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Enhancement Process of Didactic Strategies in a Degree Course for Pre-Service Teachers

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ABSTRACT

This paper presents a study on the enhancement of didactic strategies based on the idea of personal learning environments (PLE). It was conducted through three iterative cycles during three consecutive academic years according to the phases of design-based research applied to teaching in a university course for pre-service teachers in the University of the Balearic Islands (Spain). Four teachers, one researcher and over 600 students took part in the study. The results show that both teachers and students were satisfied with the didactic strategy based on PLE management (Personal Learning Environment). There were also resulting signs showing that the students transferred what they had learnt to other contexts, and the strategy designed by the lecturers showed continuity. All this leads to the conclusion that the foundations have been set for a change in methodology.

KEYWORDS

Didactic Strategies, Educational Technology, Higher Education, Initial Teacher Training, Personal Learning Environments

INTRODUCTION

The dimensions of university education enhancement processes currently include the integration of technology as an object of learning as well as an educational environment. Some authors consider information and communication technologies to be the factors which drive changes in methodology. In any case, the integration of technology in learning and teaching implies a process of redefinition and improvement of the teaching practice.

The knowledge society creates new training needs in order to solve problems related to information. The current enormous potential for accessing information and the further potential which is looming with the advent of Web 3.0 generates the need for individuals who able to move among large quantities of information and establish mechanisms to manage and select digital information which is relevant to their interests. In addition, the communication processes that are developed through the use of social tools concerning information exchange and personal relationships create new ways of learning and configure new environments in which formal, non-formal and informal learning contexts are intertwined.

In this context, the development of the Personal Learning Environment (PLE) is relevant as a didactic strategy to encourage active learning processes, centered on the students, and the development of interaction and information management procedures that enable the individual to learn throughout their life.

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According to Adell and Castañeda (2010), a PLE is the set of tools, information sources, connections and activities that each person regularly uses to learn. The PLE is structured around three components, which are (Wheeler, 2009): knowledge and information management, content creation and connection with others through the information and content that the individuals publish and their personal relationships. The sum of these connections between the PLEs of the individuals is called Personal Learning Network (PLN). The PLE assumes that each person manages information, creates content and contributes with their knowledge and shared resources to create a learning community or personal learning network. Cabero (2013) states that PLE means to reflect on the processes concerning how people learn.

The PLE concept can be framed in the principles of open and flexible learning (Salinas, 2013) and the theories of self-regulated learning (Cabero, 2013), in as much as the students, guided by the teacher, manage and take decisions concerning their own learning process and adjust it to their needs. For instance, the student selects the learning objectives, the tools that he will use, the type of materials and information sources, the people from which and with whom he will learn, designs the learning strategy, decides where to learn and what their assessment will be. And all these choices allow the integration of formal, non-formal and informal learning contexts. Participation in these new learning methods implies a need to develop competencies for the management of digital information and self-regulation (Urbina, Cormenzana, Conde & Ordinas, 2013).

Being competent in information management implies disposing of knowledge, abilities and attitudes to deal with information in an effective way and using it to solve problems related to information and to build knowledge. It involves knowing how to identify the need for information, how to search and find information in an effective way, how to select it, evaluate it, organise it, retrieve it, transform it into knowledge and share it with others (Area & Guarro, 2012; Larraz, Espuny & Gisbert, 2013).

Self-regulated learning involves students developing a series of competencies related to planning (establish goals, time and effort planning); control and regulation (of motivation, effort, context of task performance, need for help, time) to apply learning strategies, self-assessment and adopt corrective measures (Torrano & González, 2007; Cleary, Callan & Zimmerman, 2012; Cabero, 2013). University students able to self-regulate must be conscious of their own knowledge and able to reflect on their own learning ability. In other words, they are able to establish what they know, what they do not know, and what they do not know and must understand; they are able to analyze their own learning and adapt it to different contexts.

It seems clear that by developing competence in information management and learning self-regulation, students are preparing to learn throughout life in a permanent way. Each individual's ability to manage information and regulate their own learning will affect their learning results and how they transfer these to other situations.

This article presents a research and educational improvement process related to the use of the PLE as a learning strategy. The research presented has as its main objective to foster methodological changes in higher education procedures mediated by technology. Specifically, it provides supporting activities to promote new teaching strategies based on the idea of PLE and in the context of initial teacher training. This paper is an extended work of the study presented in IDEE 2014 (Marín, de la Osa & Pérez Garcias, 2014).

METHODOLOGY

The methodological paradigm for this study is primarily qualitative. It is directed towards gathering data regarding the design, development, implementation and validation of didactic methodologies, effectively fostering new forms of learning supported by the notion of lifelong learning.

According to Stake (1995, pp. 47–48), qualitative studies are characterized by being: a) holistic, oriented to the concrete phenomena in its context; b) empiric, based on practical experience; c) interpretative, the researchers rely on their intuition and direct attention towards recognizing events related to the subject matter; and d) emphatic, the subjects' intentionality is important and a social experience is provided.

The methodological approach of this study uses a design-based research methodology, within the qualitative paradigm, which places emphasis on knowledge production to enhance the design, development and assessment of educational processes. In this approach, the contributions associated with knowledge (theory) and products (practice) are equally important, as is the continuous formative assessment of the entire process. The following aspects are characteristics of this methodological approach (van den Akker et al., 2006): it is interventionist, searches for iteration, points both to the process and to the theory, and is centered on usefulness.

Design-based research in this study has been carried out in three iterative cycles, during different consecutive academic years, and following the phases proposed by Reeves (2000, 2006):

- Situation analysis and identification of the problem. This comes from precedent research on the use of ICT for teaching-learning processes in virtual environments. It is defined as the need to improve and optimise the teaching-learning processes through the use of ICT in virtual environments, and integration of the learning contexts, to put the focus on the student.
- Development of solutions: theory and design. Stemming from a theoretical framework, a methodological strategy based on the concept of PLE is proposed for the integration of formal, non-formal, and informal learning in the formal context.
- Implementation, validation and evaluation. The methodological strategy previously designed is adapted to the course which is the object of this study and is implemented and evaluated in three iterative cycles from 2012-2013 to the current academic year (2014-2015).
- Producing documentation and design principles. These implementations and validation lead to some conclusions and design principles for learning environments.

THE STUDY

Context

This study was started during the academic year 2012-2013 as part of the course 'Technological Means and Resources in the Teaching-Learning Process in Primary Education', and has continued the three following consecutive academic years. This course is part of the first semester curriculum for the third year of the Degree in Primary Education, run by the Faculty of Education at the University of the Balearic Islands (Spain).

The course's main objective is for students to get to know the educational possibilities offered by ICT as a means of learning and a resource, and for them to be able to use, select, organize, and evaluate these in order to enhance the teaching-learning process in primary education.

The course methodology is based on project work and the development of an e-Portfolio stemming from the students' active participation and content projection through the solution of practical problems. Assessment is based on the activities developed around the project through the students' e-Portfolios and a final short-answer test about the contents of the course.

Table 1. Correspondence between the academic year and number of students and lecturers

Academic year	Number of students	Number of lecturers
2012/13	192	3
2013/14	233	4
2014/15 (ongoing)	200	4

Participants

The participants in the study are the students and lecturers in the course previously mentioned from these three academic years (see Table 1).

Students in this course are previously familiar with ICT in education, as it was compulsory for them to have previously taken another ICT-related course, 'ICT applied to Primary Education', during their first year of study. 'ICT applied to Primary Education', introduces students to different tools that they use again in this other course and/or other situations and courses; for instance, CmapTools to create concept maps or Powerpoint to create visual presentations.

The average profile of the students taking the course 'Technological Means and Resources in the Teaching-Learning Process in Primary Education' is a woman under 24 years old and frequent user of social networks (mainly Facebook and Twitter), email, generic search engines (Google), and video websites (YouTube). Aside from offline office suites, they do not generally use tools to create content or to manage information, other than Google. This creates an Internet user profile that is basically that of a consumer: they consume information and communicate with their friends but seldom produce content.

Didactic Strategies Proposed

As discussed before, the didactic strategies implemented over the three academic years of the course were related to the components of PLE: content creation, connection with others and information management.

The course's main product is a project made of different digital educational resources for primary education and its didactic documentation. This project is presented by means of an e-Portfolio. Hence, the content creation strategy is this development of the educational materials and didactic documentation in the project presented through the e-Portfolio.

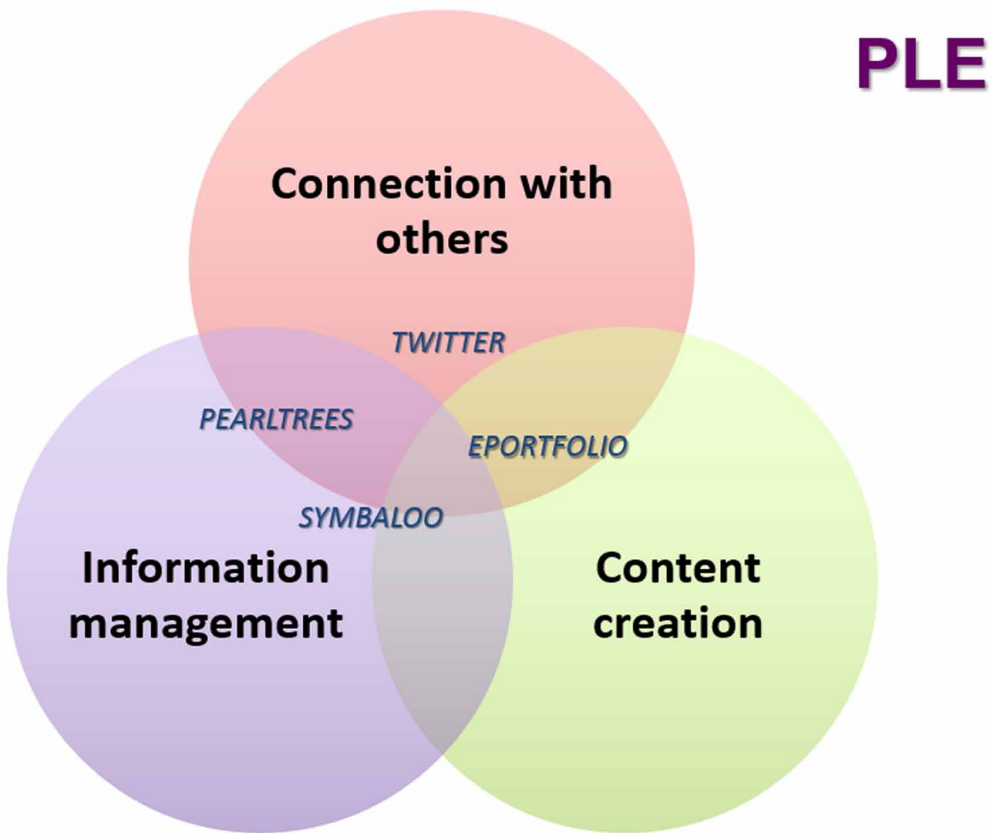
Nevertheless, students need to select, gather and use information to create that project. For that purpose, they are asked to utilize sources from the course bookmarks and create their own space for gathering information configuring their sources (through RSS or other means). This is the course's information management strategy.

Last but not least, students are recommended to share information and their work through the class network on Twitter using a hashtag, in order to take advantage of all their classmates' ideas and materials. They are also asked to create their own PLN by following teachers and other education-related people that could contribute to their learning, either on Twitter or using RSS (see Figure 1).

Regarding tools, each year students have had increasing flexibility to choose which ones are more suitable to the needs and requirements of their project. For instance, for the development of the e-Portfolio, they could choose a blog (e.g.: Blogger, Wordpress) or web platform (e.g.; Wix, Weebly, Webnode, Google Sites), or other unconventional formats, such as concept map (Cmaptools) or notes (Evernote). For the creation of the different educational materials they can also select diverse tools and spaces for their publication.

In the case of information management, students can choose to use Symbaloo or Pearltrees to gather information and ideas for their project, and they also can select a RSS reader for RSS subscription to webpages of interest. Symbaloo and Pearltrees were also proposed as tools for

Figure 1. Tools related to the didactic strategy proposed in the course



representing the students' PLE, integrating all the resources and tools they use in their everyday to learn, but also specifically for the course.

Questions Posed

By using the above mentioned didactic strategies, the study poses some questions:

- How do students and lecturers assess didactic strategies based on the idea of PLE?
- How do PLE-based didactic strategies affect learning transference possibilities?

Therefore, the aim of the research is to explore the use of didactic strategies centered on the concept of PLE with the purpose of enhancing teaching-learning processes in higher education.

Data Collection Instruments

The instruments for the collection of data were both quantitative and qualitative in order to obtain information about the validation of the didactic strategies proposed.

Interviews and tracking meetings were used to obtain qualitative data from the lecturers involved in the course. Questionnaires with closed and open questions and product observation were utilized to collect data from the students. Quantitative data from the students' questionnaire and from product observations is presented in other papers (Marín, Negre & Pérez Garcias, 2014; Marín, de la Osa & Pérez Garcias, 2014).

The data featured in this paper corresponds to the part related to the lecturers and the open questions from the students' questionnaire. They were analyzed using the content analysis technique, according to aspects related to usefulness and transference of the didactic strategies posed.

RESEARCH RESULTS

The study's results are presented in relation to the questions posed previously.

Assessment of the Didactic Strategies

Overall, the students' and lecturers' perception of satisfaction regarding the didactic strategies implemented during the course is positive. This positive perception is related to its consideration of usefulness, especially with regards to the development of the e-Portfolio, the use of bookmarking to manage and gather resources and the group work. This satisfaction is also linked to their recognition of the importance of ICT in teaching and its possibilities for personalized learning. This strategy also encourages creativity and flexibility.

The strategy is aimed at the development of autonomous and self-regulated learning. Therefore, the students who are not used to this way of working consider it a waste of time to search for resources and information to develop their project. As was mentioned before, students are given some basic instructions and sources and they have to develop their projects on their own, with guidance from the lecturers. However, and especially at the beginning of the courses, students have difficulties understanding and implementing the combination of tools involved in the strategies.

Learning through these didactic strategies is also considered positive, both by students and lecturers. Students acquire a broad background of tools and resources that they can apply in their future classes, and also expand their knowledge of the uses of tools they already use. On the other hand, this learning has also enabled them to get to know their limitations and possibilities and, they even feel a certain amount of self-improvement. Students also value the relevance of sharing knowledge and resources among classmates.

A down-side that is pointed out by both students and lecturers is saturation in the workload, as the course is very time-consuming (work involved and feedback required, in each case). Concerning this aspect, the lecturers have incorporated different changes in the strategies in order to reduce this workload for students and themselves: reducing the number of deliverable workshops, expand times for delivering, etc.

Some comments that illustrate these remarks are as follows:

I think that the work done in class is appropriate, despite being very time-consuming. I am sure that we will take advantage of the materials created in the future, when we become teachers (Student 2012-13) I do not know if I have understood things properly, but the truth is that the strategy has been difficult to me to follow. Despite the efforts, there was too much information and places to follow during the course. I was a bit confused (Student 2012-13)

Although to begin with it was all new for me, I have learnt more each time and I have also understood the use of the e-Portfolio and Twitter, and I know I will transfer this knowledge in my personal and professional future (Student, 2013-14)

Thanks to the activities performed during the workshops, I have discovered a broad range of resources and I have learnt how to use them at least in a basic form. I have also learnt more about other resources that were already known to me. After learning about many of the resources you were unfamiliar with, you can then come up with a thousand ways to use them in an educational context. (Student, 2013-14)

Content Creation

Within the strategies related to content creation, the one that received the most praise was the use of a blog for reflecting on the daily practice and as an e-Portfolio. It is considered a useful and well used tool in its functions. According to the lecturers, some of the students went beyond the basics in the use of their blog and used it very effectively. Nevertheless, tracking all the blogs and providing feedback on each one is a very time-consuming task for lecturers.

As examples of application show, the value of the different tools learnt about in the course workshops for creating educational materials is also remarkable.

Connection with Others

With respect to the strategies of connecting with others, Twitter was the social communication space for the course, but it was not considered by the lecturers as a teaching tool. Lecturers considered it as another opportunity for social interaction and learning in the course and they used it sporadically to share some relevant resources related to the course. The greatest difficulties related to this strategy were related to understanding the differences among different types of social networks; and, on the other hand, the need for more dynamic and more active participation.

Despite having some technical problems during the first academic year (solved in the following years), the use of Twitter as applied in the course was, in general, valued as positive because of its possibilities to share information, documents and work. This space boosted a PLN among the people who usually interacted on Twitter sharing resources or giving support to their classmates.

Information Management

As for the strategies concerning information management, students were provided with basic documentation for each course content block and a guide for the workshops. In addition, lecturers collected some useful and complementary resources to support the course's theoretical and practical sessions using different bookmarking systems (Delicious, Pearltrees).

Twitter, in some cases, was also seen as an opportunity to create a network of information sources and, thus, to manage information.

Then, Symbaloo, in general, was considered useful to manage information and sources, a practical tool to collect resources. One of Symbaloo's limitations is the fact that users cannot collaborate on the same page, and this is overcome by Pearltrees.

On the other hand, the lecturers detected some gaps in many students' abilities to manage digital information, to the point that many of them did not know how to carry out efficient Google searches. In contrast, others expressed their taste for researching new uses and tools. These students occasionally became class leaders in as far as they were a source of support and help for their classmates.

Transference of Learning

This item was related to students applying new knowledge acquired during the course in the present and in their forecast of use in the future.

The application examples were varied and in different contexts: personal use, use in other courses, to help/show to relatives, friends, partners, etc., to use in remedial classes, non-formal contexts, professional contexts, internships, etc.

Table 2 shows some examples of transference in the present:

Students describe these experiences as being positive as they found them to be successful and they made them feel that they were improving their abilities and identifying improvements they needed to make in their educational materials. Furthermore, these experiences enable students to see different possibilities for applying tools and resources in their future classrooms and made them feel that they were being prepared for their professional future. In fact, when they were asked in the

Table 2. Application Examples

Application	Students' description
Used for academic work	'I have used the resources I had on my page in Symbaloo for other courses, mainly: image and sound banks, tools to create activities and other didactic resources' (Student 2012-13) 'We used Audacity (a tool from the course workshops) to record in our music course. It was not difficult, as we learnt how to use it on the ICT course' (Student 2013-14)
Sharing and/or showing what they learn to other people	'I showed Symbaloo to my cousin, since I liked it very much and I thought it could be useful for him' (Student 2012-13) 'I helped a relative to create a blog for his professional field. The only visible difficulty was his lack of digital competency. Now he uses the blog alone and without help, he has improved a lot' (Student 2013-14)
Used to teach in remedial classes and internships	'I used our project's webquest in remedial classes. The results perceived were positive because the students liked it very much' (Student 2012-13) 'I used resources such as Educaplay or PowerPoint (tools from the course workshops) to teach some remedial classes. I got good results and a high degree of motivation from the students' (Student 2013-14)
Use of informal activities	'I used GIMP (a tool from the course workshops) to create a greeting card' (Student 2012-13) 'Symbaloo has become part of my daily life with the computer and it is almost always the first thing that I open when I have to work.' (Student 2013-14)

questionnaire if they expected to use the new acquired knowledge in the future, almost all of them answered in the affirmative.

CONCLUSION

In general, the experience has been valued as being a very positive one, for students and lecturers alike. The strategy implemented has allowed for the subject's own content to be followed as well as for the students to develop complementary skills related to digital competence and to establish mechanisms for permanent learning. The students have located and selected information, used diverse tools for the purposes of creating content and managing information, and they have started building their own learning network. The strategy places the student at the centre of the learning process and involves a set of tools and procedures which feature formal and informal learning (learning file, learning from others and with others, organizing information and creating content) which can be applied to their professional development as future teachers, used to design learning environments for primary school classrooms and transferred to their further professional training and development.

The didactic strategy developed promotes the creation and management of the student's and teacher's own PLE, whilst also integrating learning procedures in different contexts. The results show signs of transference; the students transfer the procedures studied during the course to other contexts and the participating lecturers maintain the enhancement process initiated. All this leads us to conclude that the foundations have been set for educational innovation.

To focus entirely on didactic designs which are based on PLE requires methodological changes, both from the lecturers as from the students. The study's results show, on the one hand, a need for the student to develop further autonomy and self-regulation procedures if they are to participate fully in this active learning system. And on the other hand, the lecturers need to develop working mechanisms which are open to large groups and they need to master new communication channels and content management systems.

Educational innovation itself requires research, experimentation, evaluation and reflection, in relation to the improvement of learning and teaching processes, especially when it comes to methodological aspects. Educational research and innovation are clearly linked (Morales, 2010).

Some of the most recent research related to educational innovation at universities has been carried out by university professors, and they evaluate methodological aspects, didactic strategies, evaluation methods, etc., from their own teaching experience in relation to the results or changes in students related to other variables to do with teaching and learning such as motivation, self-regulation, student satisfaction or other variables (Morales, 2010).

We consider educational quality to be related to the array of didactic strategies adapted to the students and their characteristics, the knowledge or curriculum followed, the organization, context or surroundings in which the work is carried out and the use of technological tools which facilitate communication, interaction and knowledge management (Salinas, 2012). In this sense, the design and development research and actions we have carried out can be considered a research sub-model applied to teaching which has not only allowed us to promote innovation in university teaching, but also to collaborate with the teacher in the design of didactic strategies, to guide and shadow them during the implementation process and analyze and reflect on its development.

Finally, we think that the research and innovation developed from various iterative cycles of implementation and analysis has generated a valuable reflection on the efficiency of the teaching practice. Indirectly, this research and innovation process has provided training and updates for the lecturers involved, not only in their use of technology and the management of their PLE but also in their ability to reflect on the integration procedures required for technology and on how their students learn in new environments. We feel this is an adequate way in which to promote educational innovation.

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