GOING BEYOND THE DIAGRAMS:
STUDENT TEACHERS' REFLECTIONS ON THEIR PLE

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Abstract

This paper presents a study on the reflections on their PLEs by student teachers in two ICT subjects from different degrees courses in Teacher Education (Early Childhood Teacher Training and Primary Teacher Training) at the University of the Balearic Islands (UIB). There were three student teachers groups (n=150) participating in this project, from two different Balearic islands (Mallorca and Ibiza). The main research issues focused on in this study are: the topics highlighted from the reflections on the students' PLEs and the differences of perceptions on the PLEs from students in different programmes. To explore these issues, a content analysis technique has been used to interpret their final assignment of the students' eportfolios, in which they had to carry out their reflections on their PLEs. For that purpose, two instruments have been designed: a system of categories and a rubric of assessment. Results show that the topics on which students reflect most are the conception of the PLE, its structure and its purpose. Furthermore, differences between reflections of the students from different degree programmes have been detected. Whereas early childhood student teachers focus more on a pedagogical concept of the PLE, its structure and its possibilities related to networking learning, primary student teachers express a more technological concept of the PLE and mainly talk about its purpose and tools. Conclusions lead us to the necessity of working further on the depth of reflections in order to adequately support self-regulated learning.

Key words: PLE, reflection, self-regulated learning, Teacher Education

Introduction

The research on PLEs is in constant evolution and much has been argued since the first time it was first introduced. The papers presented in the PLE Conference in previous years are an example of its evolution: from the conceptual debate in the early years to the pedagogical approach in recent times (Adell & Castañeda, 2013).

The pedagogical approach has particularly focused on introducing students into the virtual environment in order to use tools for learning. Many articles analyse the diagrams made by students representing the tools and the interactions of their PLEs (de Benito, Lizana & Salinas, 2011; Castañeda & Soto, 2010; Marín, Lizana & Salinas, 2013) or interpret the progressive number of tools used (Tur, 2011; Tur & Urbina, 2012). However, going one step further, it is also important to observe the cognitive processes carried out by students introduced in PLE practices, and so there is also an important line of research in this way (Dabbagh & Kitsantas, 2012; Kroop, Berthold, Nussbaumer, Albert, 2012; Nussbaumer, Sheffel, Niemann, Kravcik & Albert, 2012; Rahimi, van den Berg & Veen, 2014).

The current study is included in this last group of studies and shows the pedagogical approach from the perspective of the cognitive activity of learners through their PLEs. Students are asked to draw the tools and the interactions of their PLEs but, also and more importantly, to focus on the reflection process. Thus, students reflect on the activities they have carried out and the impact these have on their learning, among other topics.

Background

PLEs imply a change in education towards a learner-centred approach overcoming the limitations of the Virtual Learning Environments (VLE) (Torres-Kompen, Edirisingha, & Mobbs, 2008). It was the development of Web 2.0 tools that led to the appreciation of the PLE concept, which gives more individualization to the learning processes. In fact, the learning experiences that can be designed with Web 2.0 tools are usually active, process-based, anchored in and driven by learners' interests, and therefore have the potential to cultivate self regulated, independent learning (McLoughlin & Lee, 2010). In this current society, in which the information sources, connections, etc. are so diverse due to technological advances, the PLE could be considered as an environment in which we learn by using technologies in an effective way, learning to learn in a digital era. In short, it would be a metacognitive tool (Castañeda & Adell, 2013).

In this sense, there is a strong idea underlying the PLE concept: the autonomy of the learner

and what Zimmerman & Schunk (1989) call self-regulated learning.

According to these authors, self-regulated learning is "the ability of a learner to prepare for his/her own learning, take the necessary steps to learn, manage and evaluate the learning and provide self feedback and judgment, while simultaneously maintaining a high level of motivation". Zimmerman (1990, p. 14) argues that students who are self-regulated learners are "distinguished by their systematic use of metacognitive, motivational and behavioural strategies; by their responsiveness to feedback regarding the effectiveness of their learning; and by their self-perceptions of academic accomplishment".

The self-regulation process is achieved in cycles consisting of forethought (providing choices), performance (scaffolding) and self-reflection phases (assessing) (Rahimi, van den Berg & Veen, 2014). Zimmerman (2002, pp. 67-69) has detailed the self-regulation process as follows:

- "Forethought phase". It refers to the cognitive activities carried out before learning. It consists of two major processes: task analysis, which involves setting goals and planning learning strategies, and self-motivation, which is related to students' perceptions of their own self-efficacy and their expectations about learning results.

- "Performance phase". It refers to the processes carried out during the implementation and it involves two main operations: self-control and self-observation. The former is about implementing the strategies planned in the previous phase. The latter is about self-recording their learning performance, and self-monitoring is another related process that consists of tracking learning.

- "Self-reflection phase". It consists of the processes carried out after learning and it involves two main cognitive tasks: self-judgement and self-reaction. The former can be carried out as self-evaluation, which consists of comparing the self-observation with standards; and, of causal attribution, which involves attributing causes to one's own mistakes. The latter is about feelings such as self-satisfaction and the consequent response: adaptative, such as increasing learning effectiveness or, defensive (such as protecting one's own image by avoiding further learning experiences).

Furthermore, Rahimi, van den Berg & Veen (2014, p. 7), when applying the self-regulated cycle into the construction of PLEs, add a fourth phase:

"Feeding back (applying)". This mechanism is aimed at improving both student and teacher learning. As for the learner mechanisms, it consists of two parts: firstly, discovering the cognitive, personal and social affordances of the social media; secondly, tracking students' data about their use of technology.

This self-regulation process described can be observed in the construction of the PLE in itself, because it is "something that one builds autonomously to suit one's own needs and fulfill the type of learning one wants to pursue" (Henri, Charlier & Limpens, 2009). PLEs consist of different systems that help the student to take control and manage their own learning, no matter whether it comes from a formal, non-formal or informal context. These systems support the learners in deciding their own objectives of learning, managing their own learning (the content and the process), communicating with others in the learning process, and all that contributes to the achievement of the objectives (Salinas, 2013).

Therefore, the PLE, as a metacognitive tool, could foster self-regulated learning and reflection, due to its need for goal setting, awareness and control over learning resources and results. According to Henri, Charlier & Limpens (2009), it has the potential to support the internalisation/externalisation of learning processes and results. However, the realisation of this potential requires the learner to previously develop metacognition competences (motivation to analyse, control and improve their learning) and reflexive tools should be available to the learner and easily integrated in their PLE. The metacognitive skills that a self-regulated learner requires to reach the PLE potential to support learning processes and results are the abilities to execute learning activities that leading to knowledge creation, comprehension and higher order learning (Stubbé & Theunissen, 2008) by using processes such as monitoring, reflection, testing, questioning and self evaluation.

Also, reflection is a key process for a successful PLE approach (Rahimi, van den Berg & Veen, 2014). These authors suggest that the reflection process allows learning to go beyond a false constructivism where learning means doing with no other reason than doing. Rogers (2001, 40-42), after a deep revision of diverse reflection frameworks, is able to define some of its main characteristics: it is a cognitive process or activity; it requires individual engagement; it implies the examination of one's own responses to a situation; it is initiated by an uncommon experience; and, eventually, reflection is aimed at enhancing understanding and improving future actions by the integration of the new learning. Rogers (2001, pp. 50-55) also observes some commonalities in the different conceptualizations of reflection that he analyses and describes according to the following aspects:

- Antecedents. Reflection has a rather unpleasant beginning, which should be contextualised or problem-based too, and which demands a willing and engaged student.

- Context. The educational context has to be favorable for reflection and individualised for students: feedback, faculty and peer support, careful teaching design, and flexibility are among the characteristics of a rich environment that can enhance reflection.
- Process of reflection. It is the aspect which differs most among different theories, and his analysis is based on a wide variety of authors such as Dewey and Mezirow. The challenge is to conduct reflection without misunderstanding it and choose carefully what needs to be considered under reflection.
- The value of experience. The individual reflects on their personal experience so teachers must learn to take advantage of students' experience.
- Techniques to foster reflection. Probably, one of the most important one is mentoring, and also, timing and using structured activities for reflection such as journals or portfolios.
- Outcomes of reflection. The expected ones are learning and both personal and professional effectiveness.

For purposes of this study, a framework for using social media to support self-regulated learning in PLEs has been considered (Dabbagh & Kitsantas, 2012). Its aim is to scaffold student self-regulation skills in the creation of PLEs and it is based on the levels of interactivity enabled by social media tools: 1. creating spaces for personal information management, 2. social interaction and collaboration, and 3. information aggregation and management. Also, based on Rogers (2001), reflection is fostered in order to enhance students' effectiveness on their use of the social media for learning and their vision for the integration of technology in their future careers.

The study

Context

This paper presents a study on student teachers' reflections on their PLEs in two ICT courses from different degree courses of Teacher Education (Early Childhood Teacher Training and Primary Teacher Training) at the University of the Balearic Islands (UIB). During these courses, both of them in the first semester of the academic year 2013/14, pre-service teachers create different educational resources oriented towards their professional performance (early childhood teacher or primary teacher) and include them on an eportfolio. This is how students are asked to document their evolution, add artefacts and reflect on their learning.

For their last eportfolio assignment, at the end of the courses, the students were asked to include the diagram of their PLE, with the tools they most prefer, and reflect on the aspects of their learning that they consider most important. Students were given some specific topics to write about - related to tools and their impact on learning processes- but they were not limited to these and students did not necessarily have to reflect on all of them.

Following Rogers (2001), reflection was worked as follows:
- Antecedents. The unpleasant situation was based on the challenge that every new task and tools, introduced during the lessons, represented for students.
- Context. The educational context was especially concerned with: giving specific instructions about the task assigned; feedback by lecturers during the development of tasks; fostering peer support in face-to-face lessons; careful teaching design by faculty and flexibility to choose among a wide range of tools.
- Process of reflection. Although continuous reflection was demanded and in some cases developed during the course, the reflection process was enhanced in the last assignment, with the representation of student PLEs.
- The value of experience. Students reflected on their own use of tools and the impact these had on their way of accessing information, creating knowledge and sharing with others (Adell and Castañeda, 2010; Castañeda and Adell, 2013).
- Techniques to foster reflection. Mentoring was based on journals or eportfolios, so the reflection process was carried out as a structured activity that facilitated the process of sharing among peers and teachers.
- Outcomes of reflection. The expected outcomes of reflection on PLEs were to see students analysing the affordances of having a PLE for learning, and also its possibilities for transference to their personal and professional future as teachers.

Participants

There were three groups participating in this experience, studying on two Balearic islands, from different degree programmes:

- A group of 75 students doing the third year of Primary Teacher Training at the UIB in Palma de Mallorca.

- A group of 60 students doing the fourth year of Early Childhood Teacher Training at the UIB in Palma de Mallorca.

- A group of 15 students doing the fourth year of Early Childhood Teacher Training at the UIB in

Ibiza.

Due to technical problems, results shown in this article correspond to approximately 65% of participants from the total of students (n=150), so this is a preliminar study based on 96 participants.

Research questions

The main research questions of this study are:

- What topics do student teachers highlight from the reflection on their PLEs?
- Do students from different programmes have different perceptions of their PLEs?
- How deeply do students carry out their reflection process?

To explore these questions, we mainly use a content analysis technique in which we analyze individually reflection on the following topics and others not specified beforehand:

- Reflection on the impact of their PLE awareness on their own learning
- Reflection on the impact of the tools on their future teaching

After collecting these data, we represent it graphically in order to compare different results and answer the research questions initially posed. In this way, the data obtained will allow us to observe the main topics commented on by students and see if their impressions cover a wide range of topics.

Methodology

From an interpretative perspective, the current study is aimed at understanding students' reflection on their PLEs. A mixed methodology is employed, since qualitative and quantitative methods may be necessary in different stages.

As mentioned previously, a content analysis technique is used to explore the research questions posed through the last assignments of the students in their eportfolios related with the reflection of their PLEs.

Instruments

Two instruments were used for the analysis of data obtained: a system of categories to analyse students' reflections on the topics suggested and a rubric to assess the depth of the reflection process carried out by students.

System of categories

A system of categories for the analysis of content - the written texts by students in their

eportfolios - is designed ad hoc based on the research questions. This initial system was first validated with its experimental application for the assessment five pieces of writing by two of the researchers in an independent way. After this step, several convergences and divergences were found in the results and some adjustments were made. However, some minor corrections had been introduced during the process of analysis in order to optimize the system.

The resulting instrument with the relation of families and its description, categories and assigned codes is shown below:

Family	Description	Categories	Assigned codes
Concept	It refers to the mention by students of the concept of the PLE, whether with its definition or description. From this concept, a technological or pedagogical conception of the PLE was inferred by the researchers.	Definition Description	C-definition C-description
Structure	It refers to the mention of the type of structure by students of their PLE.	Personal/academic Virtual/physical Reading/writing/ sharing	S-personal/academic S-virtual/physical S-reading/writing/sharing
Explicitness	It refers to the explanation or explicitation by students of their PLE.	Process of explanation of the PLE Awareness of the PLE	E-explicitation E-awareness
Learning	It refers to student reflection on the learning related to the PLE.	Awareness of learning Learning connection Formal learning Informal learning Non-formal learning Intellectual development Lifelong learning	L-awareness L-connection L-formal L-informal L-nonformal L-LLL
Network	It refers to student reflection on networked learning related to the PLE.	Learning community Personal learning network Sharing resources Connection with	N-learning_community N-PLN N-sharing_resources N_connection

		others	
		Social networks	N-social_networks
Purpose	It refers to student reflection on the aims related to the PLE.	Projection to professional work	P-projection
		Professional practice Academic use	P-professional
		Professional teacher development	P-academic P-PTD
Tools	It refers to the students' tools considered in their PLE.	Information tools Content creation tools	T-consult T-creation
		Communication and relations tools	T-communication
		Multimedia Organization tools	T-multimedia T-organization

Table 1. System of categories for the analysis of content.

Rubric on reflection

The reflection rubric used is an adaptation of a previous work to analyse students' reflection on their eportfolio evidence (Tur, 2013). The item "reflection" of the original work is based on diverse theoretical reflection frameworks, especially Dewey's cycle of reflection (1989) and the theory of transformational learning by Mezirow (1997; 1998). Also, it includes the scale formulated by other authors who have observed some patterns in the way students address the reflection process on eportfolios (Cambridge, 2010; Oner and Adadan, 2011; Jenson, 2011). The four levels of the final design of the rubric give a wide and comprehensive perspective about the different levels of depth in which student teachers carry out their reflection process. Thus, the rubric used includes four levels:

1. Non-reflection level. Students include in their eportfolio evidence a diagram of their PLE without reflection. Although there is no written reflection, the mere fact of the construction of the artefact and what it represents has been considered a kind of reflection. Also at this level, students add the definition of the concept without any transfer into their individual cases.

2. Descriptive level. It is based on the description of the activity carried out such as the use of new tools and the difficulties encountered at a technical level. It also includes the description of feelings towards the process and the results achieved.

3. Analysis of learning. It is based on the description of the impact that the use of tools may have at a personal level.

4. Analysis of learning in relation to past and future stages. It includes the level in which students value the transformational learning they have experienced and how the new learning may change their educational perspective and future learning. But it also includes their vision of the use of technology and the impact of their PLE in their professional careers.

Results and discussion

Before the content analysis of the students' reflections, it is noteworthy to show, first of all, how students graphically represent their PLE. Students diagrammed their PLEs in two possible ways, as illustrated by the following two figures: whether as a mind map (figure 1) or as a Symbaloo page (figure 2), depending on the didactic design of each teacher program. Students who used a mind map tool to represent their PLE could also classify the tools in three groups regarding usage.
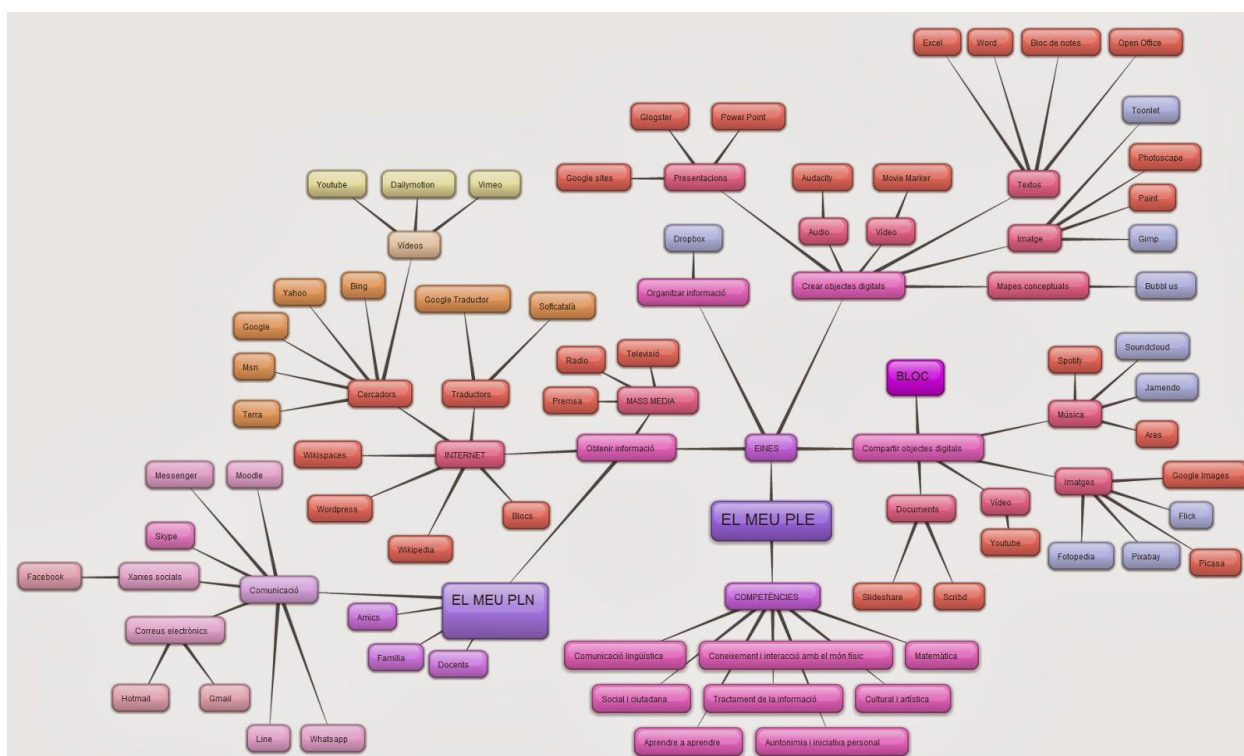

Figure 1. Map mind of the tools of one student's PLE. Early childhood student teacher in Ibiza[1]

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[1] URL: http://tanit-eportafoli4.blogspot.com.es/2014/01/ple.html

Figure 2. Symbaloo page of one student's PLE. Primary student teacher in Mallorca[2].

Results of the rubric on reflection

From the results of the rubric on reflection, we can observe that most of the reflections of the students are within the descriptive level in all the groups, with some important percentages in level 3 (impact of learning at a personal level). Most of the students have only described the tools they consider as part of their PLEs, its use or the emotions related to the use of these tools, such as difficulties, easiness or interest. Although they might comment that their PLE is useful and could be transferred to their professional future, they do not usually go deeper, and try to connect previous experiences and what the impact future could be. In general, they seem to have difficulties in going deeper in their reflections level 4, even if there are some interesting cases (e.g. 20% in Early Childhood Teacher Training in Ibiza).

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[2] URL:
http://webcache.googleusercontent.com/search?q=cache:njxh6zfrV3wJ:beabloguea.blogspot.com/2014/01/aixo-sacaba-reflexions-de-darrer-moment.html+&cd=1&hl=es&ct=clnk&gl=fi&lr=lang_ca|lang_es|lang_pt&client=firefox-a
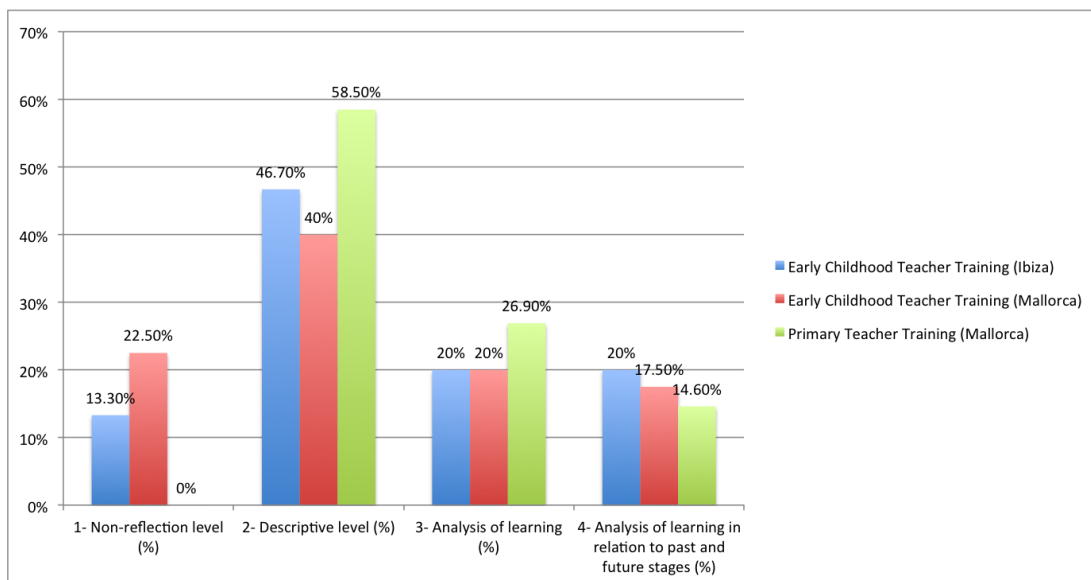
Figure 3. Graphic representation of the results of rubric on reflection.

Results of the application of the rubric are shown in the following table:

	1- Non-reflection level (%)	2- Descriptive level (%)	3- Analysis of learning (%)	4- Analysis of learning in relation to past and future stages (%)
Early Childhood Teacher Training (UIB-Ibiza) n=15	13.3%	46.7%	20%	20%
Early Childhood Teacher Training (UIB-Mallorca) n=40	22.5%	40%	20%	17.5%
Primary Teacher Training (UIB-Mallorca) n=41	0	58.5%	26.9%	14.6%

Table 2. Results of rubric on reflection

Results of content analysis for each group

Results of content analysis of written texts are presented by groups (figure 4) in order to see possible variables and patterns between groups, taking advantage of the fact that they are diverse in three aspects: different settings, professional profiles and didactic design of the
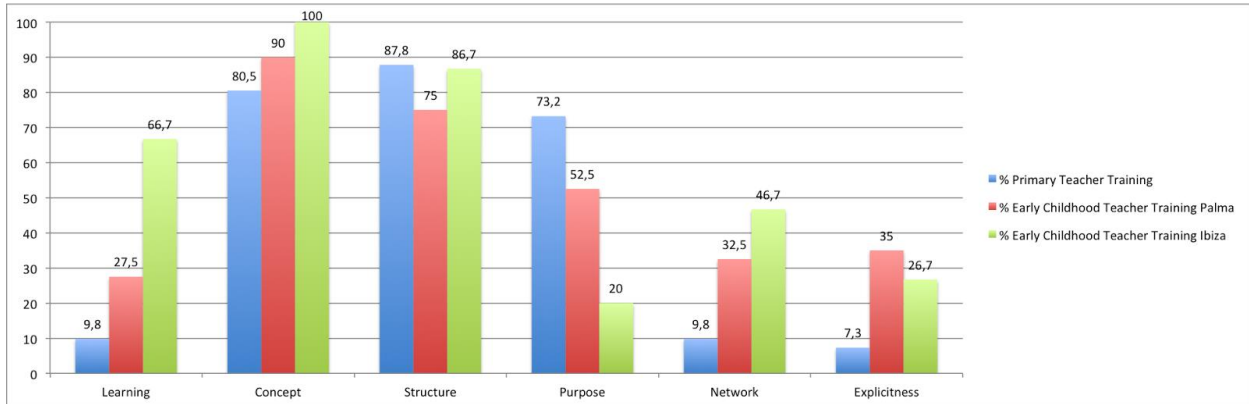
activity suggested.

Figure 4. Families of categories mentioned by students of the different degrees and locations (% students).

From data obtained, some patterns can be seen in the way students reflect on their PLE. First of all, most students in each group reflect on the topic, based on the scientific definition of the PLE which was introduced through compulsory articles for reading. Secondly, closely related to the conception of their PLE, most students reflect on its structure, which is shown in diverse ways by students in the different groups. Thirdly, as for the differences on the PLE conceptual definition among students in both programs, it can be observed that while students in Infant Education of both islands conceptualise their PLE from a pedagogical perspective (Mallorca: 97.5% and Ibiza: 86.7%), students in Primary Education consider it from a technological perspective (95.1%) (figure 5).
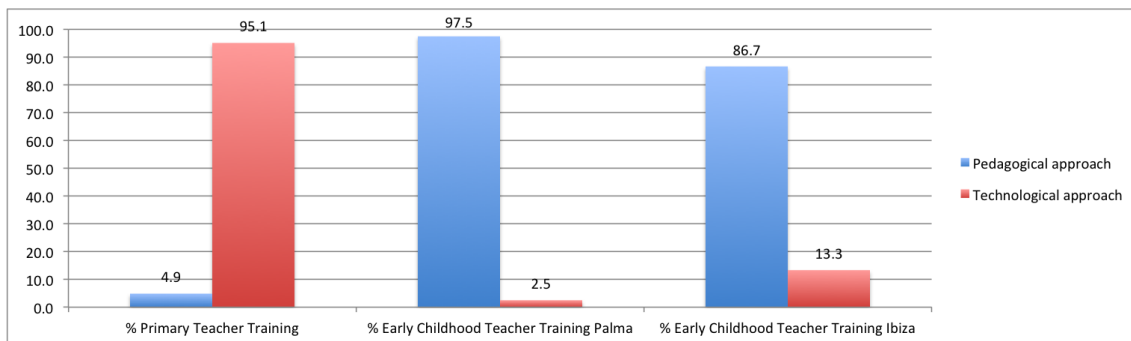

Figure 5. Approaches to the PLE concept of the students of the different degrees (% students).

This is an interesting issue that could be a subject for further research in order to discover if this is due to the instructional design (since the lecturers shared the same conception of the PLE),

which is a relevant variable, or if the educational level on which these students are focused on might have influenced the results. Therefore, this is in line with previous research by Buchem, Tur and Hölterhof (2014) who observe that factors related to context, didactic design and knowledge background may influence students' perception of PLEs.

However, the fact that the majority of students base their answers on the PLE definition and the description of its structure but not as many of them reflect on learning, allows us to observe the difficulties for reflection (figure 6). This means that students start by describing their experience, which is the most elemental level of the learning process defined by Rogers (2001), but they do not reflect further, for example, on the impact on learning. Likewise, these results are mostly coherent with the data obtained from the rubric application. So, future implementations of this activity should address student difficulties in going beyond the conceptual and description level. These results are also in line with previous research (Tur & Urbina, 2012; Tur & Marín, 2013) which allowed us to observe that student teachers have better perceptions of their technical learning than of their reflection or collaboration processes. In fact, previous research on the reflection process by student teachers revealed great difficulties in achieving the highest level of reflection (Castañeda & Soto, 2010; Tur, 2013). Thus, reflective learning is considered difficult by learners since it demands a high degree of effort and commitment (Banks, 2004). Therefore, we cannot conclude that our students are self-regulated learners according to the characteristics described by Zimmerman (1990, p. 14): "systematic use of metacognitive, motivational and behavioural strategies; responsiveness to feedback regarding the effectiveness of their learning; and self-perceptions of academic accomplishment".
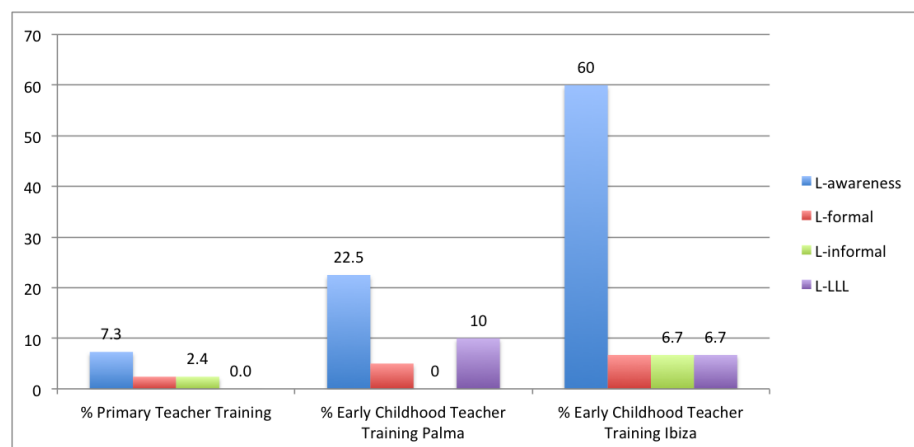

Figure 6. Reflection on the learning related to the PLE (% students).

Another pattern to observe is the relationship between the reflection on learning and the analysis of the PLE purpose (figure 7). It seems clear that going beyond description and reflecting on learning would also mean addressing the purpose of PLE. This is so in the groups in Mallorca but not as much in that in Ibiza. Thus, this could allow us to think that whether addressing the PLE concept from a pedagogical or a technological perspective, students can observe its purpose. Therefore, further research should observe if the factor influencing this is more related to the didactic design or even the setting rather than the professional profile of future teachers.
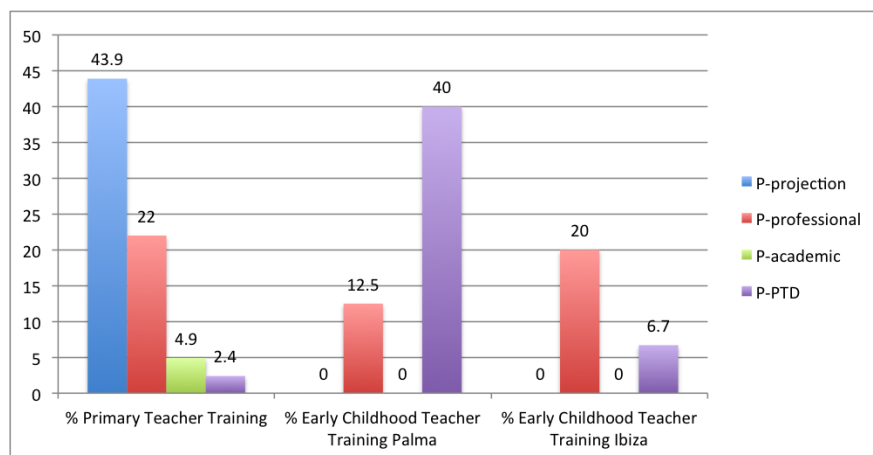

Figure 7. Reflection on the purpose of the PLE (% students).

Finally, the network topic presents a noteworthy aspect: it seems to be in line with the family of categories "learning" in the three groups. Thus, this fact allows us to think that the impact on learning highlighted by students is related to networks, which is an important variable in fostering sharing and collaboration. This result has important implications for the teaching practice and innovative methodologies as suggests that PLE may support student learning in the network, which is a key issue to enhance learning by sharing and collaborating.

In general, these results recommend that further implementations and research may be needed to explore self-regulated strategies in students' PLEs along with Dabbagh & Kitsantas (2012), Kroop, Berthold, Nussbaumer, Albert (2012), Nussbaumer, Sheffel, Niemann, Kravcik & Albert (2012) and Rahimi, van den Berg & Veen (2014). Students were asked to reflect on the transformational learning that PLEs may have introduced into their learning process, but going further would mean empowering students to truly self-regulate their learning taking into account their reflection process.

Conclusion

Having analysed a little more than half of the participants' reflection on their PLEs, first conclusions point out the following answers to our research questions and what needs to be done in further research:

- After having drawn and observed the tools that students use for learning, they have highlighted some aspects on their reflection that range from the conceptual and descriptive level (conception, structure and tools) to a deeper analysis (learning, purpose and network).

- Students from different programmes reflect on their PLE in diverse ways. This is a very interesting observation which future studies could look at in greater depth to see if the variable of the professional profile may have influenced the way students conceive their PLE. Also, we consider the didactic design of the tasks in the different courses has an important influence on student reflection.

- Students have difficulties in going deeper in learning, addressing higher level cognitive processes beyond description of concepts or activities.

- Students use a wide range of tools that cover the three main activities of learning on the virtual world on which this study is based, such as reading and accessing information, reflecting and creating knowledge and sharing and collaborating with others. Further research should also try to observe the interaction of tools and how this interaction can impact learning.

- Students are aware of the impact of the tools they use and the PLE concept for learning. However, the lower level of reflection carried out do not allow us to conclude these results. Further research should analyse in greater this issue.

Limitations of the study are especially related to the participants in the study and the didactic design of the courses. These are the first conclusions of the study based on the analysis of a little more than a half of the participants. So, a new phase of the study is needed to be able to totally confirm these initial results. Moreover, another set of limitations is related to methodology, the process of content analysis in the application of the rubric to assess student reflection. Thus, certain perceptions have been considered to correspond to the different levels of depth. However, triangulation with other research techniques should also be carried out in order to see if the written texts are their authentic perceptions or simply a strategy in saying what students think that teachers want to read.

This new study, in line with previous work carried out in relation to PLE in Teacher Education confirms that more work needs to be done in order to move students to deeper levels of reflection, so that they are able to observe not only the tools but also their cognitive processes (Castañeda & Soto, 2010). As Castañeda & Adell (2011, p. 7) state, "PLEs are not only technology, but also attitudes and values".

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