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**Personal Learning Environments as a Strategy to  
Promote the Use of Digital Technologies in Education**

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## **Personal Learning Environments as a Strategy to Promote the Use of Digital Technologies in Education**

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### **Abstract**

Ongoing studies involving digital technologies in education indicate the possibilities of enhancing educational processes based on the concept of personal learning environments (PLE). The PLE is not a technology but an approach, a way through which we can use the digital technology, especially web tools, to teach and to learn. This study aims to analyze different possibilities of boosting the PLE of undergraduate students who are enrolled in a teacher formation course and to understand how this is reflected in educational practices in the context of basic education. This study, with a qualitative approach, was developed based on the cartographic research method. Results point out the importance of promoting experiences which enable the students to use new technologies with the purpose of expanding their PLE, as well as creating opportunities for reflection on the possibilities and limitations of web tools in the educational context. Furthermore, we understand that the student involvement in educational practices during the teacher formation process can enhance pedagogical practices with the use of digital technologies.

**Keywords:** educational technology, teacher formation, personal learning environment, web 2.0, basic education.

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## Introduction

The Brazilian Internet Steering Committee<sup>1</sup> realizes every year the research called ICT in Education, a survey on the use of information and communication technologies in Brazilian schools.

This research presents an important scenario on the use of technologies in Brazilian schools informing about computers and internet availability but also presenting data about teacher formation for using digital technologies in learning activities and their impact on teaching practices.

Throughout its historical series (the research ICT Education has been carried out since 2010), the research has pointed out that one of the main barriers to the use of ICT in Brazilian public schools is the infrastructure. However, teacher training is also a challenge and the analysis of the research results reveals the importance of effectively integrating digital technologies into the teacher education program.

According to ICT Education 2013 (CGI.br, 2014), 47% of the teachers had some course, class or training on the use of the computer and the internet as a pedagogical tool, during their undergraduate formation. Among these teachers, 83% consider that this helped them to use these resources with their students. Thus, the research results show the relevance of this learning during undergraduate studies and not only in continued education courses.

In the ICT Education 2014 (CGI.br, 2015), 37% of public school teachers stated they had taken a specific course on how to use computers and the internet in activities with students during their undergraduate course. On the other hand, data indicate that there is an increase in the proportion of public school teachers who declare to have learned to use the computer and the internet by themselves (67%). Furthermore, the research shows that 92% of teachers use computers and internet in the educational context, motivated by personal interest or by the demand and/or need of students (66%).

The results of the ICT Education 2013 (CGI.br, 2014) and ICT Education 2014 (CGI.br, 2015) researches present a scenario of relative autonomy of teachers towards the selection and use of educational resources, such as images, videos, texts, presentations, lesson plans, among others.

However, the percentage of teachers who publish the educational resources they produce on the internet is still low. Only 28% of teachers who work on public schools declared adopting practices of publication and sharing of resources on the web (CGI.br, 2015).

The Brazilian legislation for teacher education programs (Brasil, 2015) takes into consideration the use of digital technologies in education and states that graduate teachers should be competent on the use of information and communication technologies (ICT) to enhance pedagogical practices.

There are many published studies presenting different experiences involving practices to foster the use of digital technologies in teacher education programs and this article focuses in practices based on the Personal Learning

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<sup>1</sup> The Brazilian Internet Steering Committee (cgi.br) regulates the internet in Brazil and publishes indicators and statistics about its usage.

Environment (PLE) concept (Castañeda & Adell, 2013; Adell & Castañeda, 2013; Torres-Kompen & Costa, 2013; Álvarez, Sánchez & Fernández, 2013; Gutiérrez-Esteban & Traver, 2014; Bassani & Barbosa, 2014; Bassani & Nunes, 2016).

The PLE is not a technology but an approach that guides us on the use of technology, especially web applications, to teach and above all to learn (Adell & Castañeda, 2013).

According to Castañeda and Adell, (2013) a PLE include tools, mechanisms, and activities that each student uses to read, to produce, and to share. A PLE integrates the formal education experiences with the new experiences involving the use of web applications and services. These new experiences enable students to record their learning process, to enhance the possibilities of interaction and communication with other students, as well as to have access to different digital learning resources.

Thus, actively and intensively using their PLE, the students can understand that it is possible to go beyond information consumption. This way, they can also create content and reflect on it within communities.

Therefore, we understand that to foster the PLE in the educational setting is the ground for new teaching and learning possibilities in the digital age. Castañeda and Adell (2013) state that the only way to teach this type of strategy is practicing, that is, the teacher needs to be aware of the potentialities of the PLE in order to propose educational practices in this perspective.

Through this approach, we understand that the promotion of learning activities which exploit the use of web applications based on PLE in teacher education courses can foster educational processes with the use of digital technologies in the classroom. However, what learning strategies can contribute to boost the PLE of undergraduate students during their initial teacher education process?

This study aims to analyze different possibilities of boosting the PLE of undergraduate students who are enrolled in a teacher formation course and to understand how this is reflected in educational practices in the context of basic education.

This article is organized as follows: in the next section we present the research context. Subsequently, we present the research path and discuss the results. We finish the paper by presenting the findings and making recommendations for future research.

## **The Research Context**

The Brazilian legislation for teacher education programs (Brasil, 2015) states that the curriculum must have 400 (four hundred) hours of practice distributed throughout the program.

These practices need to be connected to the individual experiences of the students, to the context where it occurs, which in this case is the school, and to the systematized knowledge. From this perspective, we have the student, the

school, and the university promoting opportunities for building competences in teaching practices.

It should be acknowledged that this is not reinforcing the idea that teacher education is something substantially practical. It is not a matter of defending the predominance of practice, but of adopting a new way of producing knowledge within teacher education programs (Alves, 2011).

This way, we understand that rethinking the learning process from the previous experience of the subject, allied to the possibilities of building new teacher knowledge through the research and extension practices in the university, seems to be a way to enhance the use of technologies by the teacher in the classroom, without returning to the technicism already present, in other times in the process of teacher training.

Thus, this study presents the results of a teaching experience in higher education, which articulates different teaching and research actions carried out at the Feevale University.

Within the teaching context we highlight the articulation between the Technology and Education course and the project called TecEdu: digital technologies in the educational context. Technology and Education is a common course within all teacher education degree programs at Feevale University. This course involves 50 hours of regular classes and 50 of teaching practice. The Project called TecEdu aims to offer to these students of teacher education degree programs possibilities to deepen studies involving the use of digital technologies in the classroom, providing a space for research, production and sharing of learning activities with technologies.

Within the research context, the study is complementary to both researches:

- a) *Pedagogical practices on cyberspace*, that aims to promote the reflection on the use of digital technologies in an educational setting and the production of learning activities based on Learning Design concepts (Bassani & Bassani, 2016);
- b) *Learning environments on the web*, which aims to analyze the relationship between learning activities proposed in teacher formation courses and the pedagogical practices developed by the students in their teaching practices in basic education.

The study focused on the PLE concept proposed by Castañeda and Adell (2013), which states that a PLE includes tools, mechanisms, and activities that each student uses to read, to produce, and to share.

From a reading perspective, the tools are sites, blogs, newsletters, video channels and others, and the information has different forms, such as text, audio and video. The activities involve reading, reviewing texts, and conferences among others, exercising the use of search engines, curiosity and initiative. From a producing perspective, the tools are the spaces where the student can document his process of reflection based on collected information; these tools are spaces to write, to reflect and to publish. Blogs, conceptual maps, and online presentations are examples. Finally, tools for sharing and reflecting on

communities are characterized as spaces where the student can talk and exchange ideas with other subjects with the purpose of forming social networks (Castañeda & Adell, 2013).

This study aims to contribute, to complement, and to enlarge the research area involving PLE within teacher formation settings (Castañeda & Adell, 2012; Torres-Kompen & Costa, 2013, Álvarez, Sánchez & Fernández, 2013; Gutiérrez-Esteban & Traver, 2014, Bassani & Barbosa, 2014; Bassani & Nunes, 2016).

### **The Research Path**

This study, with a qualitative approach, was based on the cartographic method (Passos et al., 2012). Cartography is a research method, which aims to follow up a process, and not represent an object. Therefore, to follow up processes, “we cannot have predetermined all the methodological procedures in advance” (Passos et al., 2012, p.13) and thus, the cartographic guideline is done by clues. The clues “are like references that contribute to the maintenance of an openness attitude to what is occurring” (Passos et al., 2012, p. 13).

Based on our previous studies, we defined two clues to guide the research. As a first research clue, we follow the idea that students do not know many web tools that allow authorship. So, we highlighted the importance of the professor in presenting different authoring web applications and tools, and also promoting opportunities for discussion on the possibilities of using them in educational settings.

As a second research clue, we follow the idea that the knowledge of new tools, that enable the student’s authorship, can inspire learning activities with technologies that to go beyond information consumption. In this case, we highlighted the idea that the student recognition of his PLE associated with the appropriation of new web tools and applications can foster the development of learning activities using technologies in teaching practices in basic education classrooms.

Through this perspective, the research path involved the proposal of different learning situations to promote the knowledge of online web authoring tools, and the reflection about their use in the development of learning activities with technologies in the educational context based on a PLE perspective.

The research process involved the group of students enrolled in the Technology and Education course offered in the second semester of 2015 (2015/02). We proposed three activities, which articulated theory and practice: learning trails; workshops; and teaching practice in the school context.

The data were collected from:

- a) observation *in loco* during the activities in the classroom with the students;
- b) online documents produced by students;

- c) testimonies of the students about their experience during face-to-face activities and statements published on the Blackboard virtual learning environment.

The activities and the results are explained in the next section.

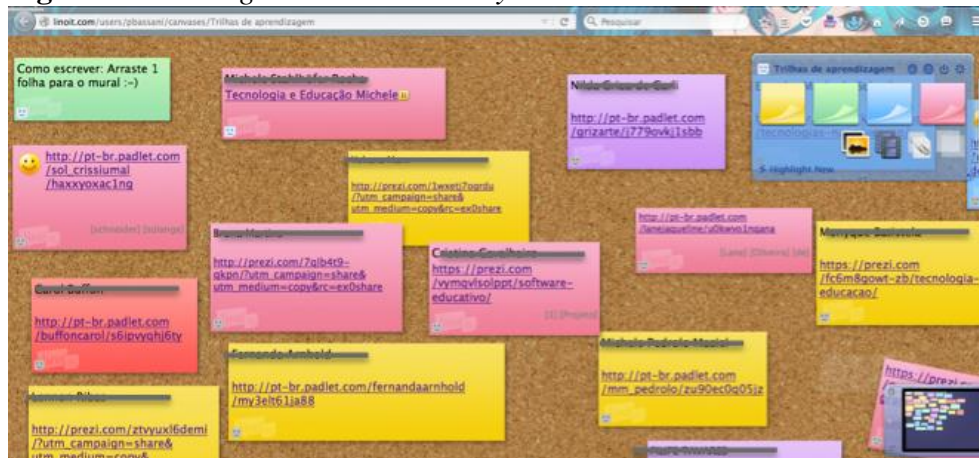
## Results

The first activity<sup>2</sup> involved the development of the **learning trails**. The purpose of this activity was to make it possible for the students to record their learning path, from the perspective of the activities that are components of a PLE: reading, producing, and sharing.

From a reading perspective, the students should reflect on the readings proposed in the course, with the possibility of expanding readings for other texts and/or articles of interest. From a producing perspective, the students should systematize their learning path using a web application presented in class, or another one of their interest and/or curiosity. Finally, in the sharing perspective, all learning trails should be shared with colleagues through a public link.

The students used the online web sticky note service Lino<sup>3</sup> to share the links, as shown in Figure 1.

**Figure 1.** Learning Trails Produced by the Students



Source: created by authors

The students used different web applications for the development of their learning trails. As a result, there were 38 learning trails using the following applications (Table 1):

- a) Prezi (<https://prezi.com>), to create dynamic presentations, was used by 19 students;

<sup>2</sup> [http://prezi.com/puhdtsqikazx/?utm\\_campaign=share&utm\\_medium=copy&rc=ex0share](http://prezi.com/puhdtsqikazx/?utm_campaign=share&utm_medium=copy&rc=ex0share)

<sup>3</sup> <http://linoit.com/users/pbassani/canvases/Trilhas%20de%20aprendizagem>



- b) Padlet (<http://padlet.com/>), to create an online board to share content with others, was used by 13 students;
- c) Lino (<http://en.linoit.com/>), to create an online web sticky note, was used by 1 student;
- d) Blogspot (<https://www.blogger.com/>), to develop blogs, was used by 1 student;
- e) Wix (<http://pt.wix.com/>), to develop sites, was used by 1 student;
- f) Thinglink (<https://www.thinglink.com>), to create interactive images, was used by 1 student;
- g) Piktochart (<https://magic.piktochart.com>), to create infographics, was used by 1 student;
- h) Tiki-toki (<http://www.tiki-toki.com>), to create timelines, was used by 1 student.

**Table 1.** *Web Tools used for the Development of Learning Trails*

Web tool	Link	Number of learning trails produced
Prezi	<a href="https://prezi.com">https://prezi.com</a>	19
Padlet	<a href="http://padlet.com/">http://padlet.com/</a>	13
Lino	<a href="http://en.linoit.com/">http://en.linoit.com/</a>	1
Blogspot	<a href="https://www.blogger.com">https://www.blogger.com</a>	1
Wix	<a href="http://pt.wix.com/">http://pt.wix.com/</a>	1
Thinglink	<a href="https://www.thinglink.com">https://www.thinglink.com</a>	1
Piktochart	<a href="https://magic.piktochart.com">https://magic.piktochart.com</a>	1
Tiki-toki	<a href="http://www.tiki-toki.com">http://www.tiki-toki.com</a>	1

*Source:* created by authors

The proposed activity gave the opportunity to the students to know different applications that can be used in a personal level for the development of academic activities, and in a professional level for the development of the activities with their future students.

However, there was still the necessity of reflecting on how to use these applications in an educational context. Thus, the second activity consisted on the development of **workshops** about web tools.

The students, organized in groups, developed workshops about different web tools. Each workshop should present a tutorial of how to use the selected tool but also foster a debate about its possibilities of usage in the educational context.

Each group of students should develop a complementary online material for the workshop. These materials are available online on Padlet<sup>4</sup>. Figure 2 shows the online board organized by the students with the links to the workshop material.

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<sup>4</sup> <http://pt-br.padlet.com/patriciab/rwcqzw14dyve>

**Figure 2. Online Board for Sharing the Resources Produced for the Workshops**



Source: created by authors

The students organized nine workshops (Table 2), exploring different applications and their possibilities in educational settings: Prezi; Padlet; Lino; *Fábrica de Aplicativos* (site to create online apps); Blogs; QR Codes; apps for gym; online digital games for children; online journal using Jex.com.

**Table 2. Workshops**

Workshop	Link
Prezi	<a href="https://prezi.com/login/?next=/ybzblgz-qjjj/?utm_campaign=share&amp;utm_medium=copy">https://prezi.com/login/?next=/ybzblgz-qjjj/?utm_campaign=share&amp;utm_medium=copy</a>
Padlet	<a href="https://pt-br.padlet.com/potaviodeoliveira/worshoppadlet">https://pt-br.padlet.com/potaviodeoliveira/worshoppadlet</a>
Lino	<a href="http://linoit.com/users/michelerocha/canvases/Tecnologia%20e%20Educa%C3%A7%C3%A3o">http://linoit.com/users/michelerocha/canvases/Tecnologia%20e%20Educa%C3%A7%C3%A3o</a>
Fábrica de aplicativos (apps factory)	<a href="http://app.vc/galeriadeartes">http://app.vc/galeriadeartes</a>
Blogs	<a href="http://novasferramentaseducacao2015.blogspot.com.br/">http://novasferramentaseducacao2015.blogspot.com.br/</a>
QRCode	<a href="https://prezi.com/ofap2wpqxqg8/trilha-ecologica-explorando-o/?utm_campaign=share&amp;utm_medium=copy">https://prezi.com/ofap2wpqxqg8/trilha-ecologica-explorando-o/?utm_campaign=share&amp;utm_medium=copy</a>
Apps for gym	<a href="https://prezi.com/6lm4snfqyfg/tecnologia-e-educacao-oficina/?utm_campaign=share&amp;utm_medium=copy">https://prezi.com/6lm4snfqyfg/tecnologia-e-educacao-oficina/?utm_campaign=share&amp;utm_medium=copy</a>
Online digital games for children	<a href="https://pt-br.padlet.com/mm_pedrolo/mlcugiibpwzj">https://pt-br.padlet.com/mm_pedrolo/mlcugiibpwzj</a>
Jex	<a href="http://www.jornaltetit.jex.com.br/">http://www.jornaltetit.jex.com.br/</a>

Source: created by authors

The workshops were offered in alternate hours (saturday mornings and afternoons) and were opened for the participation of the classmates and also for the academic community as an activity integrated with TecEdu teaching project.

This way, the students had the opportunity to deepen studies in an application/web tool in order to produce the workshop and also could deepen studies by participating in the workshops proposed by colleagues. The workshops also allowed the reflection on the use of web applications in the

context of the classroom. However, it was still necessary to effectively use them in an educational context.

Finally, the third activity involved a **teaching practice** in a basic education class. The students, organized in groups, planned and executed a learning activity using technology in a real context. First, they visited a school, observed a class, and made the previous arrangements with the teacher. Second, they executed their lesson plan with the chosen class. Finally, they reflected about the activity carried out, identifying the facilities and limitations of their practice.

The students planned those activities using many authoring tools that they had had the opportunity to know in the Technology and Education course during the development of the learning trails and workshops. Figures 3 and 4 show the results of learning activities developed using Thinglink<sup>5</sup> and Lino<sup>6</sup>. The students also developed learning activities using QR Codes.

**Figure 3.** Activity Produced During the Teaching Practice Using Thinglink

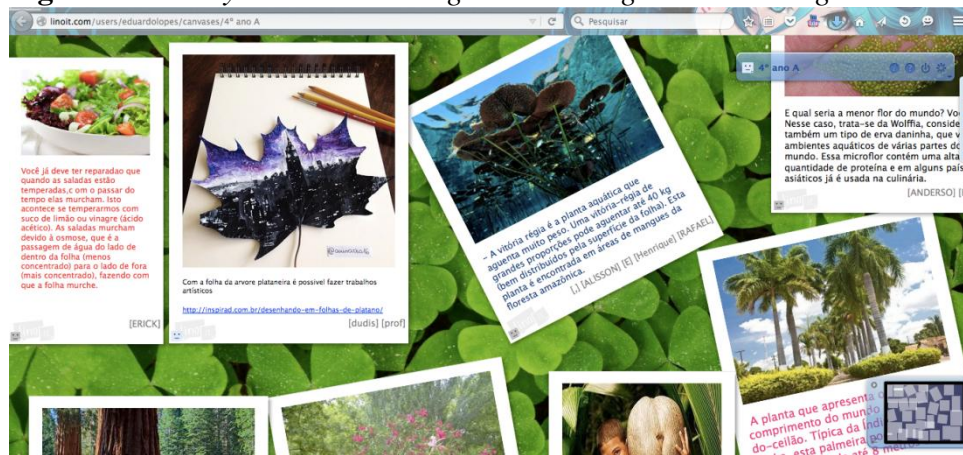


Source: created by authors

<sup>5</sup> <https://prezi.com/ww5fe6kwcnm/atividade-pratica-com-thinglink/>

<sup>6</sup> <https://prezi.com/bpsqn8qtrpue/aplicando-o-linoit-em-uma-turma-do-4o-ano-pela-primeira-vez/>

**Figure 4.** Activity Produced during the Teaching Practice using Linoit



Source: created by authors

The experiences were shared with colleagues in a face-to-face presentation and documented on an online tool, as shown in Figure 5.

**Figure 5.** Teaching Practice Documented on the Online Tool Prezi



Source: created by authors

At the end of the semester, the students recorded their impressions about their learning path throughout Technology and Education course in the Blackboard virtual learning environment.

## Discussion

The results were analyzed based on the clues that guided the research: a) the idea that students do not know many web tools that allow authorship; b) the idea that the knowledge of new tools that enable the student's authorship can inspire learning activities with technologies that to go beyond information consumption.

During the development of the first activity, the learning trails, the students had the opportunity to explore many authoring tools on the web.

Although all students said they knew the Prezi, few of them had already used it in an online presentation. Padlet was used in an activity during the classes and the students liked a lot because of its collaborative characteristics. Besides, the students tried different web tools, like Lino, Blogspot, Wix, Thinglink, Picktochart, and Tiki-toki, as shown in Table 1.

During the second activity, the workshops, the students had the opportunity to deepen studies in a web tool, and also to reflect about its possibilities in educational settings (Table 2). They explored authoring web tools and collaborative activities using mobile applications such as QR Codes.

During both activities, learning trails and workshops, the students participated in experiences of reading, producing, and sharing.

In the third activity, the teaching practice at the school, we realized that students explored different authoring tools learned throughout the Technology and Education course.

Based on their testimonials, the teaching practice at the school allowed them to face the difficulties related to the technological infrastructure of the schools, which is also pointed by national researches (CGI.br, 2014, CGI.br, 2015). They also perceived the difficulties of the children in managing computer files (recording and locating files). On the other hand, they realized that the learning activities that they proposed were an innovation for both the children and their teacher. All of them showed interest and engagement in the learning activity.

The students shared their experiences with colleagues in a face-to-face presentation and documented it in an online tool.

We realized, with surprise, that none of the groups used Microsoft Power Point for the face-to-face presentation even though it is a common software for slides creation and presentation. They used the tools learned throughout the course, especially Prezi (Figure 5). The use of different tools in a spontaneous way allowed us to infer that students have effectively appropriated new possibilities within their PLE.

At the end of the semester, the students recorded their impressions about their learning path in the Technology and Education course. Based on the students' statements published on the Blackboard virtual learning environment we realized the importance of promoting activities to foster the PLE of the students.

The statements shown in bold highlight the idea of learning throughout life, which is the basis of the PLE concept (students P. and C.).

When Technology and Education course began I sincerely had no idea what I would learn [...]. I believe that I learned a lot with the tools and **I intend to take this knowledge to all my academic and professional life.** (P.).

I learned **many new thinks that I will use throughout** all my teacher education program. (C.)

The statements of students L., E., and F. also showed the importance of the field experience in an educational setting.

The Technology and Education course was very significant. **I could learn many tools which I will be able to use in the classroom.** As I still don't work in a school, when the time comes I will have this knowledge.

The classes were excellent since on each of **them I learned new resources which I didn't imagine existed** [...]. For me, one of the most relevant things that the professor said was **the importance of continuing learning and where to search this knowledge after graduation.** This can be done through virtual learning environments and communities. I loved the sites and apps which I knew. **I have been using and recommending** them to my teacher colleagues.

Everything for me, **absolutely everything that was presented in terms of tools and applications was new.** I was an user of technology exclusively for contacts, email, searches, social networks, shopping, etc. I had never used it for developing educational resources or to do school work. I must admit that at the end of this stage I do not consider myself ready to use the contents learned as a teacher. **I have to practice more, read, study, and go deeper into these contents. It is also necessary to associate the contents of my area of activity (History) with the tools presented.** (F.)

Based on the testimonies of the students about their experiences during the Technology and Education course, we realized that they obtained new knowledge through the different proposed activities. We also noticed that the use of digital technologies should be part of the whole training course, as emphasized by student F.

## **Final Comments**

This study was guided by the following question: what learning strategies can contribute to boost the PLE of undergraduate students during their initial teacher education process?

Analyzing the research path based on the clues outlined as a starting point, we reinforce the importance of presenting to the students new tools which enable authorship, as well as promoting the reflection on the possibilities and the limitations of these web tools in an educational setting.

Besides knowing new tools and reflecting on their possibilities, we understand that only an effective teaching practice with a group of students in a real situation provides the improvement of the pedagogical practice using digital technologies, as proposed by the Brazilian legislation for teacher

education programs (Brasil, 2015).

The learning strategy proposed for the course, which was based on three complementary activities (learning trails, workshops, and teaching practice), enabled the students to deepen knowledge on many authoring web tools. They produced educational resources, shared content, and also had the opportunity to have a teaching experience with technologies and to reflected on it. Thus, theory and practice were articulated to enable the production of knowledge within the training courses.

We highlight the relevance of the articulation between academic research and teaching. The Cartography method allowed us to follow the research path from two perspectives: a) the professor of Technology and Education course; b) the students. From the point of view of the professor of the Technology and Education course, the Cartography method allowed both the analysis of the path proposed to the course and also the learning path of the students. From the perspective of the student, the Cartography method allowed each student to recognize his process of appropriation of PLE through the identification of the web tools already known, through the experience with new web applications, and through the recording of their learning trail. This learning path promoted differentiated educational practices in schools, highlighting the use of applications that allow the collaborative construction and sharing of results on the web.

So, we understand that the proposed learning strategy was relevant to foster the PLE of the students. During the entire course, they developed activities that explore different tools and mechanisms for reading, producing and sharing. However, other research paths were revealed throughout the research.

During the course the students shared the materials on the web, but the dialogues and discussions took place in a face-to-face space. It is understood that we need to expand these interactions on the web, so that academics can build their learning network. So, it is necessary to think about a learning strategy that allows the formation of personal learning networks (PLN) between students.

We was also verified the importance of extending the proposal of using digital technologies throughout their whole undergraduate formation.

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