Resources and Opportunities for Agency in PLE-Related Pedagogical Designs: a Literature Exploration

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Abstract. Personal Learning Environments as a learning approach are strongly connected to idea of the development of the conditions and resources for fostering the learners' enacting of agency. In this study, some PLE-related pedagogical designs have been analysed in light of how they implement resources and opportunities for students to practise/enact their individual, relational, and contextual agency. The final sample includes the most cited PLE-related pedagogical experiences in the last decade in which the PLE concept is explicitly mentioned. Conclusions remark on the importance of going further in the implementation of more relational resources, as well as the contextual opportunities that give students more open choices to help them to develop a deeper sense of agency and enact it as a way for managing and enriching their PLE.

Keywords: Personal Learning Environments, Agency, Learning Activity, Learning Design; Pedagogical Experiences.

1. Introduction

The concept of agency has become widely used in learning research [1, 2] and has been identified as a crucial factor in the learning process [3]. Additionally, it has been said that Personal Learning Environments (from hereon, PLE) allow agency development [4–7]. However, little is known about the nuances of this development and how the PLE design may allow for enacting the different domains of students' agency.

Current debates about agency include the socio-material definition of this as "the adaptive enactment of technology" [8]. Nevertheless, despite understanding PLE from a socio-material perspective, the centre of PLE as an educational approach is the learner. Therefore, in this study we will focus on the humanistic approach to agency, understanding the implementations of pedagogical designs under the idea of the development and enrichment of PLE.

This current work is rooted in the review of the conditionings of agency reported by the team led by Jääskelä [9]. This summarises the main contributions of some of the most influential ideas about agency and shows a wide, open understanding about students' agency, far from a neoliberal individualistic perspective [10]. In this study,

we seek to observe how agency opportunities and resources are implemented in pedagogical experiences related to PLE.

Thus, we begin this paper with a presentation of the conceptual frameworks that underpin this analysis, briefly but clearly reviewing the concepts of Personal Learning Environment and agency. In addition, we attempt to highlight the relationship between the two concepts, as well as summarize the resources and opportunities for student agency that have been referred to in the literature on agency and unified in Jääskena [9]. We will detail the objectives and research questions that guide this study, then the complex process of selecting the sample we have used and the characterization of that sample. The analysis of the results will be divided according to the research questions; the second part will be divided into the three domains of individual, relational, and contextual agency defined in the theoretical framework. Finally, we will discuss in detail the conclusions, limitations, and future prospects suggested by the observed results.

2. PLE as a learning approach and agency

The idea of Personal Learning Environments is no longer new. The process of evolution of the PLE concept, since the first discussions around 2004 [11–13] and those that followed on the pedagogical/technological/techno-pedagogical nature of the concept (most of which were concentrated around some forums [11, 13, 14]), had offered some ideas about what PLE is, even if such discussions have not entirely closed some of the big debates about its nature.

As has been remarked in some recent works [5, 11, 13, 15], the definitions of PLE in research literature about education cover a wide range of ideas, including educational technology, the use of social networks for learning, new pedagogic approaches to learning, including the role of teachers, Personal Learning Networks, informal and non-formal learning, and the different contexts in which learning takes place. The majority of those definitions are far from the ideas of "personalised learning" based on, "the development of recommender systems and the increasing use of Artificial Intelligence in education to provide different learning pathways and materials for individual learners within the curriculum"[6].

PLE is an educational approach that develops the person-centred perspective of lifelong learning in this post-digital era [11, 13, 14], including the combination of technologies, sources of information, connections, and cognitive processes, experiences, and strategies that each person - the learner - regularly implements to learn in a sociocultural context [14, 15]. Therefore, PLE constitutes a socio-technological reality that includes human and technological elements/activities that configure and determine the way a person learns [5]. This includes the resources and conditions to enact its agency -the learner's agency- to develop and enrich the PLE.

Agency, as has been previously stated [5], would be defined as how the actor takes decisions about its role in the activity; the autonomous capacity of social action.

The relationship between agency and learning has been characterised in the literature in at least two principal ways. On one hand, "agency" has been described as the ultimate goal of education [1]. They remarked that the Kant's idea of education as the process

through which human beings "become capable of independent judgement" transforms education on "the basis for agentic and autonomous action"[1, 16].

On the other hand, "agency" has been identified as a crucial factor in the learning process and is understood as a complex system which affects the lifelong learning process, including the "latent potential to engage in self-directed behaviour" and the "learner's sense of agency" [3].

In this sense, as Eteläpelto [2] summarises, the learner's agentic role in the construction of knowledge and the use of individual meta-cognitive and reflective processes for problem-solving has underlying constructivist theories of learning. However, once the learning is also seen as a social active construction -and not merely as an individual one-, the social components of agency must be remarked upon. Therefore, in order to understand how to practise/enact the agency, it is crucial to understand how this is related to local contextual conditions (material circumstances, physical artefacts, power relations, work cultures, dominant discourses, and subject positions available), as well as to subjects' interpretations, intentions, and identity commitments [3, 17].

The literature about agency has remarked upon a wide-open set of resources and conditions that would be taken into account, such as those for enacting the learner's agency (for practising it). These conditions and resources have been summarised by the team led by Jääskena [9] in three main domains:

- **Personal Resources** that frame the *Individual Agency* and include:
  - Meaning-oriented studying: expressed in different agency models as intentionality, wanting, and/or intrinsic motivation.
  - Self-efficacy: refers to beliefs about one's capacity to control events or "being capable".
  - Competence beliefs: includes perceptions of sufficient knowledge and skills; beliefs about means of gaining desired goals or having know-how.
  - Participation activity: initiative and engagement in learning.
- **Relational Resources** that shape the *Relational Agency* and include:
  - Power relationships: including equality among students and reciprocal relationships between teacher(s) and students.
  - Peers as resources: understood as reciprocal peer support.
  - Emotional atmosphere: trust and a safe environment.
- **Contextual Opportunities** that configure the *Contextual Agency* and include:
  - Opportunities for active participation: as reciprocity in teaching or participatory pedagogy.
  - Opportunities to influence: include opportunities to influence the course progress as well as one's own studying with respect to students' views by the course teacher.
  - Opportunities to make choices: between various possibilities, itineraries, or working methods.

We decided to focus on the theoretical approach summarised on page 5 and 6 of the same paper [9] due to it being pertinent at any level of education (with some nuances when addressing learner's age). Nevertheless, these dimensions have been reframed by the author at the end of the same paper, but this final proposal refers specifically to the context of adult learning.

Based on the nature of PLE, we understand that pedagogical implementations based on PLEs need to support a humanistic approach to the students' agency[18]. The support would be implemented by designing learning experiences that focus on the use of technology to provide access to resources, fluidity in terms of with whom to learn, and when, how, why, and for how long [13], as well as decentralising the terms and control conditions of pedagogical experiences. Also, the PLE approach must effectively foster the integration of the formal, non-formal, and informal learning contexts—in other words, providing learners with the relational and situational resources and opportunities for enacting their agency.

Therefore, this study has the aim to contribute to understanding how Personal Learning Environment pedagogical implementations support the inclusion of resources and opportunities for developing and enacting students' agency.

3. The Study

This study explores how the concept of "agency" is included in the pedagogical experiences reported in the most cited papers - with regard to the most studied educational topics (Emergent pedagogies and practices, Teacher Professional Development, and Self-Regulated Learning) from the last decade (2010-2020) in the research literature - that also refer to PLEs.

In reviewing those experiences reported, we should explore the following questions:

- How are the PLE-related pedagogical experiences designed and implemented?
- Is the concept of agency explicitly included in the papers? How?
- Are the personal, relational, and situational resources and opportunities for practicing/enacting agency included in the experiences reported in the papers?

For acquiring the sample, we started from a process that has already been used and explained in previous works [19], as well as updated in a more recent review [7]. The first step in the process consisted of a simple search in WOS for all items classified under the topic of 'education'. Of these, we selected the 100 most cited articles in the database from the decade 2010-2020. From these 100 articles, we extracted 885 keywords, of which we identified 593 different terms. The unique terms were grouped with other closely associated terms and, together, we considered three of those groups as the main topics in the educational research literature in the last decade: those related to (1) Emergent pedagogies and practices (EP), (2) Teacher Professional Development (TPD), and (3) Self-Regulated Learning (SRL).
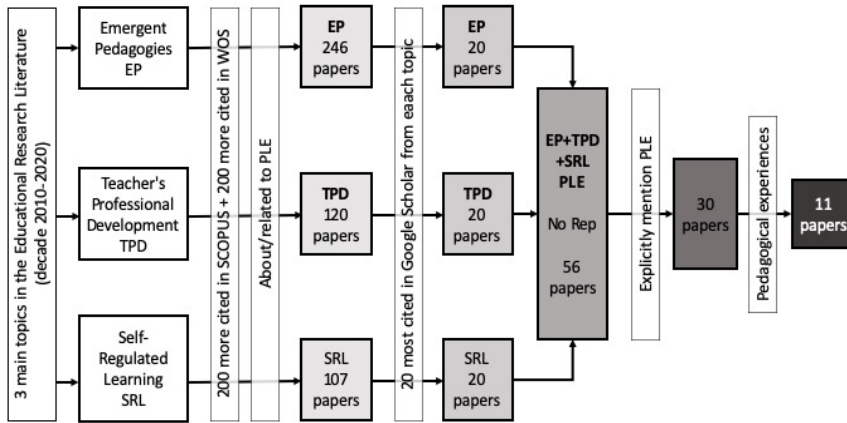
3.1. Sampling:

Fig. 1.. Sampling process

Once these three themes had been selected as key topics, searches were carried out on each in both the WOS and SCOPUS databases[2]; a sample of the 200 most cited articles in each of the databases, for each of the themes, was selected.

The ambition of this first sampling, from its foundation, is to include not only papers related to Educational Technology, but to education in general.

On each database selection, all the articles that refer to "Personal Learning Environment" in any of their parts (title, abstract, keywords, references, main text) were identified and all those articles were classified by their number of citations in Google Scholar[3] (246 papers for EP, 120 for TPD, and 107 for SRL for a total of 473 papers). The 20 most cited works were selected for each key topic.

The three lists of 20 papers from each key topic were unified in one; the repetitions were eliminated for a total of 56 papers.

Finally, after carefully reading all the papers included in this list, we excluded the papers that do not refer explicitly to PLE. From the resultant list, we selected those articles that reported a pedagogical experience for a final sample of 11 papers[4].

3.2. General characterisation of the sample

The final sample we are using for this study includes the pedagogical experiences related to PLEs in which the concept is explicitly mentioned. These articles are included

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[2] All the details about the sampling process, as well as the final sample, are systematized and available on https://bit.ly/3d2qbR2

[3] Sampling finished on the 30th of April, 2020.

[4] The list only with the final sample is available on https://bit.ly/36t3O4J

in the 20 most cited papers of the three main topics in educational literature indexed in SCOPUS or WOS in the last decade. As previously said, this is a sample of 11 papers.

From these, six papers come from the SRL collection, four from the EP collection, and two from the TPD collection (one appeared in two collections, EP and TPD).

The selected papers were published during the period between 2010 and 2017.
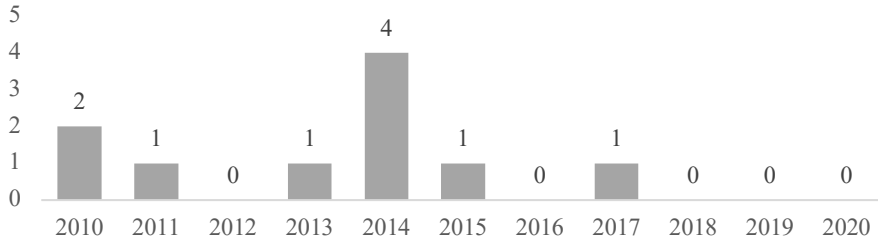

Fig. 2. Year of publication

There is also a wide of variety of sources where the papers were published, as shown in Figure 3.
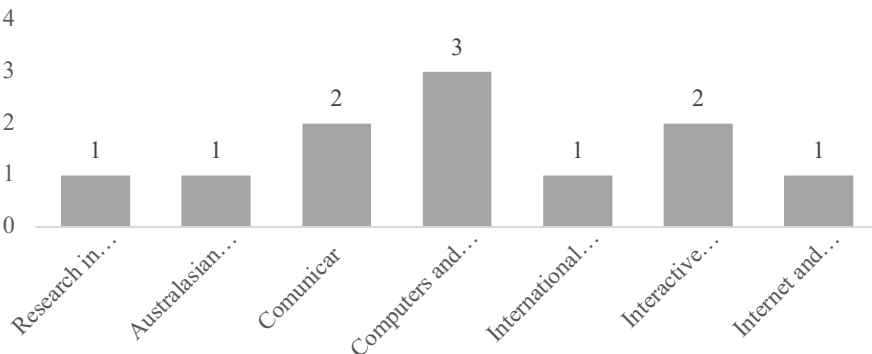

Fig. 3. Source Titles

At the final date of this data collection, the 11 papers collected 1591 Google Scholar citations. The most cited was led by Kop [20] with 609 citations in total (67.7 citations per year). The least cited was led by Marín-Juarros [21] with 37 citations (6.2 citations per year). Four of these papers are included in the most cited papers of the last decade from the field of "education" in the SCOPUS database, concretely two of the field of Self-Regulated Learning [22, 23]. Two are included in the most cited papers of Emerging Pedagogies [20, 24] and one [20] also appears in the 200 most cited papers of Teachers Professional Development in SCOPUS in the decade 2010-2020.

The vast majority of the experiences reported in these papers were developed in Higher Education (six papers); two report an experience in Secondary Education and the other three are from VET, Elementary School, and MOOC.
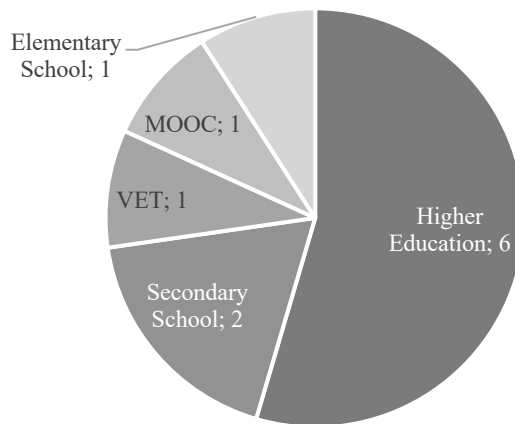
Fig. 4. Study level where the reported experience was developed

3.3. Coding

Papers were codified by means of an exploratory descriptive coding method [25] using a deductive concept-driven approach [26], which means that the code-frame was developed before viewing the data, based on the three main domains and components described by Jääskena [9].

   The researchers developed collaboratively a questionnaire that was used to systematize the coding. The questionnaire included, for each one of the Jääskena's proposal main domains, a multiple-choice question "Does this paper refers to any feature of [here the domain] Agency? (mark all that apply)" and including -on each option- the summary of the characteristics of each feature, as they appear on the the l Jääskena's original diagram.

   Following, on each domain were included open questions aimed to coding each feature, "Any relevant citation regarding [here the feature]? (please include page)".

   Despite the framework used as a code-frame was sharing, and theoretically clear, two coders participated in the project, therefore the standardization of the coding process was necessary. For this, the two coders independently used the questionnaire to code the same three papers, and, after the testing and debating about the results, each one proceeded to code half of the remaining sample.

4. Results

4.1. General characteristics of PLE-related pedagogical designs

The following table (Table 1) summarises the description of PLE-related pedagogical experiences which we are focusing upon in this study.

Table 1. Contexts and designs of PLE-related pedagogical experiences

	Program/ Country / Context (participants, length)	PLE-related pedagogical designs
Blaschke [27]	Online course for the Master of Distance Education and E-Learning (MDE) Oldenburg, Germany & USA 300 students 12-week duration	The course incorporated a variety of learning activities, called skill builders, which utilised social media and e-portfolios, which serves as a record of the students\ academic achievements upon graduating from the program.
Drexler [28]	k12 school USA blended learning 15 student 9 weeks	Moodle and creation of a Personal Learning Environment in place of a traditional textbook (blogs, Google Reader, articles, connecting with experts)
Gewerc, Montero & Lama [29]	Teacher education University of Santiago de Compostela 58 students A term	ELGG open-source platform hosted on an institutional server. The set of elements that make up one's personal environment is evaluated by the teacher using a rubric at two points in the process. In short, although e-portfolios are individual, they are carried out under social network conditions which gives the whole process a collaborative approach (page 59)
Inayat, Amin, Inayat, & Salim [30]	Vocational Training Institute of Pakistan 33 students 12 weeks	The collaboration among students and with the instructor was facilitated by the online course management system. (page 157)
Kop, Fournier, & Mak [20]	2 MOOCs Personal Learning Environments Networks and Knowledge course (PLENK2010) and the Connectivism and Connective Knowledge course (CCK11), PLENK2010 started with 846 registered participants and finished with 1,641 CCK11 achieved more than 700 participants.	The MOOCs were distributed on the web. 4 types of activities: aggregation, remixing, repurposing, feed forward.
Lu, Huang, Huang, & Yang [31]	Computer Science Taiwan 102 students - 2 months	Performing the Python language learning activities in the collaborative programming environment (page 7).
Marín-Juarros, Salinas & de Benito [32]	Online postgraduate course and pedagogy course 15 postgraduate students for a month. 105 degree students during a term	Google Apps to develop iPLE (institutional PLE) and SymbalooEDU to use iPLE
Marín-Juarros, Negre-Bennasar, & Pérez-Garcias [21]	Primary Teacher's Degree at the University of the Balearic Islands. Spain. ICT subject 3 teachers - 192 students A term	Development of a design and development-based work group project; b) creation of personal learning networks; and c) use of appropriate internet technology to locate/manage information, create content, and share knowledge. (page 37)
Meyer, Abrami, Wade, Aslan, & Deault [33]	Urban and rural schools Language arts- Canada 32 teachers and 388 students School year	Students plan, share, and self-assess their work. They also present final evidence of learning.

	Program/ Country / Context (participants, length)	PLE-related pedagogical designs
Rahimi, van den Berg & Veen [23]	1st grade Secondary Ed Geography course Netherlands 29 students - 8 weeks	Content producer activities, social learning activities, decision maker activities.
Scott, Sorokti & Merrell [34]	Master of Science in Learning and Organizational Change (MSLOC) program USA 164 students - 1 school year	Enterprise Social Network (ESN) (referred to as "The Hive") for communication and sharing course content (page 80).

These eleven PLE-related pedagogical experiences take place in a range of educational settings and contexts. It is interesting to note that there are different modalities: fully online courses [20, 27, 32], a rather uncommon blended program for compulsory education in which students attend lessons for three days and do distance work for two days [28], and face-to-face settings which are supported by online learning platforms. As seen in figure 4, there are diverse levels at which they are designed and developed; among Higher Education programs there are BA [21, 29, 31, 32] and Master students [27, 32, 34] from which it is noticeable to remark that six are in education programs and one is in computer science [31]. In compulsory levels of education, social and humanities sciences are the ones mainly involved in PLE-related pedagogical experiences by students. Although there are a variety of cultural settings, the great part seem to be based in western societies while only two [30, 31] represent other cultural backgrounds.

The learning activities involve rather small or medium-size groups in face-to-face settings, whereas fully online courses involve a high number of participants. This is particularly true in the cases of Kop, Fournier, & Mak and Blaschke [20, 27]. Only two [33, 34] take place during a whole year, whereas the rest are carried out for timeframes of four four weeks. When introducing the learning aims and outcomes of the reported experiments, authors sometimes express collaborative skills in team-based activities [30] and task-driven designs such as research-based projects [23, 24]. However, the vast majority of articles are normally addressed as skills development in PLEs. The digital platforms in which PLE-related pedagogical experiences take place also range from distributed services of social media [20, 21, 23, 24, 27, 32] to usages of single platforms such as ELGG [29], institutional VLEs [30], or other author-services like the e-portfolio system of Scott, Sorokti, & Merrell [34] and Meyer, Abrami, Wade, Aslan, & Deault [33].

4.2 Resources and opportunities for enacting agency

Nine papers of the eleven included in this review do not explicitly mention the word "Agency" in any part of their content.

Only two papers explicitly refer to the term "Agency": Rahimi et al. [23] on page 243 in the discussion includes an statement about agency, says, "Student-driven learning approaches such as PLEs centre on the self and personal agency as the main driving forces for directing the learning process". Additionally, on page 244, when

describing the main conclusions of the study, the authors say, "from the personal agency perspective, by mapping thought onto the students' planning and choosing of web tools and resources (function a) and action to the co-construction of travel guides using these tools and resources, it can be claimed that the model has provided students with appropriate opportunities to exercise personal agency (functions b, e, g, f) by getting engaged in different types of learning activities through organisation and management of technology".

For its part, the team led by Scott [34] refers to agency in the theoretical framework of its paper, saying that, "For PLEs, integration and connection is largely dependent on individual agency", on page 77. They continue on page 78 explaining that, "learning is found to be most effective when informal and formal learning coexist and a variety of learning practices are followed within more flexible learning ecosystems that allow learners to build on and extend their formal learning, increasing personal agency in the learning process"

Nevertheless, after reading every paper, all mention resources and opportunities related to agency; the majority remarked especially on the importance of resources related to individual agency or relational agency.

As evident from Table 1, all the analysed papers include elements of at least two types of agency in their description of their pedagogical experience. Indeed, nine include elements that would be classified under three type of agency (individual, relational, and contextual). Just two papers make no reference to any resource related to relational agency [24, 30], while one does not refer to any contextual opportunity to enact contextual agency in its experience. [34].

Table 2. Personal, relational, and contextual resources and opportunities that appear in the papers

	Individual Agency				Relational Agency			Contextual Agency		
	Meaning-oriented studying	Self-efficacy	Competence beliefs	Participation activity	Power Relationships	Peers as resources	Emotional atmosphere	Op. for active participation	Op. to influence	Op. to make choices
Blaschke [27]		X	X	X			X			X
Drexler [24]	X	X	X							X
Gewerc, Montero & Lama [29]				X	X			X		
Inayat, Amin, Inayat, & Salim [30]			X	X						X
Kop, Fournier, & Mak [20]	X			X	X	X				X

	Individual Agency				Relational Agency			Contextual Agency		
	Meaning-oriented studying	Self-efficacy	Competence beliefs	Participation activity	Power Relationships	Peers as resources	Emotional atmosphere	Op. for active participation	Op. to influence	Op. to make choices
Lu, Huang, Huang, & Yang [31]				X	X			X		
Marín-Juarros, Salinas & de Benito [32]	X	X		X		X				X
Marín-Juarros, Negre-Bennasar, & Pérez-Garcias [21]	X			X	X	X		X		X
Meyer, Abrami, Wade, Aslan, & Deault [33]	X			X		X				X
Rahimi, van den Berg & Veen [23]	X	X		X	X	X				X
Scott, Sorokti & Merrell [34]	X				X	X				

Individual Agency

As we can see from Table 2, all the papers analysed in this study refer to, at least, one resource related to Individual Agency. Nevertheless, none refer to all the personal resources at the same time. Papers which show the importance of combinations of individual agency resources are common in the studied sample: four papers combine three; two papers mention *Meaning-oriented Studying, Self-efficacy,* and *Participation Activity* as important for their pedagogical implementation. [23, 32]. It is also remarkable that, in five papers, the personal resources related to *Meaning-oriented Studying* and *Participation Activity* are mentioned together as resources to improve the educational experience they report upon [20–23, 32].

The wide majority of papers refer to *Participation Activity*; only two [24, 34] do not and two other cases refer only to the personal resource [29, 31]. In the case of Lu, Huang, Huang, & Yang [31], engagement in participation is measured towards a control group; the authors conclude that the experimental one achieved higher ranks. In other

studies, participation is measured in terms of content production: as in the case of Marín-Juarros, Negre-Bennasar, & Pérez-Garcias [21], who monitor students' networks and collaborative projects, or as in Kop, Fournier, & Mak [20] who observe active participation by positive outcomes such as more reflective and creative learning processes. Participation does include high engagement, as seen in these previous examples, or lower levels as the one defined by Scott, Sorokti & Merrell [34] with the concept of "active lurkers" (p. 84) recognizing that even when being an invisible participant, reading without commenting, this involves a rather active cognitive role too. Very promising seems when resources and opportunities for participation are included in the designs, as the responsibility for the completion of assigned tasks emerges from the feeling of ownership over their own PLE, as reported in Rahimi, van den Berg, & Veen [23].

Meaning-oriented studying is the second most common personal agentic resource referred to by the papers. Seven refer to the importance of "Intentionality, wanting or Intrinsic motivation" specifically, while just four [27, 29–31] do not. It is also closely related to setting learning goals, as stated by Drexler [24]; the lack of understanding the implications of one's own learning of course or activity content is related to poor performance, as in one of the two case studies reported in [32]. These authors also observe that the progressive understanding of the implications for learning, and thus increasing motivation, is therefore related to a change of students' roles from passive to active in content creation processes. In the experiment by Kop et al. [20], the goals were set by participants (p. 86); they would adapt them in relation to their motivations and other elements such as the understanding of course content.

More scarce are the appearances of references to *Self-efficacy*, which appear in four papers [23, 24, 27, 32], and *Competence Beliefs* in just three [27, 28, 30]. Only one [27] reports that the usage of social media leads to an increase in positive beliefs of competence with social media. it is noticeable that, when reporting negative results of social media usages, these are related to these beliefs and sense of self-efficacy. For instance, Blaschke's [27] and Marín-Juarros et al.'s [32] report that students argue the time-consuming as a reasons to do not use social media, which could be closely related to their attitudes and competence beliefs about their social media self-efficacy.

Relational Agency

Nine of the eleven papers mentioned at least one resource related to relational agency in its experience. In four of the papers, both *Power Relationships* and *Peers as Resources* are remarked upon as being resources for enacting relational agency [20, 21, 23, 34]. In two papers the only relational agency resource mentioned is *Power Relationships* [29, 31]; in another two, the only one mentioned is *Peers as Resources* [32, 33]. Nevertheless, it is remarkable that only one paper [27] explicitly mentions the importance of the *Emotional atmosphere:* "The only tool that seemed to support empathy was Google Docs. Use of Google Docs also helped students to feel more connected to others".

As for *Power Relationships*, Rahimi et al. [23] clearly state the potential use of social media for two-way communication, also adding the educational implications that this involves. On one hand, they attribute it with the process of feedback supported by both teachers and peers; on the other hand, they argue that the potential for the distribution

of power of social media, should carry out a shift from teachers' and content-centred to more student-centred designs. Gewerc's team [29] clearly develop this dimension by analysing nodes and observing how relationships were being progressively distributed among students: "the network centralisation index shows that participation was not only focused on one dominant node, but that «power» was distributed. We saw that at the beginning the teacher was the system «connector», but afterwards a core group was empowered and gained autonomy to produce exchanges and interrelations" (p. 61). Marín-Juarros, Negre-Bennasar, & Pérez-Garcias [21] also reflect on the role of group leaders, which was limited to their small groups even in social networks. It was observed that they, "acted as the catalyst for the group on the social network and encouraged participation by other colleagues" (p. 40) in their own teamwork, whereas no peer support between groups was observed as significant. In the case of Kop et al., [20] the concept is explicitly mentioned to address limitations such as timeframes and lack of linguistic or digital skills. These power relationships are normally designed to promote students' collaboration for teamwork, as in the case of Lu et al. [31]. These researches organise the project construction through a progression of steps in which students work from initial teachers' scaffolding, create, share with the teacher and peers, review, comment on others' productions, and redesign for final draft.

Peers as Resources for Learning allows for the enactment of agency in networks, as in the case of Marín-Juarros, Negre-Bennasar, & Pérez-Garcias [21]. In the case of individual tasks, like reflective e-portfolios, these relationships are limited to feedback supported by both teachers and students' to improve one's own learning [33]. The Scott-led paper [34] concludes that the potential of the interactive characteristic of social media for informal learning leads to a distribution of power, boosting the possibilities for peers as resources and extending the contexts of teaching: "to open learning spaces that allow for community members to interact with each other without direction from a teacher, and yet the possibility for teaching presence to exist on some occasion" (p. 84) Thus, this allows us to observe how the aims of participation for students' learning is highly connected to those resources also involved when addressing agency from the contextual dimension.

Contextual Agency

As for contextual agency, from this collection of experiences, three papers include references to the importance of including *Opportunities for Active Participation* [21, 29, 31]; eight papers remark on the importance of giving students the *Opportunity of Making Choices* [20, 21, 23, 27, 28, 30, 32, 33] in their pedagogical implementation.

Contextual resources emerge as practices that allow the opportunity for enacting agency by actively participating with others in collaborative meaning construction. This is the case of the PLE learning design in Gewerc et al. [29], who argue that, "these interactions provide a consistent foundation that enables quality exchange and the joint construction of knowledge" (p. 60). Furthermore, the participatory resources are the ones offered to student-teachers in Marín-Juarros, Negre-Bennasar, & Pérez-Garcias's [21] work, whose students explore collaborative tools for knowledge construction in teamwork and other interactive services that may allow active participation in different contexts outside the classroom.

When addressing choices, articles based on distributed PLEs with social media should be understood as having been designed to give students the possibility to make their choices in the services, like how to introduce themselves or how to connect with others; this may have an impact on students' learning. For Rahimi et al. [23], the choice over the tools in PLEs has, "potential to enhance the student's feeling of ownership over the learning environment and increase her willingness to practice autonomy over her learning process" (p. 244). Choices are possible even if in the learning design does not explicitly describe how these are addressed. For example, in the case of Blaschke [27], there is information about the Twitter activity in which students were able to choose who to follow or retweet; in the case of Marín-Juarros, Negre-Bennasar & Pérez-Garcias [21], the description of the learning activities allows for observations of the possibilities to make personal choices over the tools offered to manage information, connect with others, and create content. For Rahimi et al. [23], the possibility to choose both tools and learning aims can boost motivation and ownership, which can in turn have great impact by allowing for the development of a sense of "accomplishment and control" (p. 244). Only in the case of Marín Juarros, Salinas Ibáñez, & de Benito Crosetti [32] students were allowed to choose to take part in the learning activity. Blaschke [27] aligns students' choices beyond the formal context with other individual options, such as "personal and political purposes" (p.14). Along with the tools, Drexler [28] and Rahimi et al. [23], both in compulsory levels of education, allow students to choose their project theme. In the latter, the authors remark that the freedom to choose requires, "appropriate structure and scaffolding". In the case of Inayat et al. [30], the choice is presented as the opportunity to choose classmates, which has relevant implications on the relational dimension of agency.

As for e-portfolios, the work led by Meyer [33] suggests two possible categories of choice which have a particular impact on the learning process: firstly, one is because students can choose tools and formats to create their learning evidence as a way of adapting to individual learning styles. The second is because they can choose those that better represent their achievements.

Although no paper mentions the *Opportunities to Influence* as part of their educational experience, the usage of some social media allows this kind of agency enaction. For example, in the case of Twitter, two articles [21, 27] mention the interaction by students when spreading other users' messages (tweets) by retweeting them. This is an influencing activity that may have an impact on others and the course itself, in particular if it is an online course like MOOCs in Kop et al. [20]

5. Discussion and Conclusions

The need of understanding from a more profound perspective the relationships between the fostering of the resources and opportunities for enacting the agency, and the development of Personal Learning Environments, seems to be desirable and, mainly unavoidable [5, 6, 35]. An open wide historical agency framework [9] seems particularly appropriate since it can contribute to extending the impact of the development of students' resources and opportunities for enacting their agency, as well as in digital environments [17].

In this research paper we have just started the exploration of this relationship by observing how those resources and opportunities for enacting agency have been integrated in PLE-related pedagogical experiences - at least from the learning design point of view [36, 37].

On one hand, it has been argued that agency has mostly been fostered from an individual or social perspective, whereas the contextual dimensions have not been addressed as deeply [9]. On the other hand, PLEs have been an approach to extend the boundaries for learning activity beyond traditional educational settings. This has involved greater possibilities for students' participation and for collaborating with others, while extending epistemic tasks with different resources and tasks in different environments and contexts, such as open networks and open learning environments [5, 6, 14].

Following the data, the PLE-related pedagogical designs reviewed allow for students' participation in a wide range of terms, such as motivational, cognitive, and behavioural skills. They open up possibilities for students to participate, such as the demonstrated willingness to take a course, understanding the content, and active engagement in tasks. Nevertheless, barriers to participation relate mostly to beliefs of self-confidence and self-competence with the usage of social media [10, 38, 39].

Moreover, PLE-related pedagogical designs may be able to support students' agency by extending the opportunities for learning beyond the individual dimension [1–3]. The reviewed educational experiences foster students' agency by adding the chance to develop learning with others while managing external influences. Collaboration has been addressed in different ways, such as in teamwork for common learning aims and outcomes, peer support for dialogic learning in institutional or open environments, or as the methodological strategy for emotional and caring support. The contextual resources for practising contextual agency have also emerged [9], in particular by extending contexts of participation as suggested by the participatory pedagogies [2, 16, 38]. Furthermore, contextual agency is fostered because the self-driven activity by students in networks can have an impact on the course development, especially if it is understood from networked approaches to learning [17, 40, 41]. Finally, and most frequently, the reviewed PLE-related experiences support contextual agency by allowing students' choice. This is generally in regard to choosing the tools (ownership), but with some choices in the learning processes [42, 43].

However, it is important to notice that while PLE-related pedagogical practices seem to be maximising individual and relational resources to enact agency, contextual resources are still rather unexplored. Thus, further work is still needed to improve the learning designs for which PLEs can increase relational and contextual agency dimensions [44]. Also, it is important to note that while PLE practices seem to be maximising individual and relational resources to enact agency, the contextual resources are still rather unexplored. For example, the management of students' activity in networks to influence the course has only been reported in the MOOC activity.

More innovative learning designs and research should explore the affordances of course influence by students' networking activities in formal settings. Furthermore, context as a resource domain for students' choices has mainly involved students' decisions on tools and services: how to design interfaces following one's own preferences, the selection of social media services, and the activity carried out in each. However, we still have limited knowledge on the affordances of choice in the digital

environment for the learning processes which appear in these practices very scarcely. The team lead by Salinas has argued that open environments allow flexible itineraries [44] for learning, which is a promising learning design aligned with contextual agentic resources.

The selected collection includes different learning designs and contexts that can help in understanding PLE-related practices across levels, cultural backgrounds, and other settings such as learning modalities, disciplines, and sizes of cohorts [9].

However, this study has some limitations related to the research design about which we are aware. On the root limitations of this study is the sampling; despite the sampling being the product of a strict technical process, the selected articles mean that the sample size is rather small. It would be interesting to extend the selection by taking into account a higher number of pedagogical experiences. The selected database restricted the sample to western-influenced academic literature. Consequently, there is also the issue of the variety of designs. Most of the cases take place in western societies and only two pedagogical experiences could represent other cultural backgrounds, such as eastern societies. There also is an important number of studies in Higher Education with a relevant predominance of Teacher Education programs which could also involve biased understanding of PLE-related pedagogical designs. Finally, the vast majority of the reviewed experiences are short, of less than a year in duration, for which we raise the issue about the extent to which students may have learned sustainable practices after their lifetime of experiences.

In addition to this, it is important to remark that we are not analysing how effectively the resources and opportunities for fostering the enacting of agency are actually working in the learning activity. The learning activity is emergent, and PLE and agency as well. How students enact their agency and recreate their PLE, during or after the pedagogical experiences, is something that we must explore more profoundly and in a more complex way. The analysis of agentic resources involved in these PLE-related pedagogical experiences allows us to observe highly intertwined dimensions in each, as supported by other works' conclusions [9]. Nevertheless, PLE-based pedagogies may support agency from a holistic socio-material approach; this is difficult to separate and analyse in the way we have done on this approach. Therefore, we would go further in the explorations of renovated ways for studying PLE-related pedagogical experiences to gain a wider perspective about what is happening in them.

Moreover, if we agreed that Personal Learning Environment -as an educational approach- requires the development of the learner's digital agency, understood as, "the ability to control and adapt to the digital world" [45] with a focus on a critical (from a constructive criticism viewpoint) and socially-engaged vision that enables the learner to humanise the technology adoption process, as well as the learning process itself [35, 46], we must go further in the design of more ambitious learning designs that would better situate emancipatory experiences of students' learning.

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