DIGITAL TECHNOLOGIES, LEARNING AND SCHOOL: PRACTICES AND PERCEPTIONS OF YOUNG CHILDREN (UNDER 8) AND THEIR PARENTS

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ABSTRACT
This article explores the practices and perceptions of young children (under 8 years old) and their families about the use of digital technologies at school and their potential for learning, as well as the articulation between formal learning at school and informal learning at home. Data was collected through activities with children and their families, and then we used qualitative content analysis to explore them. The results show that the use of digital technologies at school is more common in Primary, being rare in Preschool. However, the pedagogical potential of devices like computers and tablets is underexplored both in schools and at home. Parents consider that children under 8 are too young for using digital tools in school work and believe they are not prepared to do so yet (although children are actually tech-savvy).
Keywords: Young children (under 8), school, digital technologies, learning.

INTRODUCTION

Our society is profoundly shaped by the integration of digital technologies in our daily routines. Children are being born in homes filled with computers, smartphones and tablets, and they come into contact with such devices increasingly earlier. However, most research on children and digital practices has focused older children, mostly adolescents, who soon stood out as pioneers and trendsetters in the use of media as the internet and mobile phones. Our research fills this gap (Plowman, 2015; Vatavu *et al.*, 2014) by studying the practices and perceptions of younger children, and also their parents, as important mediators of their contact with digital technologies at this age.
Concerning the use and impact of digital technologies in formal learning, the literature is as vast as inconclusive. Research acknowledges advantages and disadvantages of using digital technologies for learning, and identifies skills and domains in which their effects are positive, and others where they are negative (e.g. Lieberman *et al.* 2009; Hsin *et al.*, 2014). A significative strand of this literature focuses High School and University students, as it only became more common for young children to have access to digital technologies recently. There is also a focus on the computer, the first digital tool to be integrated in formal learning, also because it is common for University students to have their own laptop (e.g. Lai, Wang & Lei, 2012; Audi & Gouia-Zarrad, 2013; Lee & Wong, 2014; Gurung & Rutledge, 2014).

Some claims are rather consensual within the academia. On the one hand, children coming into contact with digital technologies at an early age is unarguable and possibly unavoidable (Kucirkova, 2011). Parents are the ones who facilitate the first experiences and learning, and who also set an example (Livingstone, 2007; Plowman *et al.*, 2008). On the other hand, there is an increasing discrepancy between the children's domestic environment, filled with digital devices and multimedia stimuli, and the traditional formal learning system. As consequence, children's attention span is decreasing, they may develop negative attitudes towards school, and their fine motricity is revealing changes, adopting gestures related to touch-screen devices to approach paper (e.g. McKenney & Voogt, 2011; Nachet *et al.*, 2014).

Facing this scenery, it is important to gain further knowledge on young children's digital practices, in particular the ones related with school and formal learning, as well as the parental mediation that contextualizes them. This will allow a more informed and fruitful discussion about the use of digital technologies at school as tools for learning.

1. STATE OF THE ART: DIGITAL TECHNOLOGIES, LEARNING AND SCHOOL

1.1 Digital homes *versus* traditional schools

Currently, children are being born in digital homes and receiving stimuli from digital media from an early age. Besides the traditional television, which still occupies an important role in their lives, young children are attracted to their parents' smartphones and tablets. Parents, whether because they wish to share with their children digital

activities that they enjoy, whether because they need to keep the children entertained, they allow the use of these devices, and may even acquire consoles and tablets for the children (e.g. Plowman *et al.*, 2008; Genc, 2014; Lauricella *et al.*, 2015).

The home environment, highly stimulating for all senses at a fast pace, frequently contrasts with the traditional school, particularly since Primary, where children are asked to sit quietly for long periods, to write with pen and paper, and to focus on activities as reading and calculating. There is, therefore, a deep contrast between these two settings, and the school is usually disfavored in children's perceptions, as some of them describe it as boring and monotonous (Levy, 2009; McKenney & Voogt, 2010). Even in Preschool, the habits previously acquired at home are different from the activities proposed to the children. For instance, concerning fine motricity, children prefer to use their finger to paint and draw, discarding pencils and paintbrushes, and they approach books with the same gestures they use for tablets (Nacher *et al.*, 2014). Even so, Saçkes *et al.* (2011) show that digital skills acquired at home favour the children's performance in Preschool.

Some studies (e.g. Levy, 2009; Saçkes *et al.*, 2011; Blanchard & Moore, 2010) present an argument shared by many teachers: it is necessary to introduce digital technologies in schools, not only because of the advantages they may bring to learning, but mostly because they are an additional motivation for children, and their use alone contributes to perceiving school in a more attractive way. About the way these technologies should be introduced and their impact in learning, the literature is far less consensual (e.g. Lankshear & Knobel, 2003; O'Rourke & Harisson, 2004; Hsin *et al.*, 2014).

1.2 Digital technologies and learning

Graham (2008) coined the term "digiteacher" to characterize teachers who use digital technologies in the classroom, and describes their profile. Age is determinant, these teachers are generally young and had contact with digital technologies at an early age - they are Prensky's (2001) digital natives (O'Bannon & Thomas, 2014). Besides, they have a strong online presence, are informed about tools and platforms, and enjoy using them (Graham, 2012). On the contrary, older teachers (mainly over 50 years old) are reluctant to use digital technologies in the classroom. In the middle, there are many professionals who, although they use digital tools, they do not take advantage of all their potential, as they tend to use them for tasks that they did previously using other tools. For instance, the most common activity is using the laptop to play music, as they would do with a CD player (Yurt & Cevher-Kalburan, 2010).

Even among "digiteachers", their will to integrate digital technologies in the classroom and their creativity are restrained by syllabus that they have to cover and by existing digital platforms and content, that do not always meet the expectations of children, or are enjoyable for them. For instance, the computer is the digital device more frequently used in schools while the tablet is preferred by children at home. In the tablet, the favorite activity is playing games, in particular those that are related to the fictional universes that children like the most, like characters from movies and cartoons or toys (Fleer, 2014; Merchant, 2015). At school, children are asked to engage in other type of games and activities, as the most common uses for the tablet in the classroom are apps related with stories (ebooks or storymaking) (e.g. Hoffman & Paciga, 2014; Ihmeideh, 2014; Kucirnova *et al.*, 2013;), apps for drawing and digital collages (e.g. Crescenzi, 2014), and apps with maths exercises (McEwen & Dubé, 2015).

Research shows that the impact of digital technologies in learning may be both positive and negative, that is, digital technologies favour the development of certain skills but are not as useful regarding others. For instance, some studies report positive effects in acquiring decision-making and problem-solving skills (Kim & Cho, 2013; Falloon & Khoo, 2014; Price *et al.*, 2015), in developing critical reasoning (Wood & Jocius, 2014), in gaining independence (Chou, 2013), in working collaboratively (Kucirnova *et al.*, 2014), in socially interacting with peers, parents and teachers (Roberts-Holmes, 2013) and even in expressing emotions (Tanyel & Knopf, 2011). Ihmeideh (2014) reports that learning how to read was easier for preschoolers using ebooks when compared to another group using book. Nacher *et al.* (2014) and Neumann & Neumann (2013) highlight the development of fine motricity by using touch devices. McEwen & Dubé (2015) show that using the tablet increased the attention span of preschoolers and their concentration in tasks, bringing added-value to several learning activities. On the other hand, research has also showed that children memorize more easily the name of letter and the alphabet when they study in paper (Wolfe & Flewitt, 2010; Willoughby *et al.*, 2014).

Hsin *et al.* (2014) present a systematic literature review about the effects of introducing digital technologies in the teaching of young children. After reviewing 87 articles, the authors conclude that there are more positive effects than negative, mostly related to the social dimension of child development - children become more collaborative, they relate better with peers and adults, and they are more tolerant to difference. So, the competences and skills that digital media favour, although extremely important, are not the ones highlighted in syllabus.

Hence, the debate about using digital technologies in classrooms does not call for a "yes" or "no" answer. On the contrary, digital technologies can and should be integrated in classrooms in parallel or additionally to other techniques and tools, and used strategically to develop and reinforce the skills for which they are more suitable (Lieberman *et al.*, 2009). For instance, Yokota & Teale (2014) and Javorsky & Trainin (2014) compare the use of school manuals in paper and digital, and conclude that ebooks are more suited to images and animations, as they enable interactivity, while paper is preferred for text. Ott & Pozzi (2012) study the use of game-based learning apps in Preschool, reporting high success. The role of the teacher is thus fundamental as it is up to him to manage the use of digital technologies in the classroom (Blanchard & Moore, 2010).

1.3 Family, technologies and school

Several researchers agree that, at such an early age, although children are capable of exploring digital technologies independently, they often need guidance and help. The role played by parents is fundamental, as they are the first mediators. It is with parents that children usually engage in their first digital experiences, and they regard them as role models, tending to replicate their practices and preferences (e.g. Bittman *et al.*, 2011; Kucirnova & Sakr, 2015; Livingstone, 2007; Plowman *et al.*, 2008).

The same applied to the role of the teacher, that assumes the mediation in the school context, stimulating and guiding the children (Couse & Chen, 2010; Neumann & Neumann, 2013). Research shows that the perceptions and attitudes of teachers, and their training regarding digital technologies, as well as their digital literacy, are determinant to foster a positive use of theses resources in the classroom (Blackwell *et al.*, 2014; Graham, 2012). So, the intrinsic barriers of teachers - perceptions, attitudes and skills - are the most determinant ones, instead of extrinsic factors such as access (Blackwell *et al.*, 2013).

School plays a timid role when it comes to using digital technologies for learning. Considering that parents and Preschool and Primary teachers play as mediators of digital technologies for young children, it is surprising that research on this issue reports a lack of articulation between families and schools (e.g. Plowman *et al.*, 2012; Kim & Choo, 2013). The activities performed in these different contexts are often disconnected. Parents do not resort to digital technologies to support studying or for pedagogical purposes. They regard digital devices as toys, that children predominantly use for playing. At school, during Preschool and most of Primary, teachers do not take advantage of digital technologies, they do not involve families in digital activities or tasks, and they do not explore the full potential of numerous platforms that mediate and facilitate communication between school and family. Research by Grant (2011) about the perceptions of parents, children and teachers about a integrative digital platform for schools and families reveals that it pleased them all. However, parents and children expressed concern about the delimitation of frontiers between the school and family spaces and dynamics, revealing that this articulation must be well thought, managed and balanced.

2. METHODOLOGY

2.1. Research questions

In this article, we explore the following questions: 1) Which digital practices associated to formal learning do children under 8 years old have?; 2) Which kinds of skills result from those (formal and informal) learning digital practices at home?; and 3) What are the perceptions of children and parents about the use of digital technologies for learning and in school?

2.2. Empirical Methods

In this study, we followed a qualitative approach, as its main goal was describing and developing an understanding about a particular situation (Burns, 2000; Creswell, 2007; Glesne, 1999; Goodwin & Goodwin, 1996). Qualitative researchers are interested about the meaning of phenomena, about how individuals make sense of their world, about how each of them experiences life and interprets those experiences (Bogdan & Biklen, 1994). Thus, we went "(...) to the field (...)" and researched about "(...) what people are doing and thinking (...)" about the issues we wanted to study (Strauss & Corbin, 1996: 11).

For exploring the data, we used thematic content analysis. According to Braun & Clark (2006), thematic analysis is a method that identifies, analyses and relates themes (patterns) that emerge from the data. It also allows to organize them and describe them in detail, also implying the interpretation of several aspects concerning the themes under study. In this research, we chose to build a detailed description of all the data - a portrait of each family, based on an inductive thematic analysis. Thus, all the themes identified are strongly related to the rough data. After clarifying these procedures, it is also important to mention that we followed the 6 phases of thematic analysis, a process that involves going back and forth in our analysis of the data. These 6 phases are the following: 1) familiarizing with all the data - transcriptions, reading and re-reading, taking notes about the main ideas; 2) creating initial codes - coding interesting features of the data systematically and confronting the relevant data with each code; 3) searching for themes - grouping the codes in potential themes, joining all relevant data for each possible theme; 4) reviewing all the themes - checking the themes by comparing them with the initial codes (phase 1), and generating a map of thematic analysis; 5) Defining a naming the themes - this analysis perfects the specificity of each theme and how it fits the "whole story", generating clear names and definitions for each theme; and 6) writing the report - the integration of all the analysis in clear descriptions, relevant excerpts, and using examples to answer the questions that guided the research, thus producing a final research report. For categorizing the data, we used the software QSR NVivo 11 Plus for Windows.

The main method for collecting data were semi-structured interviews to parents and children, together and separately. Several supporting techniques were developed to facilitate the data collection and to stimulate the participation of children. We interviewed a set of 25 families with children aged from 3 to 8 years old, that used at least one digital tool at least once a week. We used coding techniques during the interviews in order to get more data and being able to generate more accurate and detailed descriptions (Strauss & Corbin, 1990, 1998).

For selecting our sample, we used theoretical sampling in order to obtain a wider range of narratives about the use of digital technologies for learning (Strauss & Corbin, 1990, 1998). Theoretical sampling aims at representativity, not of the population, but of the concepts being studied, thus maximizing the opportunities for identifying and comparing situations, and later categories. However, the proportions in the sample and of the categories may vary according to their properties and dimensions. Maximizing and promoting the opportunities for comparing concepts, taking into account their features and similarities, allows the researchers to make their categories more compact and diverse, specifying its variability (Corbin & Strauss, 2008: 202).

Thus, we intended to interview a set of families with children between 3 and 8 years old, that used at least one digital device at least once a week. We searched for variability in our sample, regarding: i) gender of the child; ii) composition of the family (divorced parents, with and without siblings, etc.); iii) socioeconomic level (highlighting the participation of lower levels). The families were selected among personal contacts and in support institutions, as a Social Center and a Parish Center. All the families approached were receptive to our requests. The visits to the families were scheduled by telephonic contact, at the convenience of the family. The interviews took place between June and November 2015.

These visits included different activities: in the beginning, the family was interviewed together, aiming to get to know the daily routines of the child, and they were asked to fill a daily schedule with stickers with varied activities; then, simultaneously, one of the researchers interviewed the parents while the other talked to the child (and siblings, if they existed). The interview to the child was complemented with different activities, such as a card game about favorite activities, the identification of apps from a standard grid and a 'digital tour' where the child was asked to show the researcher his or hers digital devices, spaces of use and preferred activities. The data was registered in audio files, photographs and notes taken by the researchers about their participant observation.

2.3. Participants

We interviewed 25 Portuguese families, with children from 3 to 8 years old. All the families and their members were coded in order to ensure their anonymity and the confidentiality of the data. The coding for each family member starts with the initials of the country - in our case PT - Portugal - and numbered from 1 to 25. Next, we added the role played by each one in the family (f for father, m for mother, g for girl, b for boy) and the age.

3. DESCRIPTION AND DISCUSSION OF THE DATA

In this section, we present a description and an analysis of our data. The questions issues presented are findings of our thematic analysis, and not questions that we posed to our families.

3.1. Digital technologies used at school

Among the children interviewed, 9 claimed not to have any digital technology in their classroom and even school. Among the other 16, 11 were in the 1st or 2nd year of Primary, and three of them mentioned using the computers in the school's library and a digital board in the classroom. Among the children in Preschool only 5 refered having a computer in their classroom or school.

3.2. Activities using digital technologies performed by the children at school

We present in Table 1 the learning activities using digital technologies mentioned by children and parents.

Table 1: Use of digital technologies by children under 8 in formal learning.

Children under 6 years old (Preschool)	Educational games and casual[1] games in the computer
	Writing in a text processor
	Research to support projects
	Computing classes (writing in a text editor, drawing in an image editor, playing games)
Children from 6 to 8 years old (Primary)	Playing games in the library computers
	Using the computer in the classroom (although most times it is used exclusively by the teacher)
	Using the tablet (as a manual and as a support to study tool)
	Do not have computers at school but visit places like libraries so that children can use them
	Computing class (games, searches)
	Search musics and videos

As Table 1 shows, in Preschool, the children that have access to digital technologies use the computer to play educational games related to reading and writing, or casual games. They also write their name and colleagues' names in the text processor, and draw in the image editor pictures that teacher later print for them to paint. Two children told us they use the computer to search for projects they do in the classroom.

> *PT17Gg5: I search for butterflies, I also search… It's about what's on the plan for the day.*

This kind of activity was also mentioned by parents.

> *PT14Dm: (...) this year, they did a project about photography in which they took pictures, and then selected the best ones, the worst, focused and defocused… that was one of the projects they did this year in her classroom.*

The discourses of children and parents allow us to realize that the Preschool teachers of these two children that have more contact with digital technologies use constructivist methodologies, that is, teaching methods that promote autonomy, and children can participate actively in building their knowledge and learning.

Among the older children, in Primary, we found more children - a total of 10 - with access to computers in school, whether in the classroom or in the library. In the library, 3 children reported playing games related to cartoon characters such as Spider-Man and Ninja Turtles, and watching videos on YouTube. One of them told us that although she has access to the internet in the library computers, they only have permission to access images and not videos. In fact, in all Portuguese public schools, since 2014, the Ministry of Education limited the access in all networks to some social networks and services, claiming that it was a measure to prevent hacking attacks and slow

[1] Casual games are games directed at users that do not wish to dedicate much time or effort playing them. To progress in these games, the requirements are low, and yet they allow the user to increase the challenge by trying to accomplish tasks faster or through rewards. Usually, these games are colorful, have attractive graphics and sounds, do not include content with possible negative connotations such as violence and confrontation, and reward the player with small but frequent prizes, building constant motivation to play.

connections. Thus, the access to Facebook, Tumblr, Instagram, and Android and Apple stores are limited from 8:30 a.m. to 1:30 p.m. Apart from this time-frame, there is a daily limit for browsing. The updates on Windows operating systems are only possible from 5:00 p.m. to 8:00 a.m. The access to YouTube does not have a schedule limit, only a limit for the amount of data transferred (Bancaleiro, 2014).
In the classroom, it is frequent that only the teacher uses the computer. The children are only allowed to use it when they finish their other activities, and one at a time, they use the interactive board for addition schoolwork.

> *PT4g9: The teacher uses the computer and sometimes we do activities, when we have time. There is a place for activities and revising what we studied and we… go in line (...) we go to the board and do it.*

Although they can use the computers in the library to play, some children prefer to play outside with their classmates, playing football (mostly boys), instead of going to the library and use the computer to help them with their homework or for entertainment.
Only one child, age 7 years old, said that he used the tablet as a support for classes at school, which is a private institution. Even though the mother bought him a computer, he prefers to perform activities such as searches and digital presentations in the tablet. He connects it to the projector in the classroom and presents his work.

> *PT22m: PT22b7 needs it* [the tablet] *for school, it is a manual* (...). [He] *has a computer in the bedroom because of homework and such, but he does not pay attention to it, he doesn't use it, he prefers to do all his homework in his iPad. (...) At school, he presents with the projector.* (...) *On Sunday (...) we were all at the house, with his grandparents, with friends,* (...) *and he was online searching and then did a presentation and presented it at school (...).* [The mother picked up the son's tablet and showed some of his works to the researcher] *This is the "Lands of Portugal"* [title of the assignment]*... This is what he did on that day. He did it alone.* (...) *He went to the internet alone to get information, placed it here, and did the assignment by himself.*

School, by stimulating the autonomy of children when it comes to using digital technologies, makes them more autonomous and motivated to search about their interests, and in this case, for schoolwork.
Some schools that don't have access to digital technologies, as computers, organize regular trips or events that allow the children to have this access. For instance, PT25g6's Kindergarten went to the "Citizen Store", a place that aggregates public services, and they used a computer room for a whole morning to "*play in the internet*" [PT25m]. Also, PT21g7's class went to the nearest Secondary School in order for all children to use the computers.
Five children have computing classes, two preschoolers and three in Primary. In computing class, they use Microsoft Paint, write in the text processor and play games.

> *PT18b5: In computing class I do: I play games, I look at the board and try to imitate what is in the board, letters, letters and more letters.*

Yet, one of the mothers refers that the son is not interested in using the computer at home, nor in reproducing what he learns in computing class, he prefers to play with the tablet. This device is the favorite of most children to play with at home.
In computing class, children from the 1st year of Primary also play in the computer, search online and mentioned *"doing the login"* [PT7b6], hinting at more specific activities, such as using the internet and registering online in some websites.

> *PT10g6: I learn to go to Microsoft, saving my work, getting images from the internet.*
> *I: What is Microsoft?*
> *PT10g6: Where you can work. (...) Sometimes, when we finish those assignments, we can play. The work we do on the computer is that, get images from the internet. In the last one, we had to pick wild animals and animals we can have at home.*
> *I: How did you get those images from the internet?*
> *PT10g6: I wrote "lion" and then I went to the image and it showed up on the screen. I pressed the left button of the mouse, and then it showed up "copy image".*

PT6m claimed that her and the father considered computing class very important for the future of their son, and that was why they chose to pay for extracurricular computing classes at school.

> *PT6b7: This year he started in computing class but we have to pay for it.* (...) *now we use computers for everything* (...) *and as we can't teach him that* [the mother and the father have low digital literacy]*, we thought it would be good for him* (...) *to have that activity.*

Digital technologies are also used in a more free and playful way at school, in the context of ATL[2] (Activities for Free Time). Older children use the computer for listening to music and they teach the younger ones to search, and sing together, thus revealing collaborative learning.

> *I: And she knows how to search for things alone* [in the smartphone]*?*
> *PT3m: Here* [in the smartphone] *she knows.* (...) *But* (...) *the other day I saw her... she picks up the smartphone, goes on YouTube, and listens to Taylor Swift,* (...) *the artists* (...) *that are currently fashionable for teenagers* (...) *And I ask her "How did you do that?* [search for the songs]*" and she laughs and says "Because I already know how to do it".* (...) *I think it all started over there at school, in the school's ATL, because at the end of the day, one day I picked her up, they were all on the computers, and some older girls, they teach the younger ones, and they learn.*

3.3. Activities (involving some type of learning) using digital technologies performed by children outside school

We summarize on Table 2 the learning activities using digital technologies outside school that children and parents referred.

Table 2: Use of digital technologies for informal learning.

Children from 6 to 8 years old (Primary)	Searches for homework
	Following search suggestions in the school manual
	Installing and using pedagogical apps (e.g. reading, writing, maths)
	Using pedagogical software in the computer (e.g.. virtual school books)

These activities are usually performed at home, by children in Primary, accompanied by their parents. The parents and children under 6 years old did not mention any of these activities in the home. However, it is common that parents resort to the internet to explain concepts and doubts for their children, although most children do not show yet any motivation to search online on their own.

> *PT2m: Sometimes, when we need to explain him something that he doesn't know, we do it with the internet. Let's imagine that he asks 'what is this?' We go to Google and search. But although we do that, he does not have the initiative yet, searches are always driven by us.*

On the other hand, there are children who use digital technologies autonomously for their homework.

> *PT4m: PT4g9 does it* [search online]*, as she has her own tablet* (...) *she goes to her bedroom and searches whatever she needs to search, and does her homework.*

Although less frequent, some parents mentioned other types of educational activities using digital technologies, such as following search suggestions in school manuals, using school manuals in ebook format for homework or studying, installing pedagogical apps and using pedagogical software.

> *PT2f: But on the other day we searched with him* [PT2b7] *because of his homework.* (...) *The school manual said the homework and required an internet search. It was about animals or something like that.*

> *I: And do you try* (...) *to install games that are connected to school in any way, that are educational?*

[2] Activities available in schools to fill free time, if parents are not able to pick children up right after classes.

PT2f: We do not make a habit out of it, but if we find something that we can do I install and try to get him to play with it.
PT2m: Yes, but we could explore that more.

Besides, the "digital tour" to the children's tablets showed us that only one girl had pedagogical apps installed, namely one for learning English and ebooks. All the others only have games, and their most common activities in these devices are playing those games and watching videos on YouTube.

3.4. Use of children's personal digital devices at school

In order to overcome the lack of digital technologies in school, children might eventually bring their own devices to class. However, that is not case. Most schools do not allow children to bring their digital devices to classes.

I: At school do you use your computer or tablet?
(...)
PT3b7: I can't, not even in ATL. They don't allow me.

I: Do you usually bring your tablet to school?
PT9g7: The teacher doesn't let me. (...). *I think she is afraid it might get broken during the break.*

Although some schools forbid students from bringing their own devices, some parents disagree with this rule, acknowledging that the devices might promote some skills.

I: And to the school, can he bring it [the tablet]*?*
PT10m: No [laugh]. (...) *They told me they are not allowed to bring digital devices, and this year they said that of they* [the children] *do bring them, they are not responsible. I think it isn't normal that they do not feel accountable for what happens in school. But the break is a time when they can play with each other, fantasize, create…* (...).

On the other hand, some parents show concerns about their children bringing digital devices to school, they worry the children may break them or damage them in any way. Despite these prohibitions, some children do bring their personal devices to school. For instance, this is the case on Fridays in the ATL where PT18m works. Children are not allowed to take photos of each other, but some do not comply and the caretakers must search their devices and delete them if they find any.

PT18m: (...) *At our school, on Fridays, we let them bring the tablets for ATL. We are not accountable for any device. The funny thing is that they are forbidden to take photos of each other. (...) Some obey this rule, but we end up having to reprimand those who are bolder and want to take a photo, and then there we go… The operating systems are different and we have to try and figure out how to delete the photos!* [laughs] *Even Nintendo's take photos, and I do not know how to use a Nintendo! Everything is digital!*

3.5. Explanations for not using digital technologies more used to support formal learning

Most parents assumed not using digital technologies for any educational activities because they claim not having felt the need to do online searches with their children yet, add that it might be too soon, as school has not stimulated that kind of practices by requiring them as homework.

I: Does she need any of these technologies for school?
PT8m: Not really, not yet, but the school year has just started. But I am already organizing for [PT8g15] *(...) to spend some time with her brother and explain him those things. (...) I have told her: "*[PT8g15] (...) *you have to take at least 20, 15 minutes off, to teach* [PT8b6] *how to use the computer", because he doesn't use the computer, she doesn't let him.* (...) *I think that will be very important.*

PT3m: Concerning school I did not feel that need yet. When this need stars, I am sure more time will be spent on the laptop than on the tablet. I'll have to bring the laptop [from work] (...) *or have a laptop at home for her to do her homework, because I am sure that will be the evolution. Doing her homework in the laptop. But not for now, we are still pretty archaic here at home.*

One mother feels that her daughter does not have enough maturity to do those searches, and prefers not to engage in such activities with her.

> *I:* (...) *Do you do any searches on Google with her?*
> *PT3m: No. Not yet, because… I don't know!* (...) *I think she does not have yet… she does not absorb. And she runs away a lot.*

Another mother shared that, in spite of her son asking some questions to which she answers that they will search when they get home, that promise is usually forgotten.

> *PT1m:* (...) *in theory, sometimes he asks questions and I say we should search online… The other day he asked how bridges over rivers were built underwater, and I said we could search about that on the internet when we got home. But then in practice, we get home and he forgets, those are questions that he just remembers at the time.... Only rarely did we really go search on Google* (...).

At last, there is a mother who recognizes that she would like to explore more pedagogical mobile apps that her son could use on the tablet, but that would require some time for searching, selecting and stimulating him to actually use them, and she does not have that time. So, she lets her son choose for himself, and he always prefers games related to cartoons and movie characters that he likes.

3.6. Perceptions concerning digital technologies, learning and school

The main barrier to the exploration of pedagogical digital content at home is the perception, shared by parents and children, of digital technologies as a source of entertainment, as "toys". Parents consider that children under 8 years old are still too young and have a limited use of such tools - which isn't always true, as children, even without knowing how to read or write, develop complex strategies for searching, selecting and playing, are aware of a varied array of apps, and are able to perform complex tasks. Besides, parents resort to tablets and smartphones as an effective way of keeping children entertained, mostly when they are busy with domestic chores or work, and they do not dedicate much time to exploring these tools with them. Using the computer is often not allowed to children, as parents perceive it as a work tool.

Also for children, digital technologies are "toys". A mother even describes the tablet as he daughter's "best friend". Usually, they benefit from some freedom and are able to choose their favorite activities. Most of the parents monitor the apps installed in the children's devices, and some forbid violent games or content that they evaluate as inadequate for their children's age. Most of the children prefer games related to fictional characters that they already know and like, from cartoons and movies (such as Disney's princesses and Spider-Man), or as toys (such as Barbie and Lego).
Some parents question what can be considered learning, arguing that children are always learning when they use the tablet or the console, although they are acquiring skills different from those in school syllabus. For instance, these parents mention hand-eye coordination, a predisposition to problem-solving with and trial-and-error approach, and the ability to make independent decisions, as well as to search and select information.

4. CONCLUSION

This study aimed to know better the digital practices of children under 8 years old related to formal learning at school, as well as the parental mediation that contextualizes them, related to practices of informal learning at home. These questions were explored comparatively, considering two age groups: children between 6 and 8 years old, in Primary; and children between 3 and 5 years old, in Preschool.

At school, although both age groups have access to digital technologies, these are more present in Primary than in Preschool, namely computers and interactive boards. Between 2005 and 2009, the Portuguese Ministry of Education, through its Education Technological Plan (PTE), had the goal of technologically modernizing all public schools, concerning in particular the 2nd and 3rd cycles of Secondary school, by equipping schools with internet connections, video-projectors and interactive boards. The average of computers with internet connection per student went from 17,3 in 2001/2002 to 3 in 2014/2015 (DGEEC, 2015). Although Primary and Preschool are not directly covered by these measures, the 1st cycle of basic education (Primary) sometimes benefits indirectly from these measures.

In both cycles, the activities performed at schools are alike, being mostly playful and educational games on the computer. In Primary, some of the children play and do some online searches at school, mostly in the school's library, as in the classroom the computers are used almost exclusively by the teacher. At Preschool, children also

play on the computers. Kindergarten teachers that use the computer as a support for learning are the ones that prefer constructivist teaching methods. These methods place the student in the "center" of the activity, and thus make it easier for him/her to benefit from the pedagogical potential of technology (Ertmer & Ottenbreit-Leftwich, 2010). However, our main conclusion is that, both in Preschool and Primary, schools are far from exploring the full potential of digital technologies, either in the classroom, either for articulating with families (e.g. Levy, 2009; McKenney & Voogt, 2010). Only one child from Primary has reported using the tablet daily at school, as a manual and for researching. Consequently, this child is very autonomous in searching about his interests (Mei-Ju, 2013), reveals developed critical reasoning (Wood & Jocius, 2014) and is an example of the effects of using this device for learning (Kim & Choo, 2013; Falloon & Khoo, 2014; Price *et al.*, 2015). This child attends a private school.

Computing classes are included both in Preschool and Primary, as a way of sensitising the students and parents for the importance of using the computer, but only as an extracurricular activity. The parents who decide to enrol their children in this activity share positive perceptions towards digital technologies, believing that they will be important work tools in their children's future.

Concerning informal learning at some, some of the parents of children in Primary help them in online searches regarding schoolwork. On the other hand, others assume not using digital technologies at all, because they weren't needed so far. Besides this occasional articulation with school, most parents do not explore the pedagogical potential of digital devices at home, in particular the tablet's. Parents perceive this device as one more "toy" and do not favour the choice of pedagogical apps, letting the children choose freely the content they prefer. Parents justify this attitude with lack of time, lack of interest from the children and lack of content in Portuguese. Thus, they use the tablet mostly as a babysitter, to keep the children entertained on their own while the parents are busy (e.g. Fleer, 2014; Merchant, 2015). Even so, some parents consider that entertainment with tablets and consoles also generates learning, but of skills different from those on school syllabus.

In sum, although children live with a panoply of digital devices at home, and despite the Portuguese Ministry of Education and Science's effort to equip schools with digital devices, their use with educational purposes is insipid both at school and at home. Besides, practices at school are very different from the families' uses (e.g. McKenney & Voogt, 2011; Nachet *et al.*, 2014). Thus, the main barriers to a better exploration of the pedagogical potential of digital technologies is not access or skills, but the perceptions of teachers, parents and children (e.g. Yurt & Cevher-Kalburan, 2010; Blackwell *et al.*, 2013, 2014). It is necessary to rethink Education in this digital age, re-conceptualizing schools and classrooms. The strategies must be constructivist, reassessing the traditional approaches and methodologies of teachers and also syllabus, in order to promote better learning environments.

LIMITATIONS TO THIS STUDY AND FUTURE RESEARCH

Interviewing children so young was real challenge for the researchers, and led us to develop games and create strategies to earn their trust and make them confortable. However, some of the children were more timid, and sometimes all we got as answers from them were nods. In order to deal with this, we believe further studies are needed with a longitudinal character, allowing several visits to the same families. Besides making children more confortable with the researchers, we would also be able to observe the development of their digital practices as they grow up.

Interviews are very rich as a data-collecting method, as besides registering our conversations with all the family members, we were also able to observe the environment in each home and the interactions and dynamics in each family, which wouldn't be possible with a survey. Yet, transcriptions and coding are a time-consuming and exhausting task, making it difficult to work with wider samples. An interesting option would be the realization of a wider survey (preferably representative) in articulation with interviews.

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