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E-Portfolio improving learning in mathematics pre-service teacher

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Abstract

This research is focused on dimensions of mathematical thinking among pre-service teachers learning through the use of e-Portfolios. The data came from portfolios created and reconstructed by future mathematics teachers. Their process of reviewing and republishing pages through the Internet was constantly saved and reviewed in turn by the researchers. Seven case studies were conducted. Results stress the importance of the use of ICT by pre-service teachers as an interface to become more reflective about their learning and to improve their knowledge. Besides being a tool to recognize different dimensions (technological, conceptual and communicative) the e-Portfolios were a powerful resource for creating, publicizing ideas, and learning mathematics in different ways. The article also presents some methodological issues.

Keywords

Pre-service mathematics teachers; e-Portfolios; dimensions of learning

I. Introduction

The innovative and challenging use of Information and Communication Technology (ICT) is a claim in mathematics education. Interactions and thinking imply a growth of understanding. Mathematics education researchers have theorized close links between communication and thinking (Sfard, 2008) and between mathematical discourse and collaborative work or social cognition (Martin, Towers and Pirie, 2006; Powell, 2006; Stahl, 2009). One tool that can be used to promote knowledge construction in teacher education within the context of ICT is the electronic portfolio (e-Portfolio).

Historically the use of portfolios was most common in other areas of knowledge, as, for instance, in architecture and arts fields. In mathematics education its use is still scarce. In a Brazilian context, its use is still based on situations with pencil and paper (Mondoni and Lopes, 2009).

Recognizing e-Portfolios as an important vehicle to exchange information and to publicize ideas and concepts, we are presenting results from a study conducted during 2010 with pre-service mathematics teachers at UFRRJ. The research question focused on the implications for mathematical instruction and on dimensions of mathematical thinking. The research is also a way to promote reflection regarding qualitative assessment in mathematics using ICT. The electronic portfolio will be the vehicle for development of writing and developing authorship in the process of knowledge construction. The results highlight the importance of the use of ICT with pre-service teachers (PST) as a new interface for their own learning, a strategy for them to become more reflective about their learning and to improve their knowledge. The use of e-Portfolio could also provide new issues regarding authoring process and mathematical learning with technology.

II. Theoretical framework

Traditionally, the portfolio is used as a tool for assessment and the analysis is only focused on the progress of the concepts from a specific subject. As a new interface the e-Portfolio constitutes another virtual environment for learning and instruction. For instance, the possibility of publication in a digital version allows teachers and students' accessibility and visibility of the creation and progress of knowledge construction using a lot of sources, links and mediating tools. For instance, postings, videos, pictures, images, notes, gadgets, publishing files, etc.

As a virtual space of learning, the e-Portfolio constitutes a hypertextual environment. We agree that mathematical language and mathematical thinking develop simultaneously in social interaction (Sfard, 2008). Working with e-portfolios, the interaction should be more than a simple compilation of artifacts (Brandes and Boskic, 2008) and promote learning as a reflective and continuous, hypertextual process. According to Aido (2003) the portfolio should be a justified selection of activities (essays, surveys, inquiries, tasks etc.) that reflects learning and instruction.

In our practice, the published portfolio (the product) is not as important in itself as the process of constructing and reconstructing it. In this critical reflexive process, pre-service teachers can reflect critically about their professional actions while developing metacognitive thinking. To

promote this progress the pre-service teachers were assisted collaboratively by teacher and technical assistance to increase their own portfolio.

Hypertexts are important discursive components in the negotiation and construction of meanings on e-Portfolios. Powell and López (1989) note that text construction necessarily involves authors in ordering both thoughts and feelings about things and about thoughts. For instance, as pre-service teachers (re)write and publish texts (movies, resources etc.), they and their readers (the teacher or their colleagues) review their knowledge to understand and reflect on the meaning of the texts.

In virtual scenarios we recognize learning as a hypertextual process. Hypertextual learning implies important differences for both research and learning. In virtual environments, the elements of a communicative message continuously build and rebuild on each other, in both scale and meaning universes. In such environments, a hypertext refers to the multiple formats, ways, and channels that one uses to access information as well as to the social-technical processes of information access (Lévy, 1993).

Hypertexts represent a more complex discourse modality. Hypertexts allow for the organization of information in direct content blocks connected through a series of links that enable the user to instantly access target information. Hypertexts and metaphors are useful vehicles to move away from linearity and chronology to new organizational modes that better illustrate students' cognitive processes (Brandes and Boskic, 2008).

In agreement with Sfard (2008), we consider that the hypertextual development of cognitive transformations is the result of two complementary processes: individualization of the collective and the communalization of the individual. According to her, individualization and communalization are reflexively interrelated. Individualization results in personally modified versions of collective activities, whereas some of the individual variations feed back into the collective forms of doing and acquiring permanence, and are carried in space and time from one collective to another.

Assuming learning as a mediated process by immersion and participation in a particular environment of learning supported by different mediating artifacts, we are interested in analyzing the way in which pre-service teachers construct their e-Portfolio and transform them hypertextually. This process takes on an individual moment (when it is being created), as well as a collective phase (when it is published). Although there appear some isolated moments, they are related, as the (individual) creator has in mind the reader who will access his/her e-Portfolio (communalization).

III. Context, data collection and analytical process

Our ongoing research1 is a longitudinal study focused on the implications for mathematical instruction and on dimensions of thinking among high school students (Costa, 2009; Bairral and Costa, 2010) and in teacher education. During the year 2010 we implemented the e-Portfolio for 20 pre-service teachers during a regular course called "Practice of Teaching Mathematics". Besides the contents concerning instruction and learning processes, the subject of the course was focused on development of geometrical thinking. Promoting reflection regarding

[1] Research granted by Brazilian Foundations (CNPq and Faperj).

construction of knowledge in geometry is still a demand in Brazilian pre-service teacher curriculum.

For this article we conducted seven case studies[2]. The data came from e-Portfolios and every one was considered as a unit of analysis. Each student continually created and reconstructed his or her portfolio. The process of reviewing and republishing pages through the Internet was continually saved and reviewed by the researchers (teacher and graduate students working on a Master's degree program). For the triangulation process we adopted the following procedures and sources. The period of time of observations is also indicated.

Procedures	Sources	Schedule of observation
1. Access and systematic observation on the e-Portfolios	Tables indicating the emergent aspects and changes	Five times during the semester. The date of observation was previously scheduled.
2. Accessing each portfolio and public self-reflection	Notes	Weekly, during the classes
3. Self-assessment3	Writing on paper and posting on the e-Portfolio	Three times (after first, third and last construction/publishing)

Table 1 – Analytical process summary

To access and register the systematic observation on the portfolios each researcher constructs a table as the following. After their observation indicating the emergent aspects, changes and other issues, they exchange the tables[4].

Student	Version 1	Obs.	Version 2	Obs.	Version n	Obs.	Last version	Final observations
1								
2								
n								

Table 2 – Table from each researcher's systematic observation

The University provided one computer for each student. One graduate student in a Master's degree in Education conducted the orientation process of construction and publishing of the portfolios. As progress on the construction was our focus, we provided for pre-service teachers only the first step for publishing, without ICT details. We spent about two class hours giving

[2] Since in a prior study (Costa, 2009) we observed the amount of work involved in this kind of research, for instance, continuously observing the portfolios changes (capturing screens and writings), we decided to analyze only one in our class, the smallest one. That decision is also an important didactical strategy because we need time to analyze each portfolio together (technical, research and PST people implied) and share ideas for future versions.

[3] PSTs are often invited to write about the process of (re)construction of the portfolio and their influence on their learning. There is no specified format regarding this. They are asked to reflect about future ideas and links, conceptual changes, ways of reasoning, constrains (with ICT or mathematics) etc.

[4] On Figure 2 we illustrate as the table is filled. Sometimes we also add screenshots as examples to show improvements.

them the first information and publishing everyone's portfolio. Since it was free, we used the Google sites. The detailed information and technical support was provided weekly during the process of accessing and commenting the portfolios (Table 1: procedure 2) according to students' demands.

In the next section we are summarizing our results underlining two aspects that we observed in the e-Portfolio regarding the pre-service teachers' learning process (i) as a strategy to recognize different dimensions during the process of creation, and (ii) as a resource to study, publicize ideas and learn mathematics in different ways. As an example we gathered the information and carried out the analysis. We are providing data from each procedure (Table 1).

IV. Results

Since the virtual environment is dynamic, it is difficult to gather all the information, and changes happen constantly, so one of our strategies was the creation of screenshots from the portfolios. Those screenshots were almost daily saved. Since the screenshot generated a picture we also visited each link and saved all the postings and writings in order to observe changes in writing discourse. In the following three pictures we see one example of how we capture and highlight the changes (Table 1, procedure 1).

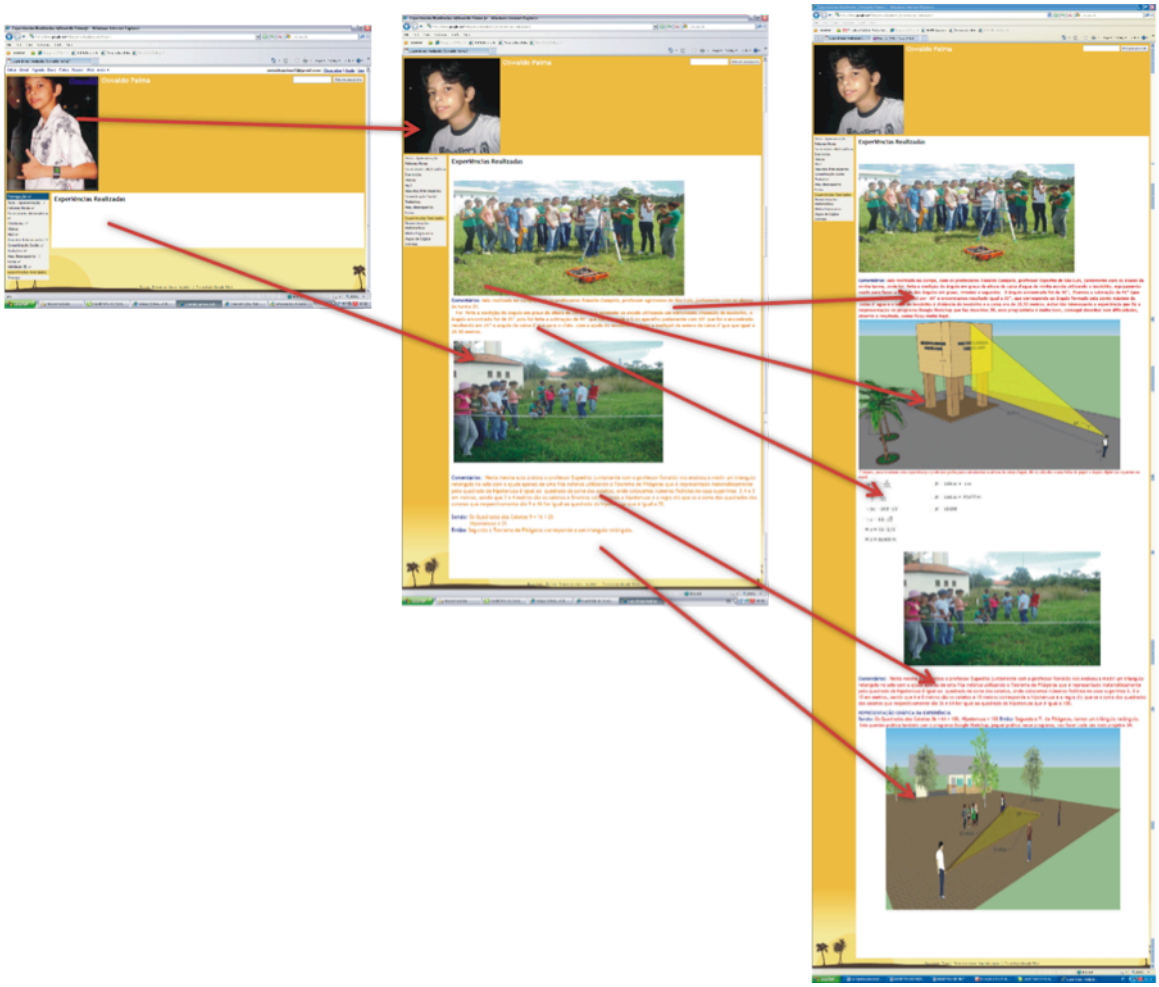


Figure 1. Screenshot from three captured versions. http://sites.google.com/site/oswaldopalma43/

As the arrows indicate, the student changed a previous posted picture, added two new ones, improved his writing and added a gadget. Also, he added pictures as a strategy to explain his way to solve the problem. Using some specific software the student elaborated a geometric representation to make his solution clear.

Since we were interested in improving PST creative thinking we didn't provide a template for the portfolio. Each e-Portfolio had their own format and they weren't compared. Every PST organized links and published information (curiosities, YouTube videos, pictures, etc.) and activities done by them during the course. The only recommendation is that publishing information had to have some significance for him/her. In this hypertextual process of creation and learning, we found three interview dimensions (conceptual, communicative and technological) and observed the continuous motivation and interest of the students regarding mathematical instruction and their own learning process, as we summarize on Table 3.

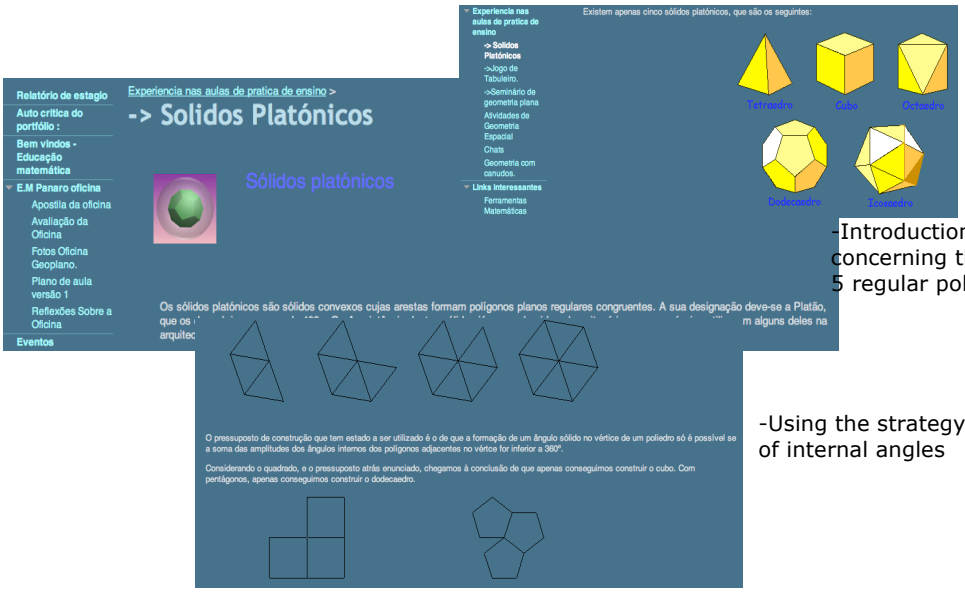
Dimension	Competences	Evidence
Technological	-Use of different sources	-Added pictures, images, videos, gadgets and postings
	-Increase reasoning process	-Use of software to construct figures
Conceptual	-Use of appropriate concepts and property	-Applied the Pythagorean theorem -Explained the solution for the question
	-Increase mathematical thinking	-Added 3-D representation to enrich the process of resolution
Communicative	-Development of writing	-Changes and improvements during the process of construction
	-Promoting interaction	-Comments on the colleagues' portfolios

Table 3 - Dimensions observed: conceptual, communicative and technological

When used in a conventional way (pencil and paper) the use of portfolio tends to be focused on one specific subject or field. Our analysis shows that e-Portfolio can be a helpful tool to promote, among pre-service teachers, the capacities to integrate different areas (Geometry, Algebra, Psychology, Technology, Language etc.) of curriculum and the emergence of different concepts, thinking and sharing experiences.

Accessing the portfolios we can also see different aspects regarding mathematics thinking and learning (Table 1, procedure 2) in progress. For instance, on the following screenshots we show

some aspects that can be observed when PSTs are improving their knowledge regarding the number of platonic polyhedrons.



-Nomination and illustration from each polyhedron

-Introduction of the idea concerning the existence of only 5 regular polyhedrons

-Using the strategy of the sum of internal angles

Figure 3. Screenshot from three captured versions regarding platonic polyhedrons

Looking for aspects on PST learning we also can identify discoveries, constraints and different ways of reasoning. For instance, PST Al posted a reflection about the importance of description in the development of geometrical reasoning.

> "In this lesson, I wrote down a sentence that the teacher said which called my attention: 'The description is very important in learning, mainly in geometry'. Then I asked myself: Why? (…) We have to think before writing, we have to read, to reread, to rewrite until concluding the description. Therefore in the learning process the description becomes an important element through which the teacher provides students' reflections on their knowledge and vision of the world (…)." PST Al (http://sites.google.com/site/profalinecom/aulas/aula-1)

This idea is posted on link Lesson 1 (*Aula 1*) from her portfolio (Figure 4). Her comprehension about the nature of the description and its importance for the learning is clear on her writing. She also gathered one definition from description from a Dictionary, summarized and posted it. On the link Lessons (*Aulas*) she published short reports about lessons. In most of them she used different sources to summon her colleagues for a debate and collective reflection.

Besides conceptual reflection concerning the role of description on cognition the PST adds a picture at the end on the link Lesson 1 as a communicative strategy to motivate the visitors. In the following Figure we can also see her technological improvement organizing the link within different categories (Activities at School/*Atividades na Escola*; Lessons/*Aulas*; Self-reflection/*Auto-crítica*; Schedule/*Cronograma da Disciplina*; Curiosities and Resources/*Curiosidades e Materiais*), as shown on the following screenshot.

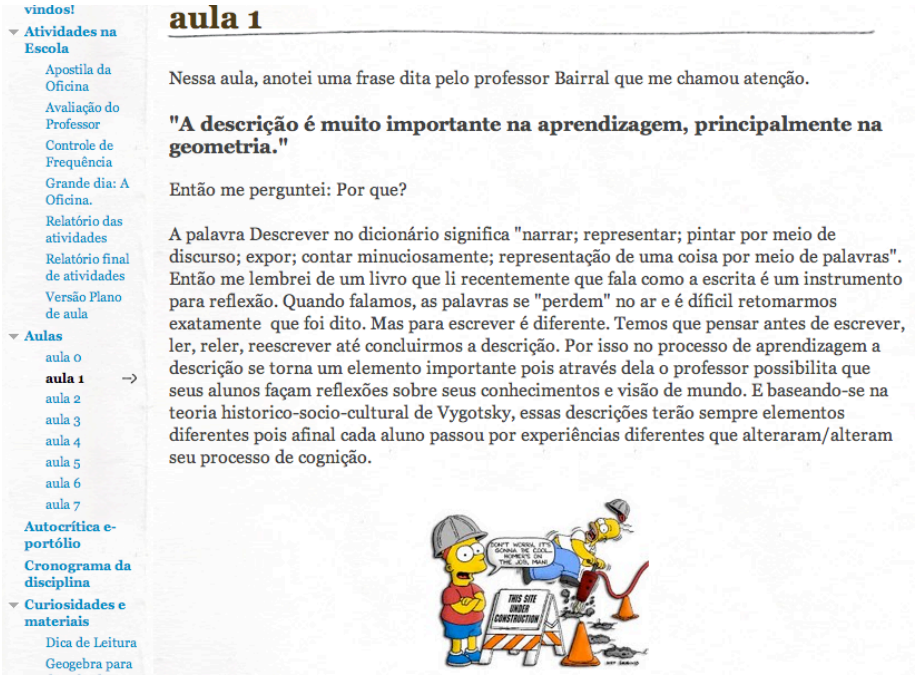


Figure 4. Screenshot from PST An reflecting concerning the role of description on the learning

Writing his first self-assessment (Table 1, procedure 3), PST An reflects about the importance of the e-Portfolio for classes in general and makes explicit some of his plans to improve his portfolio's design.

> "By now the portfolio has been an instrument for investigation of resources and its possible applications in the lessons. I believe that the portfolio has a great potentiality as a complementary resource for classes in general. In version 2, I will do some improvements in terms of a design and information I had in my imagination during this last week" (PST An, self-assessment version 1).

The imagination and reflective thinking regarding the kind of information he will publish (whether influenced or not by his colleagues' portfolios) is visible on PST An's self-assessment. One month later, writing his second self-assessment (see full tipping on link portfolio self-assessment), he appears to feel satisfied with his changes.

> (…) "My current portfolio changed significantly regarding the first version. I already made many improvements in terms of content and 'lay-out'. I really want to improve the interface a little more. I realize that the portfolio has a great potential for the lesson" (…) (PST An, self-assessment, version 2).

Since the process of (re)creation of the e-Portfolio is dynamic and continuously stimulated by the teacher, we can observe his interests and stimulus for new arrangements and changing. His last comment shows how the resource is being apparently powerful in his lessons. The following three pictures summarize the improvement observed on PST An's learning in two domains: (1) his continuous motivation and interest in mathematical instruction and (2) his creative learning reconstruction of his portfolio.

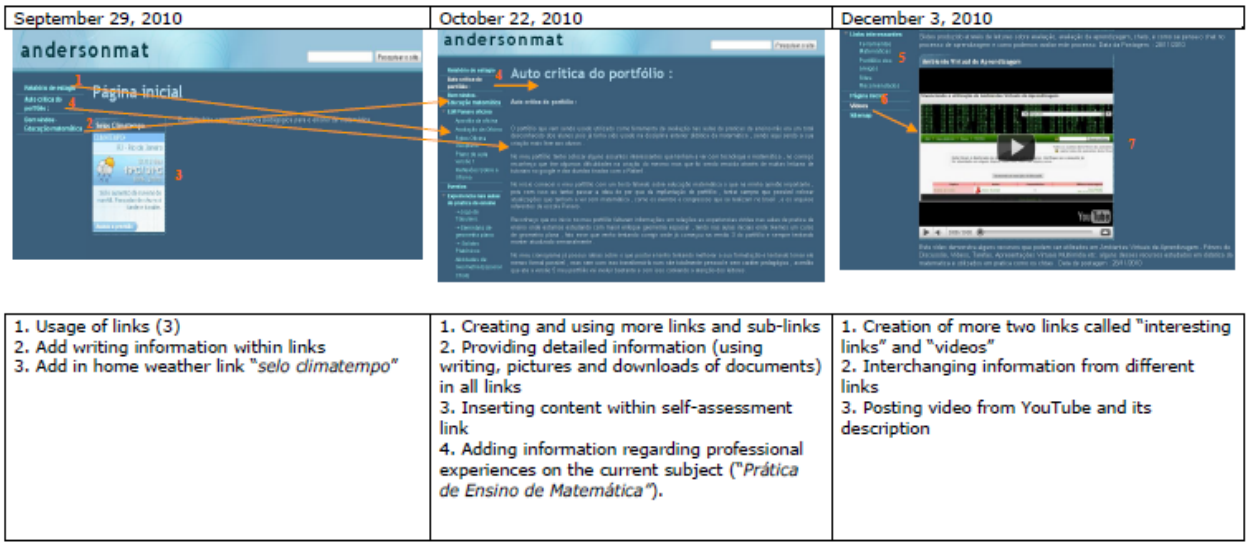


Figure 2. Screenshot from three captured versions (2nd, 3rd and 4th)

http://sites.google.com/site/andersonmat23/

The screenshots show how PST An improves the interface. He changes versions of his e-Portfolios from merely using links to trying to relate information across different links.

Although the process of construction and publicizing portfolios appears as isolated moments, they are interrelated: as the (individual) creator has in mind the reader who will access his/her e-Portfolio (communalization). According to one PST, Tan, this individual process assumes another characteristic: when it is being created, it involves some responsibility and this presented some further difficulty on the creative process. Besides using ICT tools, she had to consider each task in terms of not hurting anyone's rights, as we can see in her self-assessment.

> "What impressed me was working with the tools of informatics the way we worked during the course. Building a website that anyone could access was not a simple task. We had to think each activity so as not to hurt anyone's rights. Besides trying to make the site something that would interest prospective visiting Internet users, so that they would want to visit again later on. (...) Therefore, the creation of the site was something of great responsibility. "

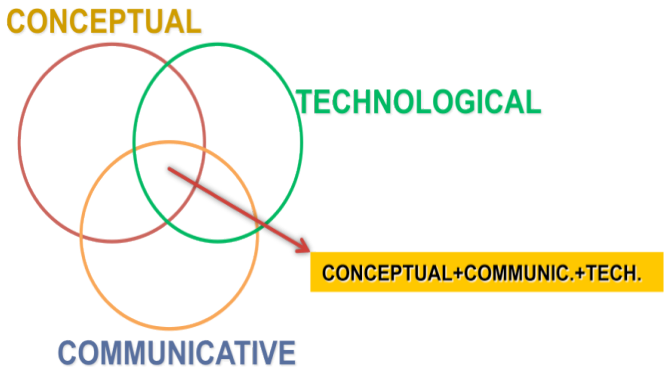
Furthermore, an important way to promote metacognitive thinking emerged from the joint observation done by PSTs and researchers of each portfolio, their sharing of impressions, discoveries and constraints when changing the portfolios. Besides individual responsibility, authorial and creative process, PSTs can reflect critically about their professional knowledge while developing metacognitive thinking (Powell and López, 1989) on the subject.

Finally, our systematic access and analysis of each captured version (Table 1, line 1) of the e-Portfolio show an important pedagogical strategy of researchers and teachers. The strategy involves PSTs in reflection on information published in e-Portfolios and that the information should be more than a simple compilation of artifacts (Brandes and Boskic, 2008).

V. Conclusions

In our research, the e-Portfolio was seen as a systematic meeting point online among pre-service teachers, teachers and the technical support. In this resource PSTs gathered, organized and published their own way. In this section we are presenting issues regarding PST learning as well as methodological ones.

Traditionally, the instruction of mathematics is done through tasks that aim practice in calculus and memorization of formulae applying usual skills or models of reasoning. Using e-Portfolio trainers presents new challenges: it considers mathematical learning involving other dimensions. In our research we observed three of those: conceptual, technological, and communicative, as illustrated in Picture 5.



Picture 5. Interrelated dimensions of mathematical learning

Sometimes we can see aspects of learning in only one set, but our recommendation to teacher education using e-portfolios is to try to improve learning at the intersection of those domains.
Our practice was centered on the PSTs' creativities and potentialities, and providing them with constant stimuli. Although PSTs were always wondering as to format (examples from prior models of portfolios), we feel that teachers and researchers should not interfere during this authorial and creative process. Teachers have to provide technical support and information as far as students ask. Since the use of e-Portfolio implies new ways to deal with the time and creates different expectations on the group, we have seen that the strategy to schedule the dates to access the portfolio is very important.

We agree with Sfard (2008) that discourse permeates and shapes all human activities. The e-Portfolios were an important vehicle to exchange information, change discourses and to publicize ideas, concepts and ways of reasoning. With more experience and further analysis of existing portfolios, pre-service teachers became more nuanced in their organization of their e-Portfolios, reflecting the messages they conveyed (Brandes and Boskic, 2008). Learning with e-Portfolios as a mediating artifact corresponds to a change on discourse. In this process of changing, interactions and collaborative suggestions assumed an important role.
While reconstructing their e-Portfolios pre-service teachers applied technical sources (YouTube videos, pictures, etc.), created different types of activities (reports, curiosities, diaries, games, etc.) and posted information about themselves used by them during the course. This commugnition process (Sfard, 2008) improved by ICT became a useful vehicle to move away from linearity and chronology to new organizational modes that better illustrated students' cognitive processes (Brandes and Boskic, 2008). During this creative and authorial process, we found three dimensions—conceptual, communicative and technological—and observed the

continuous motivation and interest of the PSTs regarding mathematical instruction and their own learning process.

The use of e-Portfolios constitutes a propitious scenario for knowledge construction. This knowledge is hypertextually constructed in the conjunction of images, music, videos, writing and other kinds of discursive manifestation. In this process, the communication, the creation and the authorship assume an important role. As mathematics educators we have to develop ways to promote learning when ICT is being integrated in teacher education programs.

We have seen that it is difficult to use the portfolio for more than a compilation of information. On the first or second version PSTs tend to construct portfolios without relating the information publicized into the links or explaining the importance of the available content for their learning. This kind of relationships can be observed rather after the fourth version. Working with e-Portfolio in a short course (or in a limited period of time) as a way to improve analysis in PSTs is still a challenge.

In future research we will analyze the discourse (postings, writings, etc.) and PST learning across the portfolios' links and even among portfolios. Of course, as researchers we are looking for better procedures to capture, for instance, the changes on the screen and in writings, and other forms of manifestation of discourse.

Taking into account the hypertextual dynamic of the e-portfolios and the amount of information posted, we are going to carry our next analysis focusing on: (1) one activity and related resource; (2) one mathematical conceptual doubt that one would clear, and (3) one PST interest to think and develop in order to improve his/her professional practice. Each PST should decide on those three items and inform the teacher.

Since most teachers consider students familiar and motivated with ICT they tend to use it in some homework assignment. This kind of use provides only for an individual and isolated learning process. Students often do the task at home, show the teacher and the learning process is concluded. Working with e-portfolios involves a great amount of time to observe continuously the changes and the recreation process. Even though we have a schedule to see PST portfolios, we recommend that all individuals enrolled in the process (technical staff, researchers, teachers and students) share their portfolios. For us, this is a strategy to keep participants seduced by the use of ICT as a resource to learning. In terms of research, we have seen that case study provides us with an important strategy to analyze the reflective and creative process in depth.

Finally, when working with ICT teachers often try to transfer their understanding of students' learning. We think we have to promote training courses with ICT that place teachers' knowledge at the center of the process, which includes using ICT in a variety of ways. Although students' learning could be the goal, we would say that working with PST using ICT we might provide them a moment to reflect about their own leaning.

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A Learner-Centred Game-Design Approach: Impacts on teachers' creativity

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Abstract

This study presents an innovative pedagogical approach where teachers become game designers and engage in creative teaching practices. Within co-design training workshops, 21 Spanish primary and secondary school teachers have developed their own Game-Based Learning (GBL) scenarios, especially tailored to their teaching contexts and students profiles. In total, teachers developed 13 GBL scenarios and put them into practice in teaching contexts. The present paper analyses the impacts of this learner-centred game design approach on teachers' creativity from three different points of view: the GBL design process, the GBL scenario, and the teaching processes at stake.

Keywords

Creativity, Game-Based Learning, Game-design

I. Creativity on the stage

Due to several broad transformations in major industrial economies, the twenty-first century requires schools to foster creativity (Sawyer, 2011). Indeed, the function of education is currently being re-conceptualized as building human capital by equipping youngsters with capacities for creativity and innovation (NACCCE, 1999). Nevertheless, creativity still does not seem to play a central role in the curriculum and learning objectives that teachers are asked to follow in European countries (Ferrari et al., 2009).

There seems to be a consensus view within research in education, that creativity is amenable to teaching (Amabile, 1996, Kaufman & Beghetto, 2009, Lin, 2011). For students to learn how to become creative, teachers need to be creative themselves and to provide learners with an ethos and a culture that values creativity (Craft, 2005). According to the National Advisory on Creative and Cultural Education, teaching creatively refers to teachers using imaginative approaches to make learning more interesting, exciting and effective (NACCCE, 1999).

Game-based Learning (GBL) seems to fulfill these requirements. Indeed, games provide challenging experiences that promote the intrinsic satisfaction of the learners and offer opportunities for authentic learning (Gee, 2007; Mims, 2003).

In the context of the ProActive[5] project - Fostering Teachers' Creativity through Game-Based Learning, this study presents an innovative pedagogical approach where teachers become game designers and engage in creative teaching practices. Within co-design training workshops, 21 Spanish primary and secondary school teachers have developed their own GBL scenarios, especially tailored to their teaching contexts and students profiles. GBL scenarios include educational videogames created by teachers embedded in comprehensive units that consider their context of use in the classroom. To do so, they have used two game editors: <e-Adventure>[6], an open-source software for creating adaptable 2D point-and-click adventure games for educational applications; and EUTOPIA[7], a tool for designing multiplayer educational scenarios in a 3D environment. In total, teachers developed 13 GBL scenarios and put them into practice in teaching contexts.

This paper analyses the impacts of this learner-centred game design approach on teachers' creativity at three different stages: the GBL design process, the GBL scenario, and the teaching and learning processes.

II. Creativity in education

In the past creativity was seen by literature as the preserve of a gifted few, rather than of the many, and it was mainly associated with the domain of arts (NACCCE, 1999). However, the scope has been changing to a view through which all people as capable of creativity from early childhood onward. According to this idea, creative potential can be found in every child (Runco, 2003), and its development depends on the kind of training people receive (Esquivel, 1995). Thus, creativity is amenable to education. Furthermore, creativity in education has moved beyond the field of arts, to argue that it is required in all educational subject areas (Craft, 2005).

Creativity in educational contexts can be seen from two perspectives: the one of the teacher being creative and the one of the students being creative. Indeed, NACCCE (1999) made a distinction between teaching creatively and teaching for creativity. The latter refers to forms of teaching that are intended to develop students' own creative thinking and behaviours. It involves teachers in identifying children's creative strengths and fostering their creativity (Cremin, 2009). This is strongly related to the former, as students' creative abilities are most likely to be developed when the teacher's creative abilities are engaged (NACCCE, 1999).

[5] Lifelong learning Programme, Key Action 3, 2010/2011 – Website: http://www.proactive-project.eu

[6] http://e-adventure.e-ucm.es/

[7] http://www.lanas.unina.it/eutopia/

a. Teaching creativity

Teaching creatively refers to teachers using imaginative approaches to make learning more interesting, exciting and effective. Indeed, teachers can be highly creative in developing materials and approaches that foster children's interests. Sale (2005) provides a simple operational definition of creative teaching: "Creative teaching occurs when a teacher combines existing knowledge in some novel form to get useful results in terms of facilitating student learning". Furthermore, Sawyer (2011) provides a list of behaviors in order to give advice for creative teaching, such as trust and safety (i.e. maintaining a psychologically safe classroom environment), problem finding (i.e. encouraging questions and different responses), encouraging surprise, humor, risk taking and allowing mistakes. Cremin (2009) identified a number of features of a creative pedagogical stance, such as adopting a learner-centred ethos, creating space, time and freedom, implementing multimodal teaching approaches, prompting full engagement, ownership and ongoing reflection, modeling risk taking and enabling children to take risks.

Psychologists distinguish process-oriented creativity and product-oriented creativity (Lin, 2011). The former focuses on the "mental process" involving creative potential to generate new ideas and solutions (Esquivel, 1995).

Different authors (Wallas, 1926, Amabile, 1983, Shneiderman, 2000) describe the creative process as an iterative sequence of steps or stages. Models vary according to the number and characteristics of stages. By examining 19 different models, Howard, Culley and Dekoninck (2008) simplify these stages by making three groupings which represent the major phases of a creative process:

Analysis: This phase consists of defining and setting the problem to develop an understanding of what is required in order to generate an acceptable solution. The individual becomes familiar with the content area by building or recalling relevant domain knowledge, and learning from previous works stored in libraries, on the web, etc. Task motivation has to be high, so the individual has sufficient interest to pursue solving the problem.

Generation: This is the creative phase of the process, during which the individual searches through available pathways, exploring features of the environment that are relevant to the task at hand, in order to generate adapted ideas and responses.

Evaluation: The novel ideas and solutions produced during generation are tested, evaluated and verified regarding their appropriateness and value.

On the other hand, according to Cropley (2001), creativity can be seen as a property of products, which might be a tangible (e.g. documents, works of art, etc.) or intangible (e.g. ideas, strategies, systems) result of the creative process (Cropley, 2001). Based a wide number of studies, Villalba (2008) concludes that there is a commonly accepted view of creativity involving the creation of something new and useful. Novel refers to original work, while appropriate concerns the usefulness of the product towards a certain need.

This paper analyses the impacts of this learner-centred game design approach on teachers' creativity at three different stages: the GBL design process, the GBL scenario, and the teaching and learning processes.

III. Game-Based Learning

GBL represents a good candidate for fostering creative teaching practices. Indeed, the literature shows that games have qualities that can facilitate student learning, such as providing challenging experiences that promote intrinsic satisfaction and offer opportunities for authentic learning (Gee, 2007; Mims, 2003), by enabling learners to freely explore the environment in a risk-free environment (Aldrich, 2005). Furthermore, they have proven to increase personal fulfillment and to lead to higher performance (Blunt, 2007).

However, some barriers to the implementation of GBL in formal learning settings by using commercial off-the-shelf games have been identified (Williamson, 2009), such as the lack of

integration of most games with the current curriculum and assessment framework, and teachers and parents concerns over the content of some games. In this context, games created by educators may be easier to integrate in the official curricula. Easy-to-use game editors allow for not only professionals, but also teachers to design educational games.

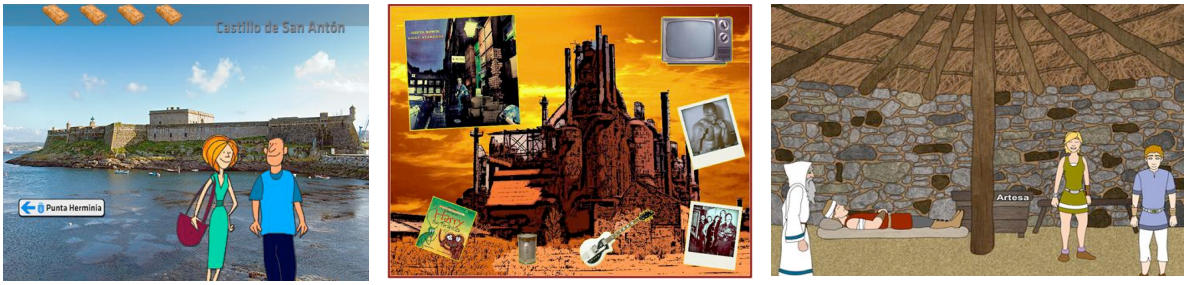
Fullerton (2008) describes the process of game-design with a focus on the player's experience. The author emphasizes the importance of "playtesting" throughout the development process in order to understand the game from the player's perspective, through an iterative, "playcentric" design process. The fact that players are learners adds another dimension to the design, which has not been sufficiently studied in gaming literature.

Game-design processes are reported to promote active learning and foster creativity (Egenfeldt-Nielsen, 2006; Kafai, 1995). However, the corresponding studies refer to the learners / kids as game designers. A literature gap can be observed, regarding the possibilities of game-design by teachers.

IV. The learner-centred game design approach

The study aimed to offer to teachers the possibility to use GBL as an innovative and imaginative approach in their teaching practices. To overcome the obstacles of introducing GBL in formal learning settings, a constructivist approach is adopted, in which teachers designed their own GBL scenarios, specially adapted to students' characteristics. The study was conducted in the following way.

As a first step, a preliminary study was conducted in order to explore teachers' attitude, interests and needs towards GBL and creativity. To do so, two focus-groups were organized by the University of Barcelona research team with 15 teachers from Spanish primary and secondary schools. On the basis of the focus-group outcomes, a training program was designed according to blended learning methodologies, including face-to-face and virtual modalities. During training sessions, 21 teachers from seven primary and secondary schools have been introduced to GBL and have learnt how to use the game editors. On this basis, teachers designed their own GBL scenarios (including digital learning games and complementary educational activities), in an individual or collaborative manner, according to their teaching objectives and their students' profiles. The design process lasted for three months, during which the UB research team provided support to teachers. Support was given through regular meetings and online (Moodle, e-mails, etc.), and was related to pedagogical aspects (definition of learning objectives), game-design strategies (writing of game storyboards, definition of game dynamics and mechanisms) and technical guidance (help on the usage of the game editors). In total, 13 GBL scenarios have been created by teachers, covering a wide range of learning subjects (e.g. History, Physics, and Language Learning) and addressing different educational levels within primary and secondary education.



Picture 1: Screenshots of games created by teachers on History (left and right) and Rock history (middle)

V. Data collection procedures

The study examines creativity through three different aspects, as shown in Figure 1: a) GBL **design**, i.e. when teachers design their educational game and plan a learning scenario; b) the

GBL scenarios, as the results of the design process; and c) **implementation** of the games in the classroom.

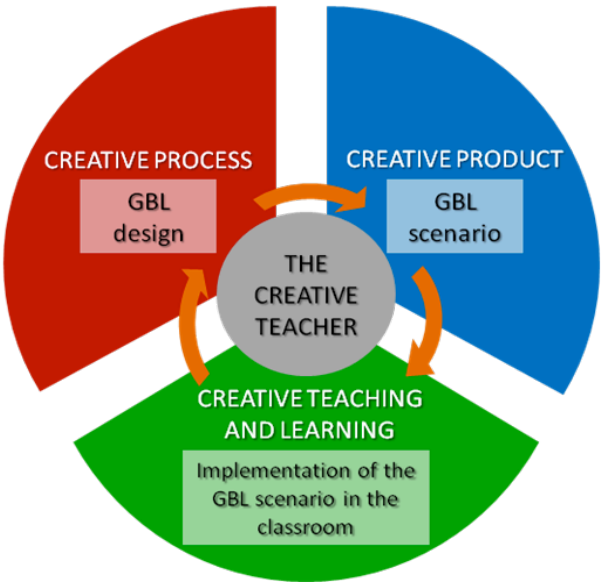


Figure 1: The creative circle of GBL

To evaluate the creative process of GBL design, an open ended questionnaire was designed, aiming to explore the characteristics of teachers' GBL design process within the creative stages identified in the literature. The questionnaire had been validated by recognized experts in the fields of creativity and GBL. It was then filled-in by 16 teachers after the GBL design process.

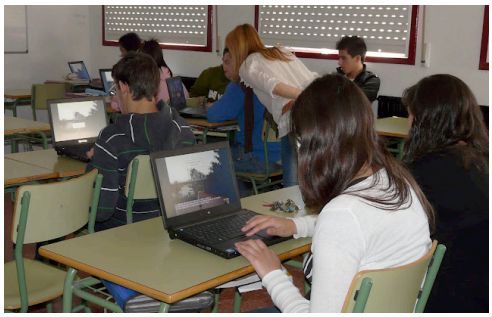
Based on the literature related to the studying the creativity of a product, our study considers a learning artifact (i.e. the GBL scenario and playable game) to be creative when it is new and appropriate to the teaching contexts at stake. In order to define appropriateness of GBL, a review of successful serious games has been performed[8], which enabled to define a set of key features of good educational games. These features have been grouped into three dimensions, namely *gaming*, *learning* and *technical aspects*. Gaming aspects include consistent rules, balanced challenge, appropriate feedback, immersion, good competition and entertainment. Learning aspects include valuable educational objectives, relevance to students' profiles, appropriate evaluation methodology, personalized learning process and motivation. Finally, technical aspects include ease of use, adapted graphics and reusability in different contexts. A questionnaire was designed, aiming to assess the appropriateness of the designed GBL scenarios according to these three dimensions. It was used by independent GBL experts to evaluate the games and the related scenarios designed by the teachers. Three GBL scenarios have been analyzed at this stage. Furthermore, in order to evaluate the novelty of the creative products, teachers who developed the games were asked if they perceived the GBL scenarios as innovative.

Finally, to explore creativity within the teaching processes, pilot implementation was organized in two Spanish schools in Galicia, a region in the North-West of Spain. During two classroom sessions (one in a primary and another in a secondary school) four games, created with the <e-Adventure> game editor, were tested in secondary school level, and one in primary education. In total, four teachers and 46 students were involved. One teacher performed a pilot implementation with 25 students of fifth year of primary school, age 10 and 11 years old. Three other teachers did so with a group of 21 students from first year of post-compulsory secondary school, age 16.

4 - The complete literature review is part of an internal deliverable of the ProActive project (ProActive D3.1 - Success factors for GBL) which can be provided upon request.

The games covered various subjects, such as local History and Physical Education. All sessions had similar settings. Each student had a laptop on which s/he played the game. Each game session lasted between 15 and 20 minutes.

In-depth interviews were conducted with teachers and students who participated in the field implementation in the classroom. In addition, observations were performed during the GBL sessions, i.e. two researchers gathered data through participant observation.



Picture 1, Picture 2: Pilot implementation of the GBL sessions in primary school (left) and secondary school (right)

VI. Findings

This section describes the results of the study, exploring creativity in the three evaluation levels, as described previously: the GBL design process, the GBL scenario, and the teaching processes.

a. Dynamics of the GBL design process

The design process has been previously conceptualized according to three different stages, namely analysis, generation, and evaluation. The results of the questionnaire regarding the creative process of GBL design by teachers are summed up below.

During the ***analysis stage***, teachers engaged in the process of GBL design by preparing for the task. Results showed that teachers considered several of the activities as useful.

- *Definition of the task:* Teachers defined their specific teaching objectives (i.e. students' profiles, concepts to be taught, etc.) and became aware of the resources available, i.e. time, material, etc., in order to define the appropriate strategy for teaching and creating an adequate game. Some of them decided to work collaboratively and established work groups.
- *Exploration of the game editors:* During the training workshops, teachers explored the affordances offered by each editor, in order to know what was possible and not possible to do, and develop their game ideas accordingly.
- *Consulting examples of others:* For 13 out of 16 teachers, examples of similar works provided a clear vision of the editors' functionalities and possibilities, as well as an idea of what was possible to create.

On the basis of the analytical phase of definition and preparation, in the ***generation stage*** teachers generated ideas and responses to create their GBL scenarios through several design activities. Results of the questionnaires elicited the following characteristics for each activity.

- *Conceptualization / ideation:* Teachers generated ideas of GBL scenarios according to different factors. First, exploring the affordances of the game editors determined and conditioned their ideas. Second, consulting examples of GBL scenarios created by others helped them to generate ideas and to decide on which editor to choose. It was mentioned that examples helped teachers understanding what they wanted, and more importantly what they did not want to develop. Teachers who worked collaboratively

stated that sharing opinions enhanced the generation of ideas. Finally, in most cases, ideas were determined by external constraints, such as the time they could dedicate to the design process and the editors' limitations.

- *Prototyping:* 14 of 16 teachers felt more confident writing a storyboard for their game, than working directly with the editors. Indeed, answers showed that it enabled them to effectively expand their ideas into the plan of a full consistent game by planning details about the game dynamics, the forms of gameplay, the content of scenes, and the progression of the narrative.
- *Implementation with the editors:* Teachers' ideas were turned into a working game, within a process of development, which was done through the functionalities offered by the editors.

Teachers' ideas, GBL scenarios and games were continuously evaluated and adjusted by teachers through an iterative process (***evaluation stage***).

- *Peer review:* Teachers often involved peers or experts in the evaluation at different moments of the design process. Furthermore, teachers involved their students in order to evaluate the adequacy of their games for the targeted audience.
- *Testing and redesign:* The work with the editors was interwoven with cycles of testing and redesign. Problems or gaps sometimes became apparent, prompting revision. Continuous adjustments of the game elements were necessary before the achievement of a working game.

In some cases, the initial idea was kept and adjusted along the process. On the other hand, most of teachers adapted their game ideas and objectives all along the design process according to two different criteria, feasibility and appropriateness. The former refers to time constraints and editors' affordances. In a teacher's words, "*I had to discard my first idea because the editor did not enable me to easily develop it"*. Teachers generally adapted, and, in many cases, simplified their initial ideas while they learnt how to use the game editor. The latter looks at the value of the GBL scenarios regarding the teaching objectives. In a teacher words, "*my classes and my students were the context in which I always thought to review my game"*. Thus, students' profile and teaching contexts were the core criteria for the ongoing evaluation of the games.

b. Novelty and appropriateness of the GBL scenarios produced

In order to analyze the creativity of the GBL scenarios created by teachers, two aspects were analyzed, i.e. novelty and appropriateness.

Most of teachers considered their GBL scenarios as innovative. Innovation is perceived according to various criteria: the created resources are seen original in comparison from the ones existing on the educational market, which are normally used in similar contexts; furthermore, the games created are new compared to teachers' usual resources. Finally, the experience offered to students is perceived as innovative, as mentioned by one of the teachers: "*the GBL scenario is innovative in comparison to what students usually do with the computer [in the classroom]". Thus, innovation is both p*ersonal (new in respect to teachers' realities) and social (new in respect to the social and cultural environment).

Results of the experts' evaluation suggested that gaming aspects are usually appropriate. Within those, goals, objectives and rules obtained the most positive results. Generally, it was clear what the player has to accomplish and how in order to complete the game. In contrast, feedback was well considered to a certain extent. Most games allow the player to perceive the impact and consequences of his / her actions on the game world. However, all experts believe that it can be enhanced. As an example, one expert stated that "*the impact of incorrect answers is not clear"* and another noted that "s*ometimes, characters make actions without feedback"*.

Other items within the gaming aspects dimension obtained lower scores, such as challenge, immersion, adaptability, replayability, promotion of "good" competition, and entertainment. As an example, replayability can be improved in the games and scenarios that were evaluated. Indeed, one expert stated that the game evaluated is not replayable, as the narrative has only one path.

Overall, learning aspects were more positively evaluated than gaming ones. In general, experts

considered that the learning objectives in the games can be achieved "*easily"* and "*satisfactorily"* by the target audiences. In addition, games include sufficient resources to successfully achieve the learning goals. In contrast, experts considered that the evaluation methodology should be given more importance.

As for the technical aspects, usability concerns regarding the use of icons and frequent interactions have been expressed. For instance, an expert evaluator observed that "*when the player has to leave a scene of the game, it could be useful to show where the area to mark on the screen is".* Another evaluator suggested enhancing usability with "*tutorials, menus and showing how to play correctly"*. Graphics and the possibility to use the game in different contexts have been considered average. Some of the improvements suggested by the evaluators are already "in plan" by teachers. It seems important to note that evaluators, as experts in the field, are used to play professionally designed games, with a high level of graphics details. However, these games are still away from the standards of commercial games as design contexts (budget, time, teachers' experience in games, etc.) are not equal.

c. Creative teaching through GBL

Generally, teachers were able to create a psychologically safe classroom environment. Most of the time, teachers acted as facilitators, by checking whether students were finding their way through the GBL activity, and providing guidance, which did not precluded a high level of autonomy of students, who freely interacted with the game and explored its different scenes. Teachers encouraged questions and different responses when they gave feedback to students within the game session. They included humorous elements in their games (jokes, references to elements specific to the students' socio-cultural contexts, etc.). Most students positively reacted to these elements, by smiling, laughing or sharing them with their peers.

Classroom settings included students playing the game individually, or working in pairs. Situations of collaboration among students and teachers were observed, in which they identified and solved problems together. Furthermore, collaboration among students, when working individually, was frequent: when they did not know what to do within the game, they usually asked for help to other peers. Sometimes, learners engaged in short discussions, to arrive at an agreement before deciding what to do.

Moreover, both teachers and students stated that the learning outcomes of the GBL activity were achieved more effectively than with current methodologies. Indeed, the game activity was considered more engaging. As one teacher puts it, "*it was more fun for the students to learn with the game, as it was engaging and the contents will stay in their minds".* About their own learning, students report: "*I have the impression that I am more attentive when using the game. The information is easier to remember"*. In addition, several students stated that games enabled them to "*learn without realizing it*".

VII. Conclusions

This paper explored a methodology through which teachers designed and implemented learning games adapted to their specific educational contexts. Teachers were neither professional game designers, nor experienced in using games in their teaching practices. Creativity was closely looked at during the whole process of GBL design and implementation, although it appeared as an elusive concept, difficult to apprehend.

The process of designing a learning scenario and creating an ad-hoc game was influenced by different factors. A very important one was time. Time conditioned the design, since teachers were compelled to a complex process of adapting and discarding their teaching strategies according to the time available, which was limited. Indeed, a creative process implies time for mastering the support tool, as well as for reviewing and increase the quality of the produced outcome, through an iterative process.

Second, collaboration among teachers appeared as a key-factor to creativity. Sharing opinions among the teachers enhanced the processes of generating and testing ideas. In some cases, this was enriched by involving students in the process, which enabled teachers to evaluate the adequacy and playability of the games with students, as target audience.

Finally, game editors' affordances appeared to have two roles in the design process. On one hand, as mediators, they shaped the game dynamics, profiling its mechanisms, and facilitating

the production of ideas by providing schemes to design the different game elements. On the other hand, they acted as constraints, since scenarios were conditioned by the characteristics of the software.

Teaching processes involving games designed by teachers appeared as a stimulus for teachers and students, both in terms of learning outcomes and motivation for both. Games also supported a creative learning environment, in which questions and humor were encouraged.

The learner-centred game design methodology appeared as a productive and creative approach to teaching and learning, along with difficulties, but worth to explore if we want to promote creative teaching and creative learners and, by extension, creative people. It implied a paradigm change in teachers' practices, who risked their traditional methodologies for unknown teaching approaches, closer to their students' cultural realities.

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Role of Teacher in Personal Learning Environments

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Abstract

This paper aims to discuss the changing roles and competencies of a teacher in context of prevailing developments accomplished by the vast availability of social software, which have made easy the development of Personal Learning Environments (PLEs). This has been accomplished by an in-depth review of the literature on teacher's socially situated competencies and roles with regard to the tasks and guidance they provide to students shape their PLEs. Review process provides an insight of PLE research studies, constructivist learning theories, and teacher changing roles. The results of this study outline the roles that portray the importance of teacher competencies as role in Planning and Design, Instruction and Learning, Communication and Interaction, Management and Administration, and Use of Technology.

Keywords

Personal learning environment; teacher roles; teacher competencies; learning technologies; collaborative learning

I. Introduction

Competencies of teacher are challenged (Downes, 2010; Minocha et al. 2011; Alvarez, 2009; Thach & Murphy, 1995; Shaikh & Khoja, 2011; Selvi 2010). There is a growing realization (e.g. see (Downes, 2010; Minocha et al. 2011; Alvarez, 2009; Thach & Murphy, 1995)) that traditional teaching competencies might not produce desired results in learner-controlled PLE settings. Focus on delivering content and information in the form of lecture-based environment is not as effective as when communication is mediated through technology. Teachers involved in teaching using face to face, distance, or online methods need help and support to identify new roles to be successful (Thach & Murphy, 1995). Besides this, it is also expected from 21st century teachers to collaborate with all sectors of the educational community in planning, managing, implementing, and evaluating programs (Shaikh & Khoja, 2011; Selvi 2010).

By choice and demand, technology is restructuring education, teaching, and learning, and affects them in ways that impact on everyone (Minocha et al. 2011). Teacher roles are changing rapidly than ever before, and new competencies are required all at a faster pace. McLoughlin & Lee (2010) and Drexler (2010) observed that free and easy availability of emerging learning technologies and social software have resulted complex and multifaceted challenges for teachers – including the provision of personalized learning experiences to students that cultivate their independent learning skills – besides scaffolding the learner reflection and the development of generic competencies. Väljataga & Laanpere (2010) found that the required pedagogical change involves not only importance of acknowledging learners' existing skills and the adoption of appropriate teaching approaches, and awareness of learners' experiences, as well as integrating social media in ways that enable active participation, social interaction, global networking, and community connections. Teacher may not be the only expert during students' learning processes, but he can still play key role in offering support in literacy skills and subject matter expertise, help them navigate the breadth of content and apply the technologies and tools properly (Drexler, 2010; Väljataga & Laanpere, 2010; Attwell, 2009).

Many research studies have established critical role of teacher in PLE design and implementation, but only some of them have focused on investigating teacher roles and competencies. Hence, we argue that future PLE research should look into this matter.

II. Current Review of Teacher Role in Personal Learning Environment

Our review of research studies and online resources with regard to teacher roles and competencies in PLE settings is divided into three areas, which are:

a. Review of Personal Learning Environment studies

b. Analysis of constructivist learning theories, and

c. Examination of teacher changing roles and competencies

a. Review of Personal Learning Environment Studies

PLE represents a paradigm shift (Elliott, 2010); an easy-to-use environment based on the idea that learning is a continuous and ongoing process being provided by number of resources and individuals. It seeks to provide tools to support learning of an individual learner which takes place in many contexts and situations (Attwell, 2009). A PLE is a place where learner constructs knowledge socially with the help of knowledgeable peer mentors and teachers (McLoughlin & Lee, 2010 and Drexler, 2010). Here, the role of teacher is to insert scaffolding in learning plans of a learner, assist her in taking control of her learning, and help her realize her learning goals (Shaikh & Khoja, 2011). Väljataga & Laanpere (2010), Attwell (2009), and Wilson (2008) argue that an effective PLE 1) must address deeper educational issues, 2) support realization of learning objectives through the formulation, reuse, and repurposing of learning plans, 3) provide ways of

controlling the technological infrastructure, 4) recognize teacher and learner inhabit the same system, and 5) maintain the technological shift in the locus of control from institutional centralized delivery to learner-driven inquiry.

b. Promise of Personal Learning Environment

PLE is an environment where people and communities, and tools and resources, interact in a very flexible way. It promises to learner an important result of learning and the quest for independent learning that incorporates largest collection of tools under the control of an individual (Wilson, 2008 and Peña-López, 2010). PLE promises new teaching methodologies for successful learning to occur; where teacher ought to rethink her approaches, realign her methodologies, and move beyond restrictive, teacher-controlled environments to learner-driven collaborative spaces (Elliott, 2010).

i. What should be in a Personal Learning Environment

A PLE should contain a) content, b) context, c) connections, d) collection, e) communication, f) community, g) collaboration, and h) creation (WikiEducator, 2010). Peña-López (2010) argued that an effective PLE may contain accessing, aggregating, manipulating, and analyzing knowledge, or in other words, a PLE may provide the facilities of reading, noting, thinking, and writing. Wilson (2008) found that in order to facilitate learning processes, PLE should provide analysis, synthesis, abstraction, and critique components.

c. Constructivist Learning Theory

The constructivist model of learning is learner-driven, where learner learns best by actively constructing his own understanding about the World objects (Khoja, et al. 2009). It offers learning that occurs as the result of collaboration and social activity (Shaikh & Khoja, 2011). This constructivist theory describes that learners can learn things easily and in a better way by using their prior knowledge when they are asked to discover things by themselves rather than being told what to do next (Shaikh, 2009).

Constructivist teaching methods put responsibility on learners for learning to occur, where teacher's role is to help them manage their learning environment (Khoja, et al. 2009 and Shaikh, 2009). Väljataga & Laanpere (2010) found that in learner-centered approaches, teacher create an interesting phenomenon in order to motivate learners take ownership of the learning process, and produce best solution they can derive.

Design of PLE fosters meaningful learning. Jonassen et al. (2003) argues that "meaningful learning occurs with knowledge construction, not reproduction; conversation, not reception; articulation, not repetition; collaboration, not competition; and reflection, not prescription." Väljataga & Laanpere (2010) admonish that after a successful integration of PLE, some learners may still feel trouble getting started and explicating their objectives.

d. Teacher Changing Roles and Competencies

Teacher is responsible for operating educational system, hence, she needs strong and efficient professional competencies (Thach & Murphy, 1995). According to Shaikh (2009), it is necessary to redefine teacher competencies. Since teacher's main role is transferring changes into educational system, hence, teacher needs to excel in these new competencies that deal with these new changes effectively (Shaikh, 2009). Selvi (2010) suggested that teacher competencies should be reviewed consistently and in parallel with the changes, and reform studies through scientific methods. This study considers teacher's socially situated competencies – the ability to perform tasks and roles to the expected standard – and roles with regard to the tasks and guidance she

provides to students shape their PLEs (McLoughlin & Lee, 2010). According to Drexler (2010) and Williams (2003), nature of the tasks and the particularities of the learning environment are very important in teacher's socially-situated competencies. Olivier & Liber (2001) found that in socially situated learning environments, teacher's competencies must be related with context and, consequently, any such statements will be relative to these particular circumstances.

III. Methodology

In order to perceive teacher competencies and roles, we consider putting forward this preliminary theoretical study, centering on teacher roles and competencies in PLE settings.

A number of research papers and periodicals were reviewed that discussed the concept of teacher roles and competencies in PLE settings. The scientific output from the past 10 years was of particular interest, given that was the period when seminal work started in this research area, and when, for the first time, the term PLE was used in the literature by (Olivier & Liber, 2001) in 2001. Besides, the literature on teacher competencies and roles in face-to-face, distance education, online learning environments, and virtual learning environments was also comprehended. Special attention was paid to looking into specialist journals, books, and online resources of great scientific prestige (e.g. Australasian Journal of Educational Technology, British Journal of Educational Technology, American Educational Research Journal, IEEE Transactions on Learning Technologies, Interactive Learning Environments, Turkish Online Journal of Educational Technology, Educational Technology Research & Development, American Journal of Distance Education, Workplace Learning in Context, Pontydysgu, Educause, iCALT, eLearning Papers, The PLE Conference, etc.). The basic purpose of this study is to identify different roles of a teacher in such environment. This is very important as this study will help identifying different qualities and abilities to be developed by a teacher to work under this environment.

Teacher competencies are categorized as suggested by Alvarez et al. (2009), Williams (2003), and Trilling (2008) proposals. Categorizing the functions to relate them with their respective competencies also respected Alvarez el al. (2009) and Williams (2003).

IV. Results

PLE invite teacher to consider a role change and extend her craft to prepare students for the challenges of life beyond university. This allows students to develop lifelong learning skills which are paramount to self-direction and self-regulation (e.g. see Drexler, 2010; Väljataga & Laanpere, 2010; Attwell, 2009).

Despite the numerous studies on the design, pedagogies, and structure of a PLE, no competency study on teacher roles and competencies in PLE settings has been conducted to date. However, recent studies in the field of face-to-face learning, online learning, distance education, and network literacy have shed some light on critical components of teacher roles to include in a list of teacher competencies in PLE perspectives (Downes, 2010; Minocha et al. 2011; Alvarez, 2009; Thach & Murphy, 1995; Shaikh & Khoja, 2011; Selvi 2010).

The results of this study focus on the model suggested by us in [Fig 1]. The figure shows many roles of a teacher categorically grouped into five competencies.

a. Teacher Changing Roles

Setting up a PLE requires considerable planning. Teacher need to be innovative and knowledgeable regarding where and how to locate the resources he needs. He not only know clearly why the need of a PLE should be introduced to students, but also, how Web 2.0 and learning technologies can be incorporated with curriculum to make possible collaborative learning (Peña-López, 2010).

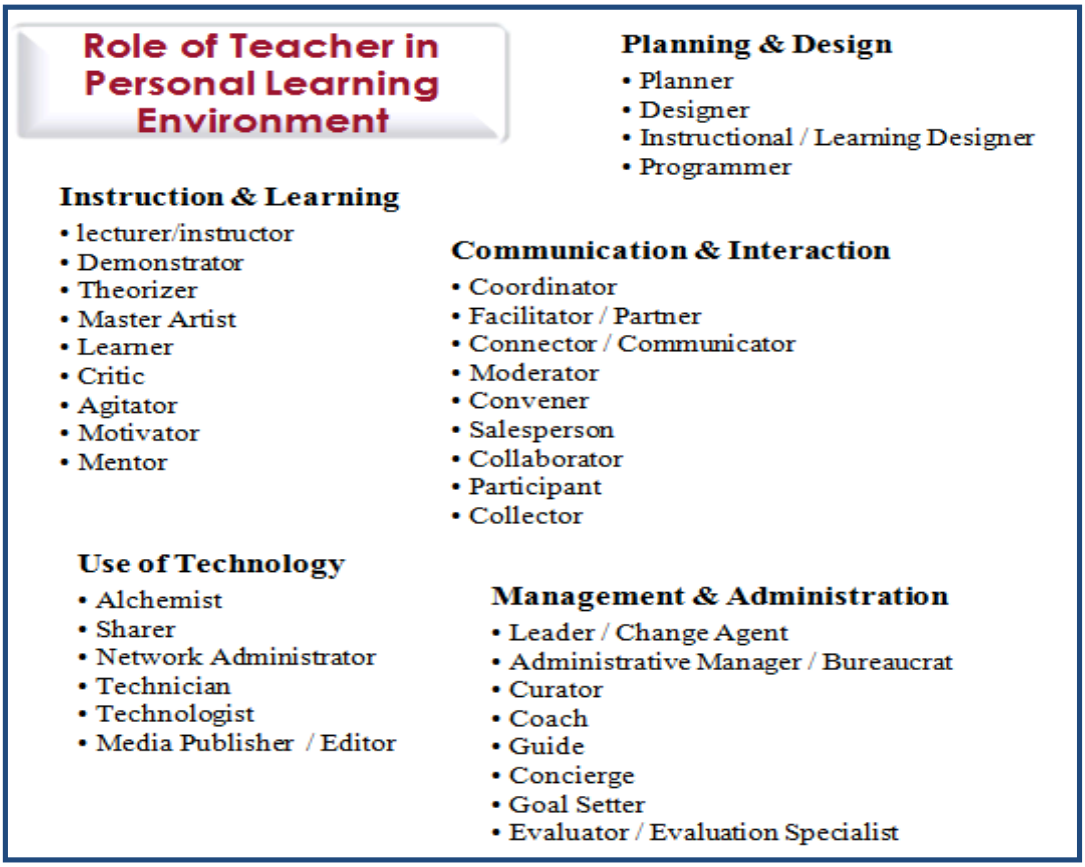

Fig 1. Teacher roles as per performing tasks

In PLE settings, a teacher ought to be an expert instructional designer (Downes, 2010 and Siemens & Tittenberger, 2009). According to Jonassen et al. (2003), instructional design plays vital role in designing the learning activities within a PLE. An instructional designer is a person who creates, browses, views, and edits learning designs used for the automatic creation of personalized learning activities for students. Kuo (2000) noted "instructional designer makes instructional decisions based on his or her judgment about what and how students should learn, what their learning contexts should be, what learning strategies they should employ, and how they should be assessed". Computer programming skills have also been rated high in digital network literacy phenomenon. Downes (2010) argued that "a programmer builds sequences into machines, manipulates symbols to produce meaning, calculates, orders, assembles, and manages social networks, [and] set ups wikis."

In teacher competency studies, lecturing and learning are two learning tasks that surface repeatedly. Several researchers, viz. Downes (2010), Minocha et al. (2011), Alvarez et al. (2009), and Thach & Murphy (1995) argue that a lecturer organizes larger bodies of thought into a comprehensible whole, and employs the oratory skills and exposition to make the complex clear for students. Siemens & Tittenberger (2009) observed that a lecturer or instructor must be an expert learner.

Related to lecturing and instructing is the very critical competency of theorizing and demonstrating. A demonstrator uses some equipment, models and simulations, or movies, to tell stories, while a theorizer, as noted by Downes (2010), "leads students develop world views, find the underlying cause or meaning of things, create order out of what appears to be chaos, [and] help them remember things by giving a single structure."

In PLE settings, teacher ought to motivate learners to take ownership and control of their learning processes, and mentor them to realize their goals towards success (Kuo, 2000; Mullen, 2010;

Arthur, 2009). Kuo (2000) and Mullen (2010) advocate that mentor has a versatile personality, ranging from sharp critic to enthusiast coach. Mullen (2010) noted in her study "not everyone can be a mentor, not every mentor can take on too many prodigies, and of all the roles described here, that of the mentor is most likely to be honorary or voluntary." The need of agitator and master artist has also been discussed in the PLE settings. The former "creates the seed of doubt, the sense of wonder, the feeling of urgency, and the cry of outrage" (Downes, 2010), while the latter "observes the activities of students and can draw attention to innovative approaches" (Siemens & Tittenberger, 2009).

Instructive and cognitive skills raise new requirements to teacher competencies in knowledge and skill level. According to Mullen (2010), "teachers need to get accustomed to and trained on their new role as partners and facilitators in learning processes, rather than lecturers". Minocha et al. (2011) add that one of the changing roles that this new learning phenomenon has created for teachers is that of a facilitator who help learners adapt their PLEs, scaffold learning, and manage the content before it becomes more complex (Global Teacher, 2010). Attwell (2009) stresses that, in PLE process, coordination, collaboration, cooperation, communication, connection, and integration between teacher and students is important. Peña-López (2010) puts emphasis on teacher's coordination role and notes that coordinator supplies a framework in which learners collaborate, connect, and integrate with each other more flexibly. Alvarez et al. (2009) and Elliott (2010) argue that communicator or connector is the person who draws associations among distributed links and applications in order to infer latent factors and hidden relationships. Downes (2010) noted "the connector is the person who links or bridges distinct communities with one another, allowing ideas to flow from art to engineering, from database design to flower arranging."

Many studies outline how teacher ought to facilitate the process of learning within PLE and act as moderator, convener, collector, and salesperson (Minocha et al. 2011; Downes, 2010; Mullen 2010; Global Teacher, 2010; Arthur, 2009; Alvarez, 2009; Thach & Murphy, 1995). Drexler (2010) asserts that "teachers have always been collectors, from the days when they bring stacks of old magazines into class to the modern era as they share links, resources, new faces, and new names." In many studies (e.g. see Downes, 2010; Minocha et al. 2011; Alvarez, 2009; Thach & Murphy, 1995; McLoughlin & Lee, 2010; Mullen 2010; Arthur, 2009; Global Teacher, 2010), teacher is seen as a role model, leader, manager, and change agent. McLoughlin (2010) observed that teachers are the administrative managers who manage classroom computing resources and finances, organize accountability procedures, and maintain systemic coherence. Trilling (2008) found teacher a curator and advocates that "he should balance the freedom of individual learners with the thoughtful interpretation of the subject being explored, and create spaces in which knowledge can be created, explored, and connected." Sandy (2005) termed teacher as a leader in her draft paper, and noted "the effective teacher must be a leader who can inspire and influence students through expert and referent power but never coercive power. This teacher knows his subject well and is kind and respectful toward his students. He also has high standards and expectations coexisting with encouragement, support, and flexibility. This teacher empowers students and gets them to do things of which they did not think they were capable. This teacher has students who surpass him."

Mullen (2010) and McLoughlin & Lee (2010) suggested in their studies that PLE demands teacher to act as a(n) a) coach, who these days is no longer the sage on the stage, but instead provides learners with access to a variety of independent learning experiences, b) concierge, who directs learners to learning opportunities that they mean to be aware of, serves to provide a form of soft guidance, and permits them to explore on their own, c) evaluator, who not only assesses declarative knowledge and compositional ability, but the instinct, reaction, sociability, habit, and attitude of students in relation to their learning, and d) goal setter, who assists learners in taking control of their learning and education, and scaffolds them to realize their goals.

Related to managerial is a critical role of technologist or digital technology expert. This includes tasks that are performed by a a) sharer, who shares cultures, concepts, ideas, materials, mailing lists, links, and creates and manages e-portfolios (Downes, 2010 and Arthur, 2009), b) technologist, who transfers technical knowledge to students, and teach them how to tackle with complex technological issues (Downes, 2010; Minocha et al. 2011; Alvarez, 2009; Thach & Murphy, 1995); c) technician, who enables students to be knowledgeable about learning resources (Mullen, 2010; Arthur, 2009; Global Teacher, 2010); d) network administrator, who helps students master in the skills required to construct learning networks, evaluates their effectiveness, and work

within a fluid structure (Downes, 2010); e) editor or media publisher, who edits objects for style, clarity, grammar, and structure (Downes, 2010; Trilling, 2008; Siemens & Tittenberger, 2009); and f) alchemist, who mixes the ordinary and unexciting things into some innovative and surprising master pieces, analyzes rhythms in dissimilar materials, and brings them together to bring them out (Downes, 2010 and Trilling, 2008).

V. Discussion

Following the same order as teacher competencies and roles discussed in the results section, we now present our findings. Considering the significant role of teacher in PLE settings, we have grouped teacher competencies around five performing roles according to the nature of tasks with which they are associated as shown in [Fig 1].

a. Planning and Design (Designing/Planning Role)

The planning and design aspect of teacher competencies and roles is related with setting up students' PLEs, designing learning activities, creating learning spaces, making instructional decisions, and solving programming problems. Tasks include: plan and prepare course design, promote teamwork in design process, define procedures of instructional design, conduct needs assessment of students, present content and questions, in-line existing courses with PLE requirements, creation of online interactive content, ensure course design works with technology, etc. Roles identified: planner, designer, instructional/learning designer, programmer.

b. Instruction and Learning (Instructive/Cognitive Role)

This role relates to instructive and cognitive aspects of instruction in PLE settings. It consists mental processes of teaching and learning, abstraction and generalization, information storage, motivation, and mentoring, etc. Tasks include: tutoring, learning guidance and evaluation, competency in the subject matter, provide students with timely feedback, validate knowledge acquired by the process of collaborative learning, initiate and maintain interactive discussions, monitor and evaluate students' performance, enthusiast about teaching, well-versed with collaborative, constructive, reflective, active, and authentic learning, facilitate information presentation, monitor and evaluate students' performance, establish learning outcomes, advice and counsel students, etc. Roles identified: lecturer/instructor, demonstrator, theorizer, master artist, learner, critic, agitator, motivator, mentor.

c. Communication and Interaction (Social Role)

The communication and interaction aspect of teacher competencies and roles is related with learners' relationships with peers, other knowledgeable ones, and teachers. Tasks include: managing healthy and cooperative interactions, identifying areas of consensus, analyzing patterns of cooperation, diagnosing misconceptions, seeking consensus, encourage peer learning and social links, understanding, encouraging, initiating collaborative learning activities, acknowledging or reinforcing student contributions, fostering learning and setting climate for learning, ensuring participation, prompting and controlling discussion, assessing the efficacy of learning processes, etc. Roles identified: coordinator, facilitator, partner, connector/communicator, moderator, convener, salesperson, collaborator, participant, collector.

d. Management and Administration (Managerial Role)

Teacher's management role is related with competencies that allow her to develop and adapt managed actions such as: motivation and learning needs of students, quickly responding to students' expectations, and channelizing spaces of communication and voluntary participation. Tasks include: inspire and influence students through expert and referent power, command on subject matter, kind and respectful toward students, encourage and support students in all matters, flexible, having good listening skills, empower students to do things of which they did not think they were capable, etc. Roles identified: leader/change agent, administrative

manager/bureaucrat, curator, coach, guide, concierge, goal setter, evaluator.

e. Use of Technology (Technologist Role)

Technological role relates to technical knowledge of support services, social computing applications, open access and proprietary software, data analysis and design skills. Tasks include: smooth transfer of knowledge, sharing online file áreas, maintaining and managing learning environments within and outside the classrooms, managing shared mailboxes, functionalities in the lecture, learning platform tools use for tutoring, authoring, and annotations, styles of face-to-face, virtual, and online communication, knowledge of web-based teaching and e-learning paradigms and systems, PLEs, etc. Roles identified: alchemist, sharer, network administrator, technician, technologist, media publisher/editor.

VI. Conclusion

This study contributes and clarifies to the growing body of research on teacher competencies and roles in PLE settings, while linking them with the notion of situated learning. The decision of adopting applications, the development of matching learning activities, the moderation and facilitation needed, and teacher's own confidence level in integrating these web 2.0 based learning technologies in instruction are all roles and activities that directly contribute to the successful implementation of PLEs.

PLE construction process requires equal participation of both students and the teachers, hence, a teacher may not necessarily perform all the roles, but, rather, she interact with students in general. Yet, in any case, teacher's required competencies depend not only on the role being performed, but, also on the nature and complexity of the tasks they are supposed to carry out.

a. Recommendations for Future Research

Recommendations for future research include validation of results of this study from learning technologies practitioners, students, teachers, and the people involved in PLE research within academia, business, and industry, with survey or focused research methodology, in order to develop consensus over teacher's PLE competencies and roles. Since the scope of this study was limited to only identifying teacher's perceived roles and competencies, it does not explore the criticality of the competencies for different types of learning technologies, approaches, and contexts, hence, it is recommended that further research may to be carried out in these dimensions. And due to the quick changes in learning technologies and social software, the enormous growth of social networking and collaboration, and the fact that this is the first literature review of its kind, it is recommended that similar studies may be repeated every so often to ensure relevance of teacher roles and competencies in PLE settings.

Finally, it is also very important for future research on PLEs to consider the importance of teacher as part of PLE implementation, and to recognize the diversity of roles teacher perform in this context. Although we have focused on higher education in this study, the issues that we have raised are also applicable for teacher roles in further and school education where students are being familiarized with PLE conception, social software is being integrated in teaching and learning, and research to investigate the potential benefits of these emerging learning technologies has been commissioned.

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digitalEDUCATION

Docencia universitaria con apoyo de entornos virtuales de aprendizaje (EVA)

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Resumen

La enseñanza basada en la investigación-innovación es esencial para la mejora de los procesos de desarrollo de competencias en la Universidad. En este sentido, este artículo presenta los principales resultados de un proceso de investigación sobre usos y valoración de la plataforma Moodle en la docencia universitaria. Los datos obtenidos ponen de relieve la importancia de esta herramienta. Asimismo, se destaca el papel de Moodle para visualizar la organización de la docencia, así como para el intercambio de información y documentos, y en menor medida para generar espacios de colaboración y coordinación.

Palabras clave

Entornos virtuales de aprendizaje (EVA); enseñanza basada en la investigación; docencia universitaria.

University teaching with the support of Virtual Learning Environments (VLE)

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Abstract

The research-innovation based teaching is essential to improve of competencies development at university level. In this sense, this article shows the main findings of a research process on the usages and appraisals of the Moodle platform at university. Data gathered highlight the relevance of this tool. It also stresses the role that Moodle plays to visualize teaching outline and to exchange information and documents and, to a lesser extent, to provide spaces for collaboration and coordination.

Keywords

Virtual Learning Environments (VLE); research-based teaching; university teaching.

I. Introducción

Las Tecnologías de la Información y la Comunicación (TIC) se han convertido en un elemento clave en los procesos de formación, gestión e investigación en muchas universidades del mundo, y en los últimos años, el sistema universitario español está experimentando un desarrollo sin precedentes (Uceda Antolín y Barro, 2009). Así, y en un contexto de generación de nuevas demandas y necesidades para avanzar hacia la sociedad del conocimiento, la activación de procesos de innovación docente, favorecedores de metodologías activas (MEC, 2006) y de entornos virtuales de enseñanza/aprendizaje (Moodle, Atutor, WebCT, Fle3…), son esenciales para ofrecer el máximo de condiciones y situaciones de desarrollo competencial de los estudiantes. La relevancia de los entornos virtuales de aprendizaje (EVA) está en que pueden actuar como "artefactos mediadores entre el docente y el alumnado o entre iguales que proporcionan un contexto educativo singular y virtual facilitador de procesos interactivos de co-construcción de conocimiento" (Salmerón, Rodríguez y Gutiérrez, 2010, p. 164). Un buen ejemplo de ello es la proliferación de experiencias de docencia virtual que, en modalidad *blended learning* y mediante el LMS (Learning Management System), está centrado la atención de muchas publicaciones para conocer sus posibilidades y limitaciones reales sobre el aprendizaje universitario (Dougiamas y Taylor, 2003; Lopes y Gomes, 2007; Cole y Helen, 2007; Pérez Rodríguez et al., 2009; Rodríguez Damián et al., 2009; Martínez Sánchez y Sánchez Santamaría, 2010; Silva y Ramos, 2011).

Todo ello en un contexto de introducción del enfoque de competencias profesionales que, unido al proceso de convergencia europea de la educación universitaria, conlleva una serie de implicaciones pedagógicas, tales como (figura 1): énfasis en el aprendizaje; cambios en el rol del docente como facilitador y mediador en los procesos de aprendizaje del alumnado; promoción de la metodología ECTS de "otros espacios" didácticos como los grupos pequeños -seminarios- o trabajos grupales dentro del mismo aula (Morales Calvo, 2011); tareas auténticas; sistemas de evaluación profunda y/o superficial (Sánchez Santamaría, 2011; Manzanares Moya y Sánchez Santamaría, 2012). De modo que podamos aprovechar el potencial que nos ofrecen los EVE (Entornos Virtuales de Aprendizaje) para la mejora en dos cuestiones esenciales: a) del desarrollo competencial de los estudiantes en su formación inicial; y, b) la calidad de la docencia.

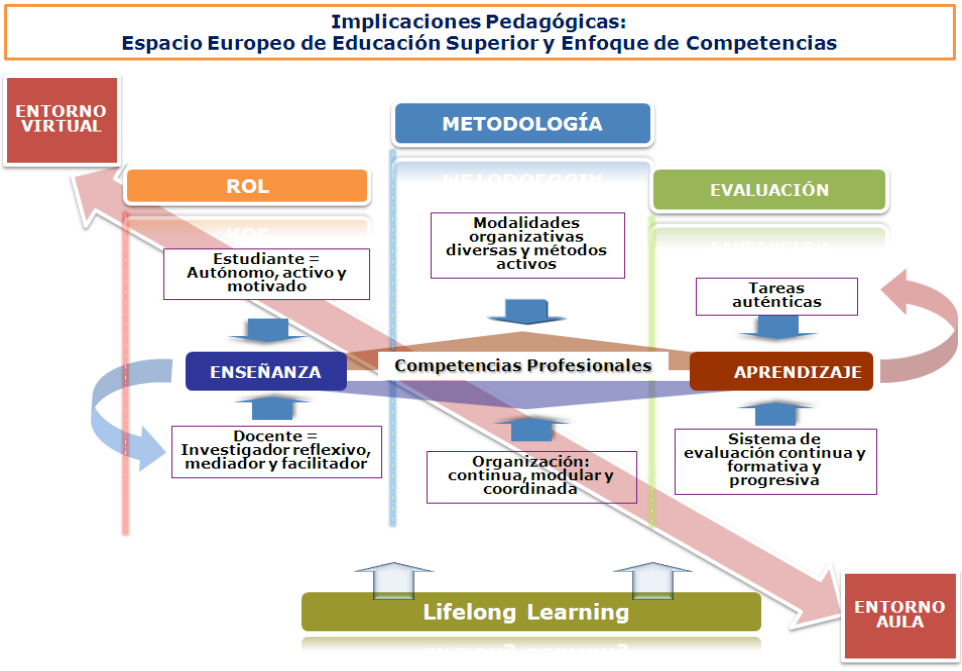

Figura 1. Implicaciones pedagógicas del Espacio Europeo de Educación Superior y del Enfoque de Competencias

Fuente: Elaboración propia, a partir de Ballester Vila y Sánchez Santamaría, 2011.

Por ello, este artículo muestra y analiza los usos y concepciones en torno a la plataforma Moodle en tres titulaciones de la Universidad de Castilla-La Mancha -UCLM- (educación social, educación infantil y educación primaria del campus de Cuenca), así como la valoración sobre su impacto en el proceso de logro competencial del estudiante. Esta propuesta se alinea con la tesis defendida por muchos autores sobre la necesidad de entender la introducción de las TIC como un cambio en las formas y modos de enseñar, es decir, en las implicaciones de las TIC en el desarrollo de competencias profesionales de los estudiantes universitarios.

Este trabajo exploratorio-comparativo se integra en una línea de investigación sobre el impacto de las TIC en la docencia universitaria, y en la que venimos trabajando desde 2010, con el objetivo de abrir procesos de reflexión-acción que nos permitan ahondar en un conocimiento más sistemático y válido sobre los usos, concepciones e impacto de las TIC en la docencia universitaria; de modo que la intención que lo inspira es la de conocer las implicaciones pedagógicas, con sus limitaciones y posibilidades, de las TIC en el desarrollo competencial, así como a generar conocimiento orientado a monitorizar la toma de decisiones.

En definitiva se trata de "centrar nuestra atención en los procedimientos, estrategias, mecanismos, dispositivos y experiencias cuyo objetivo es la evaluación de los usos de las TIC para impulsar nuevas formas de aprender y enseñar, a partir de sus hallazgos y resultados […] la evaluación de las TIC en la educación se configura como aliada relevante para identificar los procesos y prácticas que resulten ser más eficaces y, al mismo tiempo, ha de ofrecernos novedosas herramientas y dispositivos analíticos para comprender mejor uno de los objetivos fundamentales de la enseñanza: ¿cómo ayudar a los estudiantes a aprender?" (Bustos y Román, 2011, p. 4)

II. Moodle en la docencia universitaria: el caso de Castilla-La Mancha (UCLM)

Moodle (entorno de aprendizaje dinámico, modular y orientado a objetos) es un CMS (Content Management System) distribuido bajo licencia Open Source; una plataforma que nos ofrece multitud de posibilidades como herramienta de enseñanza, aprendizaje y de investigación (Correa Gorospe, 2005; Rice & Rice, 2007; Pérez Rodríguez et al., 2009; Rice, 2010). Se trata de una aplicación para el diseño y la gestión de recursos de tipo formativo.

Desde el punto de vista psicopedagógico, queremos resaltar que Moodle se configura en torno a lo que se denomina "pedagogía construccionista social" (Silva, 2011), es decir, conjuga aspectos del constructivismo (conocimiento que se genera mediante mediación e interacción con el ambiente) y del construccionismo (aprender haciendo). Y, esto es lo que la convierte en una herramienta con un comportamiento ideal en relación con las metodologías activas.

Como nos recuerda Baumgartner (2005), Moodle nos permite hacer uso de cinco tipos de gestión de conocimiento (CMS puro, Weblog, C-CMS, C3MS y Wiki), así como de los tres tipos de e-enseñanzas asociadas (transmitir, adquirir y acumular, desarrollar e inventar). Entre las ventajas de Moodle frente a otras plataformas similares cabe destacar (Adell, Castellet y Gumbau, 2004, p.13-14): a) más y mejores funcionalidades didácticas. Flexibilidad de modalidades organizativas y métodos didácticos; b) mejor comportamiento del índice de usabilidad; y, c) elevado grado de apertura y dinamismo.

No obstante, el simple hecho de hacer uso de Moodle u otros sistemas basados en LMS no conlleva una innovación o mejora de los procesos de enseñanza-aprendizaje, ya que el aprendizaje on-line requiere de unas condiciones y recursos adecuados vinculados al diseño, contenido, desarrollo, herramientas de trabajo, apoyos del profesorado, percepciones de los alumnos, experiencias previas, entre otras.

En el caso de nuestra experiencia, Moodle se introduce en la docencia universitaria de la UCLM durante el curso académico 2008/09, aunque convive durante un cierto período de transición con WebCT, que era la plataforma con la que se venía trabajando hasta el momento. A la herramienta se accede a través del Campus Virtual, donde además encontramos una serie de espacios complementarios a Moodle como la Secretaria Virtual (figura 2).

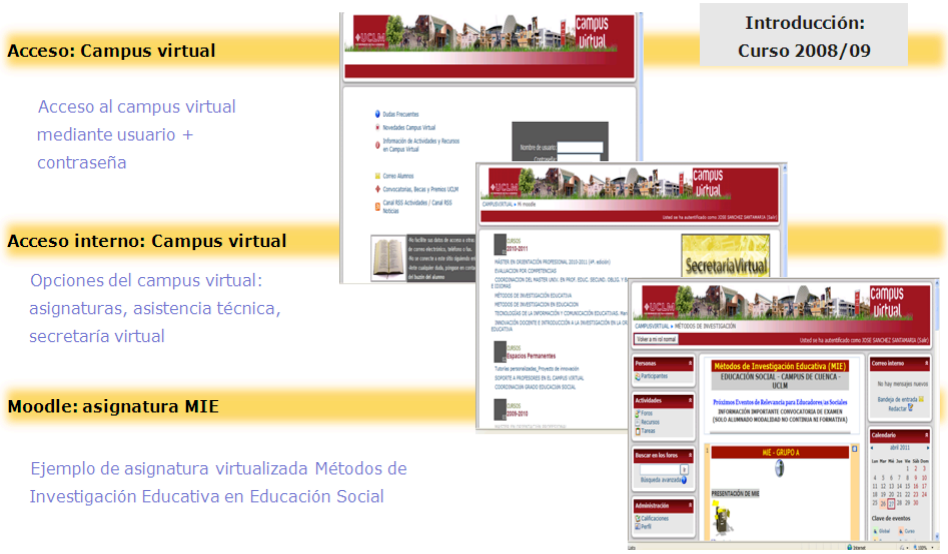

Figura 2. Acceso al campus virtual.

Fuente: https://campusvirtual.uclm.es/course/view.php?id=14707

Durante estos años, la plataforma se ha visto mejorada y ajustada a las necesidades docentes, habiéndose introducido cambios en el formato y en el contenido desde el Servicio de Informática de la UCLM. Se cuenta con un espacio para el soporte a profesores sobre el Campus Virtual donde poder resolver las dudas más comunes o consultar estadísticas de uso.

III. Método

La finalidad del estudio se centra en recoger evidencias sobre usos y valoraciones del entorno virtual de aprendizaje Moodle, en el primer curso de tres perfiles profesionales vinculados con la educación: educación infantil (EI), educación primaria (EP) y educación social (ES), del Campus de Cuenca de la UCLM.

Esta finalidad, se articula en dos objetivos de trabajo, a saber: a) identificar la visibilidad y función de Moodle en las guías docentes; y, b) conocer, desde la perspectiva de los estudiantes, el uso de la plataforma Moodle en las tres titulaciones, así como la valoración de los mismos sobre su impacto en el proceso de aprendizaje.

A continuación se presentan las características del muestreo y del método de estudio escogido (tabla 1):

Muestreo y Método del estudio de casos con fines descriptivo-exploratorios		
N	30	324
Unidad muestral	Guías docentes	Estudiantes matriculados en primer curso de EI, EP y ES
N	30	126: 43 (EI), 47 (EP) y 36 (ES)
Selección muestral	Casos relevantes	No aleatorio: Intencional y accesibilidad
Método	Revisión analítica	Descriptivo
Recogida de datos	Escala observacional	Cuestionario
Análisis de datos	Descriptivos	
Criterios de calidad	Validez: jueces	Validez: jueces - Fiabilidad: .854

Tabla 1. Características muestrales y metodológicas del estudio.

La muestra de tipo casual por accesibilidad la han formado un total de 126 alumnos matriculados en primer curso de grado en educación social, educación infantil y educación primaria del Campus de Cuenca de la UCLM.

Para la recogida de datos se han utilizado dos técnicas, a saber (Creswell y Plano, 2011):

1) Escala observacional compuesta por 3 dimensiones de análisis

   a) Datos identificativos de la guía docente (5 variables).

   b) Descripción de la guía (11 variables): modelo básico o avanzado, formato.

   c) Visibilidad de Moodle (3 variables)

      i) Modelo difuso (MODI): el que no se diga equivale a que no se usa; y, el segundo, se usa pero no se recoge en la guía docente.

      ii) Modelo orientado a la enseñanza (MOEN): se centra solo en el apoyo a la docencia, es decir, informa del uso de Moodle en un sentido restrictivo, basado en transmitir información, y de forma muy puntual, favorecer procesos de adquisición competencial.

      iii) Modelo orientado al aprendizaje (MOAP), se centra en el apoyo a la docencia (informar, consultar documentos, etc.) y al aprendizaje (participativo, dinámico, etc.); promociona la comunicación e interacción docente-estudiante y estudiante-estudiante.

La elaboración de estos tres modelos se referencia y justifica a partir de la propuesta de Baumgartner (2005), cuando establece que Moodle nos permite trabajar, por grado de profundidad, tres tipos de e-Teaching, en concreto: a) transmitir contenidos (MODI); b) favorecer procesos de acumulación y adquisición de saberes (MOEN); y, c) desarrollar e inventar nuevos saberes, así como nuevas formas de trabajar el contenido (MOAP). A ello, se une la consideración de las implicaciones pedagógicas sobre el proceso de enseñanza-aprendizaje de competencias, que se ha mostrado en la tabla 2 (niveles).

Justificación de los tres modelos de visibilidad de Moodle basados en la función que el docente le concede en sus guías docentes y la metodología con la que se relacionan				
Modelo difuso (MODI)	No visibiliza el uso de Moodle	Sin implicaciones en la enseñanza y en el aprendizaje	Nivel 1	Metodología no activa
Modelo orientado a la enseñanza (MOEN)	Visibiliza el uso de Moodle	Centrado en la docencia (docente)	Nivel 2	Metodología didáctica mixta: no activa y activa
Modelo orientado al aprendizaje (MOAP)		Centrado en el aprendizaje (alumno)	Nivel 3	Metodología didáctica activa

Tabla 2. Justificación de los modelos de visibilidad de Moodle en las guías docentes.

Fuente: Elaboración propia, 2011.

Leyenda:

Nivel 1: Sí transmite, no favorece la acumulación-adquisición y no desarrolla nuevos saberes.

Nivel 2: Sí transmite, sí favorece la acumulación-adquisición y no desarrolla nuevos saberes.

Nivel 3: Sí transmite, sí favorece la acumulación-adquisición y sí desarrolla nuevos saberes.

2) Cuestionario conocimientos, usos, percepciones y satisfacción con 4 dimensiones:

   a) Datos sociodemográficos (6 variables)

   b) Conocimientos y usos sobre TIC (8 variables)

   c) Conocimientos sobre Moodle (3 variables)

   d) Utilidad percibida y grado de satisfacción (3 variables)

El estudio presenta una serie de limitaciones, desde el punto de vista del diseño, que deben ser consideradas para una ajustada interpretación de los datos, a saber:

- La naturaleza descriptivo-exploratoria del estudio condiciona la validez ecológica del mismo.
- El análisis entre-grupos solo se ha realizado en términos generales, no habiendo analizado en detalle las varianzas.

Ambas limitaciones, serán consideradas para procesos posteriores, en los que se pretende asumir un método comprensivo-explicativo de mayor calado. Para ello, se han diseñado 3 grupos de discusión en proceso de realización.

IV. Resultados

a. Visibilidad de Moodle en las guías docentes

Del análisis de las 30 guías docentes se extrae que la mitad (15) recogen de forma explícita el uso de Moodle, en concreto 10 de cada una de los grados estudiados. No obstante, en el grado de educación social solo 2 de las 10 guías lo hacen.

Podemos establecer que en la revisión realizada de las guías se han identificado los tres modelos de visibilidad programática de Moodle: el MODI lo presentan 14 de las 30 guías docentes, mientras que el MOEN se identifica en 6 guías y el MOAP en 10 de ellas (figura 3).

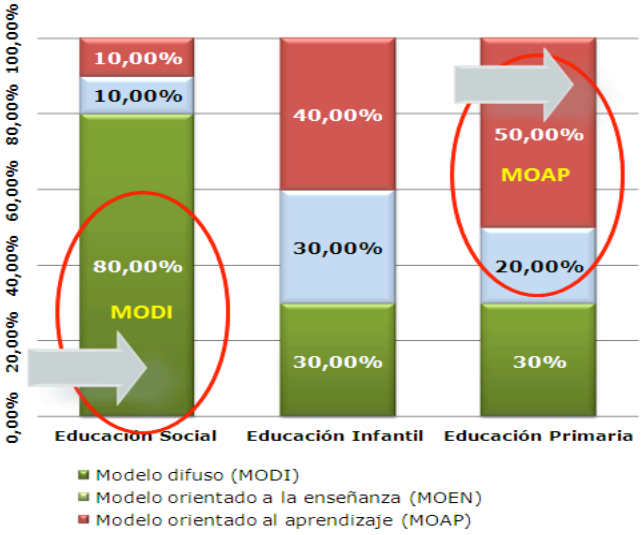

Figura 3. Visibilidad de Moodle en las guías docentes.

Fuente: Guía de observación documental, 2011.

b. Conocimientos, utilidad percibida y satisfacción sobre Moodle en la docencia.

i. ¿Qué conocimientos informáticos básicos tienes?

8 de cada 10 estudiantes se conciben con un nivel medio y/o de experto en conocimientos informáticos. Es decir, que un alto número de ellos poseen conocimientos básicos en sistema operativos, principalmente Windows (87,3%), y en programas básicos: procesadores de texto (93,6%), hojas de cálculo (36,5%), entre otros; y, en menor medida, software libre (7,9%).

Figura 4. Conocimientos generales y uso de las TIC por parte de los alumnos

Fuente: Cuestionario CPUS, 2011

Además, 8 de cada 10 afirman que tienen ordenador, de ellos 5 tienen ordenador portátil y PC de sobremesa, y 3 cuentan solo con ordenador portátil.

ii. ¿Qué conoces de Moodle?

El conocimiento de Moodle al inicio del curso era muy bajo o prácticamente inexistente, solo 1 de cada 10 dice que ya lo conocían y que lo habían utilizado en educación secundaria (52,9%), en otras carreras (29,4%) o en formación profesional de grado superior (17,7%).

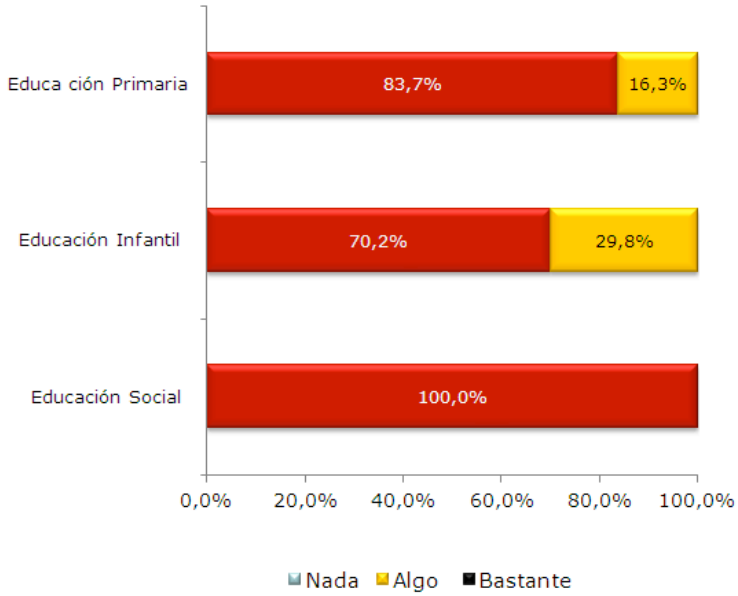

Figura 5. Conocimientos generales sobre Moodle.

Fuente: Cuestionario CPUS, 2011.

Este dato nos informa de que Moodle es una herramienta con poca o escasa presencia en el proceso formativo que han tenido los participantes en el estudio, y en los casos que nos han informado de su uso, han dicho que había sido utilizado por iniciativa del profesor de la asignatura y, no tanto, por de decisión de toda la institución. Y, el conocimiento se basa en cuestiones de acceso a Moodle, visualización y subida de documentos y participación puntual en los foros.

Asimismo, 3 de cada 10 estudiantes han consultado algún documento sobre Moodle y 1 de cada 10 ha realizado alguna acción de formación sobre el uso de Moodle promovida desde la Universidad.

iii. Grado de utilización de Moodle en la docencia universitaria.

En la siguiente figura se observa la distribución de las respuestas de los alumnos sobre el uso que sus profesores hacen de las diferentes herramientas. La lección, las bases de datos, los talleres o diarios son las herramientas que en mayor medida se indica que no son utilizadas por ningún profesor. Entre las herramientas que los estudiantes manifiestan que son utilizadas por prácticamente todos los profesores destacan la subida de documentos, la subida o entrega de trabajos, el correo interno, el calendario y las consultas.

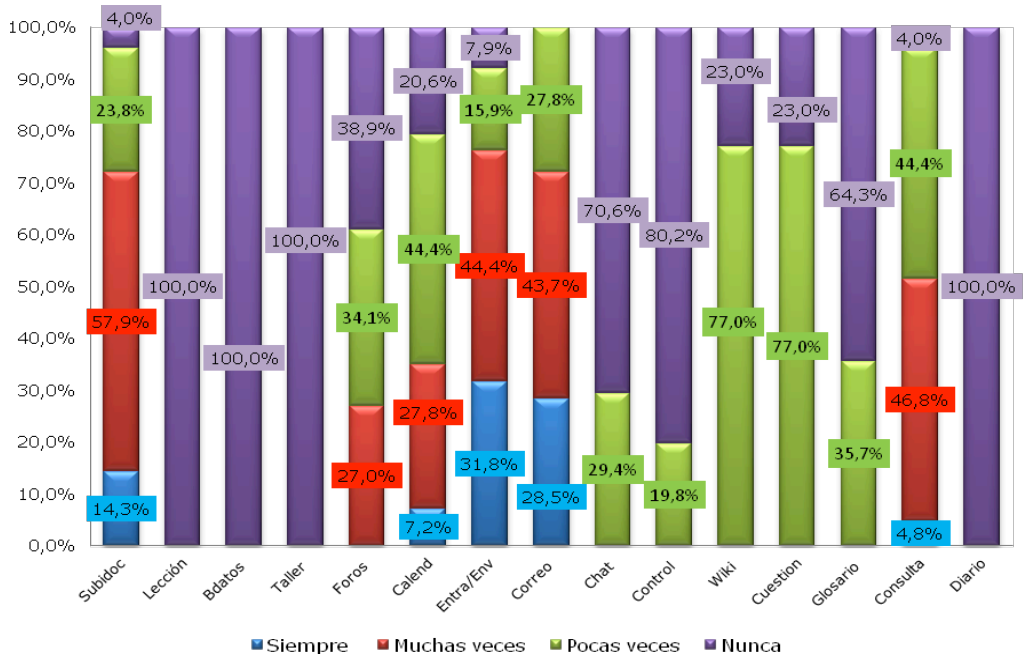

Figura 6. Distribución de la percepción del uso de cada una de las herramientas de Moodle.

Fuente: Cuestionario CPUS, 2011.

Por otra parte, teniendo en cuenta estas respuestas se ha calculado la utilización media de las distintas herramientas de Moodle percibida por los estudiantes. Entre las herramientas que los estudiantes manifiestan que son utilizadas por prácticamente todos los profesores destacan: el envío o entrega de trabajos (M= 3,0; Sx= .894; Mo= 3), la subida de documentos (M= 2,83; Sx= .716; Mo= 3) y consultas (M= 2.52; Sx= .806; Mo= 3).

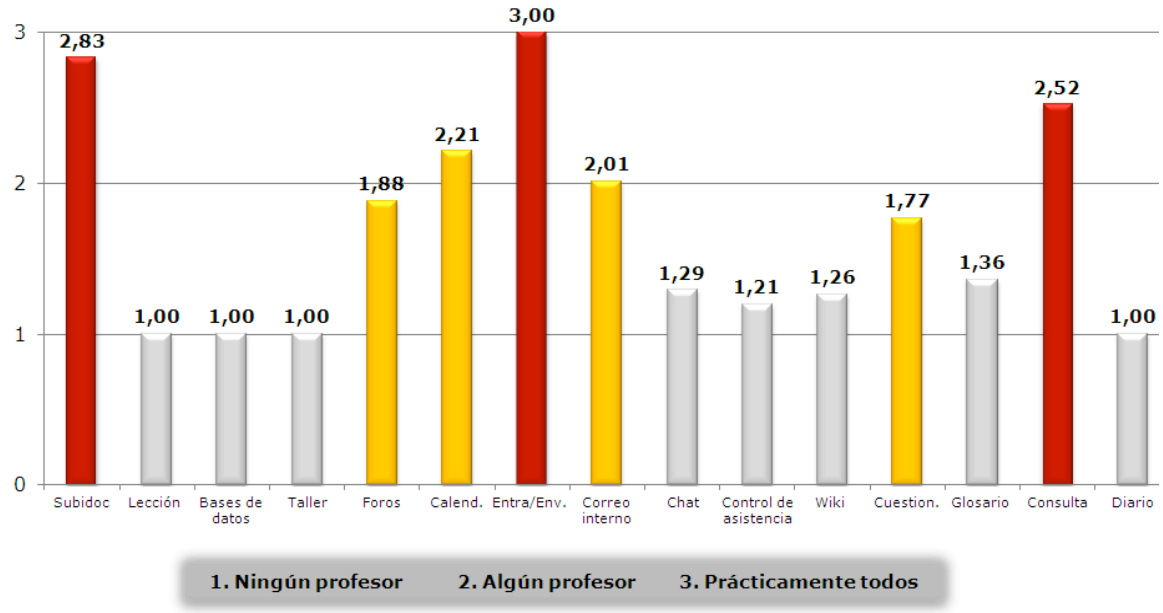

Figura 7. Utilización media percibida de cada una de las herramientas de Moodle

Fuente: Cuestionario CPUS, 2011.

iv. Grado de satisfacción del alumnado en el uso de la plataforma Moodle.

La satisfacción de los alumnos con utilización de las herramientas de la plataforma Moodle por parte de sus profesores durante el curso 2009/10 se midió mediante una escala de 4 puntos (de 1 = totalmente insatisfecho a 4 = totalmente satisfecho).

La distribución de las respuestas de los alumnos refleja que, las posiciones predominantes son las de satisfecho y totalmente satisfecho, siendo las menos frecuentes: insatisfecho y totalmente insatisfecho.

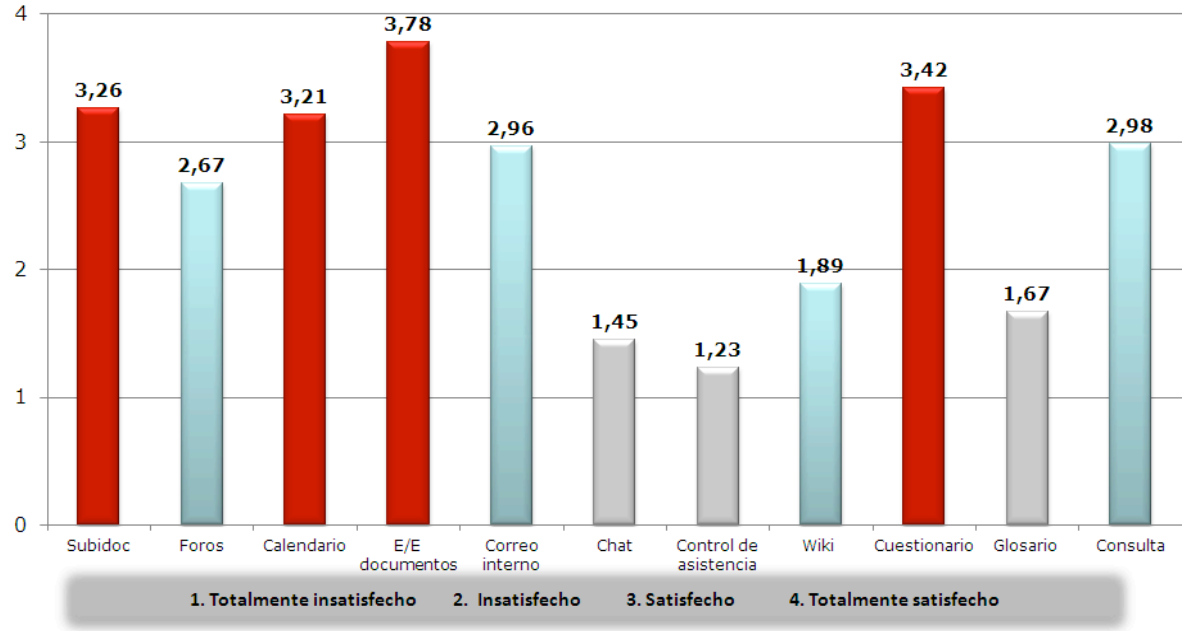

Figura 9. Satisfacción media de los estudiantes con cada una de las herramientas de Moodle

Fuente: Cuestionario CPUS, 2011.

Por último, la satisfacción media con el uso de las herramientas de Moodle se sitúa por encima de 3 (satisfecho) en el 63,6% de los casos.

V. Conclusión

Los datos obtenidos ponen de relieve la importancia de Moodle en la docencia universitaria dentro las tres titulaciones estudiadas. Asimismo, se destaca el papel de Moodle para visualizar la organización de la docencia, así como para el intercambio de información y documentos. No se han identificado evidencias que nos hagan pensar que Moodle se concibe como una herramienta para generar espacios de colaboración y coordinación.

Si se toma la clasificación de Baumgartner (2005) sobre los tipos de modelos educativos de Moodle, el modelo I de "transmitir conocimientos" es el que más se percibe por parte de los estudiantes respecto al uso que los profesores hacen de la herramienta. Se atisban ciertos indicios que nos hacen pensar que el modelo II de "adquirir, compilar y comunicar conocimiento" se conjuga, en ocasiones con el I. No obstante la situación ideal es avanzar hacia la consolidación del modelo II para crear las condiciones que nos permitan incorporar el modelo III caracterizado por "desarrollar, inventar y crear conocimientos", donde los profesores pueden trabajar de forma colaborativa, y no sólo como un espacio cerrado a los estudiantes de una determinada materia, esto facilitaría el desarrollo de las competencias mediante Moodle. Incluso, valorando la capacidad de administrar del estudiante.

Y, sobre la satisfacción, aún sabiendo que estos datos están condicionados por los recursos activados y utilizados por cada uno de los profesores en sus materias, nos parecen interesantes las opiniones de los alumnos ya que refuerzan la lógica de trabajo establecida por el tipo II del modelo de enseñanza. Indicios que nos deben animar a una reflexión que permita generar procesos más conscientes e idóneos a las demandas y necesidades dentro de las aulas universitarias actuales. A

ello se une que las opiniones, respecto al uso, vienen condicionadas por tres motivos que a modo de indicios hay que estudiar con mayor precisión en siguientes procesos de indagación sistemática: a) tipo de materia; b) modelo de enseñanza; y, c) familiaridad con la plataforma.

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