becomes significant for the acquisition of skills needed to train teachers /students, and emphasises the constructivist approach to the learning process as well as the topics that make up each of the guides, to which must be added that it meets another of the research objectives ("To develop basic themes in consensus between different ET professionals on the most significant areas in which university teachers should be trained for the didactic use of ICTs").

One of the big challenges for future research into PLEs from an educational standpoint is to unify them with other types of more institutional environments (Barroso *et a*l., 2012), not from a technological/instrumental perspective as with the Learning Management System (LMS) but rather from a cultural and attitudinal reference perspective.

It is there that most of the problems arise, often caused by the university's inclination towards control and its fear of open, flexible and personal environments: "in order for this learning approach to be significant, i.e., for it to offer real possibilities to acquire high-level institutional learning, two issues possibly need to be reviewed: the competences that students have to succeed in environments with instructive purposes, and the methodological skills owned by the teacher for the incorporation of these new approaches into the educational practice." This last aspect re-establishes the link between the need for technical and didactic training of university teachers, as pointed out at the beginning of this article, but focusing on new tools and, therefore, on new teaching and learning approaches.

Finally, it is worth highlighting that the proposal conducted annually by the Centre for Learning and Performance Technologies becomes not only necessary but also advisable when selecting the tools to configure a PLE, regardless of the degree of customisation that will later be reached with each one of them. Furthermore, as it happened with the pioneering studies on telematic learning platforms, there is a need to focus the challenge of educators towards PLE adoption and integration from a pedagogical point of view rather than from a technical standpoint.

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