

# Digital learning: the emerging consequences on literacy development and practices.

## A case study perspective

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### Abstract.

*What the impact of the introduction of the digital media is on the development of child literacy skills is a question that, today, should be a priority when pretending in change educational systems. I propose the results of a research conducted with One Laptop Per Child – Plan Ceibal (2009-2010). I established qualitative and quantitative indicators for studying children’s digital literacy need and its development. My focus will be on defining children’s practices related to digital literacy, in comparison to analogical one, and on a better understanding of how in a digitalized PLE they change literacy habits, practices and outcomes.*

**Keywords:** Education, Technology, Computer, Children, Collaborative writing, literacy, Digital divide, OLPC/CEIBAL.

### 1 Introduction

The access to the information society brings some important consequences such as the reorganization of space and time in the terms of distance [1]; the process of externalizing important cognitive skills [2]; new possibilities for social sharing and new forms of identity construction [3].

Considering all these profound changes, the access to the information society, should desirably proceed on equal footsteps with a profound change in formal learning. The change should be in the strategy of teaching, the nature of the contents, the way students work, the organization of communication strategies and evaluation in the broadest sense. In fact, the didactic work to be effective today has to consider:

1. how mind is changing, influenced by technology. Technology extends some cognitive functions, externalizing and integrating them in net-shape structures [4] and we cannot reasonably ignore the features, the diffusion, the advantages and also the risks of the new digital panorama. It is crucial to analyze the possibilities and the effectiveness of two strategies, which are stimulated by the possibilities of communication offered by the digital media and the net: peer-learning and online collaborative activities;
2. the different literacy needs. Unesco define literacy as “the ability to identify, understand, interpret, create, communicate, compute and use printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society”. [5]. According to this definition, new kind of literacy

should be proposed by formal learning with the aim to give access to the contemporary info-sphere and at the same time not to lose access to the cultural patrimony accumulated in the past;

3. the changes in text codes and writing practices. Writing, today, passes from analogical to digital, from linear to hypertextual, from individual to collaborative.

Digital texts and digital practices of writing are dramatically different from print-based ones. However, the ability to correctly understand and manage the alphabetical code remains a necessary competence for an autonomous and meaningful use of the ICTs.

The hypothesis is that the educational system must renew literacy as goal to provide a model of how to effectively empower in children the development of a complex cross-media literacy competence which includes both functional, critical and active literacy [6]. A new kind of literacy should be proposed by formal learning to empower a positive approach to the interaction between analogical and digital codes, media and contents, that means a positive way of co-constructing online and offline identity, relationships, conversations and culture.

## **2. Objectives**

Many research projects were focused on defining literacy competences in the 21st century and were focused on how writing with a computer affects literacy, writing processes and texts [7] [8]. Actually we know what happens when we read a text on a screen [9] and some researchers are arguing that digital reading competence can be defined as trans-literacy [10].

However, there is still a lack of evidence about what happens to children literacy development when the personal learning environment is fully digitalized and highly connected. It is arguable that when every learner has, and can share, ubiquitously, hardware, software, and connectivity it means every learner can contribute to construct and can share symbolic systems, meanings and practices. It is plausible that when the “digital saturation” will be reached in the children’s personal learning environment, the change in practices of teaching and learning will be evident.

This research project had the aim to explore the relationship between the introduction of the digital media in public primary schools and the development of writing skills. It focuses on individual and collaborative writing and also focuses on the role of the teacher in formal learning mediated by technology. The main issue to consider is how to guarantee enough mastering of the reading and writing process to access the contemporary info-sphere. It is necessary to evaluate if the reading and writing techniques of the online digital media will change literacy processes and practices. Besides, observing how much being online contributes to the writing process could give some guidelines about the effectiveness of peer-learning and collaborative writing as a didactic approach to literacy skills.

The research presented was motivated by the following broad questions:

1. Is there a visible effect on writing practices by the introduction of the one-to-one model?
2. What about the effect of sharing writing experiences?
3. How do children get information from the Internet to solve a given issue?

## **3. Methodology**

The present research took place in the Uruguayan project One Laptop Per Child-Plan Ceibal from May 2009 to November 2009 and from July 2011 to August 2010; with the supervision of Uruguayan Administración Nacional de Educación Pública.

The pilot project of Plan Ceibal began in Uruguay in the department of Florida in 2007, in 2009 it expanded to Montevideo and its metropolitan area (about half of Uruguay's population). According to the objectives of the Plan, all children of the Uruguayan public elementary schools received an MIT XO laptop connected to the internet. Furthermore, students not only received the devices and instructions for their use, but all the educational settings were be remodelled according to the potentialities of the digital cooperative media and the constructionist pedagogical approach.

Ceibal aims to diffuse and promote the use of digital cognitive tools, but obviously, the project at the same time has to fit into the various learning levels: the youngest children learn to read and write with the OLPC-Ceibal technologies, while older students who used to read and write with traditional print-based and linear methods have to change their habits and practices.

### **3.1 Population and activities:**

Considering this scenario, the choice is to focus on two groups of children with comparable partner socio-economic extraction.

The first group of 20 third-grade children was chosen from an elementary school of a village where the Plan Ceibal started as a pilot project in 2007. This village is a typical rural installation of the department of Florida. The school has 197 pupils and counts 24 students per class on average with about 8% of repeaters per year. These children received their first formal learning experiences in reading and writing with digital media, they know and use the tools of digital interaction and communication, they are used to experience collaborative activities, in class, with the use of digital media.

The second group of children is a group of 40 third-grade children, from an elementary school in the Cerro department of Montevideo. Cerro is a district in the outskirts of Montevideo that welcomes both families of middle-low class (workers, artisans etc) and a vast zone of slum or precarious installations without primary infrastructures and conditions of structural poverty. The whole school has 364 pupils, with classes composed of 25 students on average and about 10% of repeaters per year. These children have received their first formal learning of reading and writing in analogical, they are used to face-face interaction, and to individual production.

### **3.2 Tools**

Firstly, a background scenery was defined through interviews (to 22 children, 3 teachers, and 2 directors) questionnaires (to 3 teachers, 60 families), unstructured observation (shadowing) of the classes with the aid of ethnographic notes and analysis of the previous didactic activities. Then, the analysis focused on observing children abilities of composition and interpretation of the digital and analogical text, individual or collaborative.

Consequently, preliminary tests of reading comprehension and efficacy offline, with linear texts, and online, as webquest, were administered with the aim to explore how children search and collect information. The reading tests were administered two times in the first 6 months of the research. The data collected consisted of comprehension scores and navigation logs.

Then, once per month, four kind of tests combining individual and collaborative writing with traditional (pencil-paper based) and digital media (XO laptop based) were assigned to children. The analysis of the texts produced, was both syntactic and semantic. I elaborate a mixed qualitative - quantitative model based on the analysis of their literacy practices. I focused on the quantity of written words per text; the quantity of written sentences per text and the number of words per sentence; the quantity of non-standard words per text and the type and quantity of punctuation marks used per text. What is more, I analyzed each text with respect to coherence, cohesion,

complexity and care for graphics aspects. Observations were added in respect of the graphic aspect and the spatial organization of the text.

## 4. Results

### 4.1 home media environment

The children personal learning environment outside of school seems to host more audiovisual than written communication. According to parent declarations: in the three classes as a whole (81 children): the 57% of the families possess an encyclopedia; the 20% romances/other books; the 75% has children's books (but they count scholar books too). On the other side, 91% of children has a TV color at home, the 64 % with a DVD player. The 11% of families has a Ipod /Mp3 or Mp4 player and the 17% of the families a Play Station/ Xbox o other console. The 32% of the families has an home telephone, but the 81% has (at least) one cell phone. Furthermore, the 57% of families has a computer at home; however, only the 27% of mothers and the 15% of fathers use it.

### 4.2 Webquest

It is interesting to observe that both the children who have a long experience on internet usage and the children who have not, show a extremely naïve attitude toward internet. Children have difficulties in efficiently manage their time while surfing the web and many of them, basically, do not know how to use a search engine. When had to search information for answering queries, they spent about more than 2/3 of their time on the search engine (Google. com). The analysis of children's answers, besides, showed that, on average, they get the information they need from the first page of Google ranking, without scrolling the search engine results page or browse the suggested link to the website.

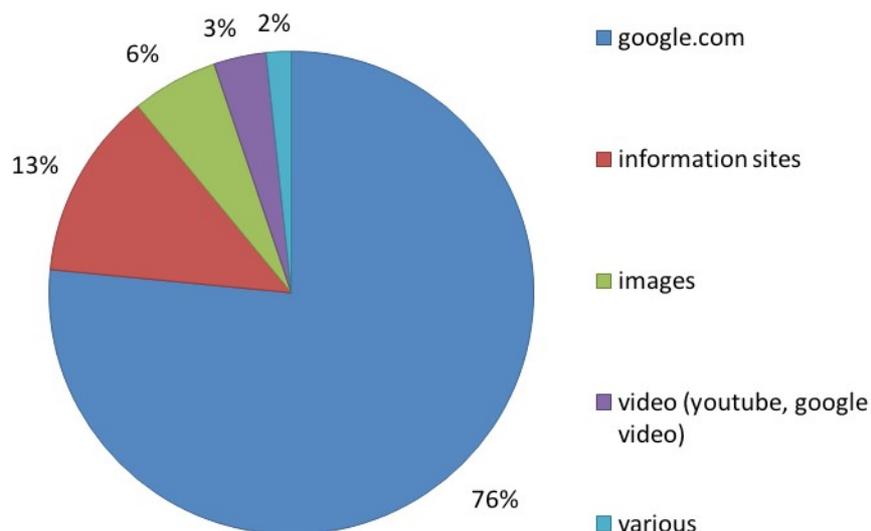
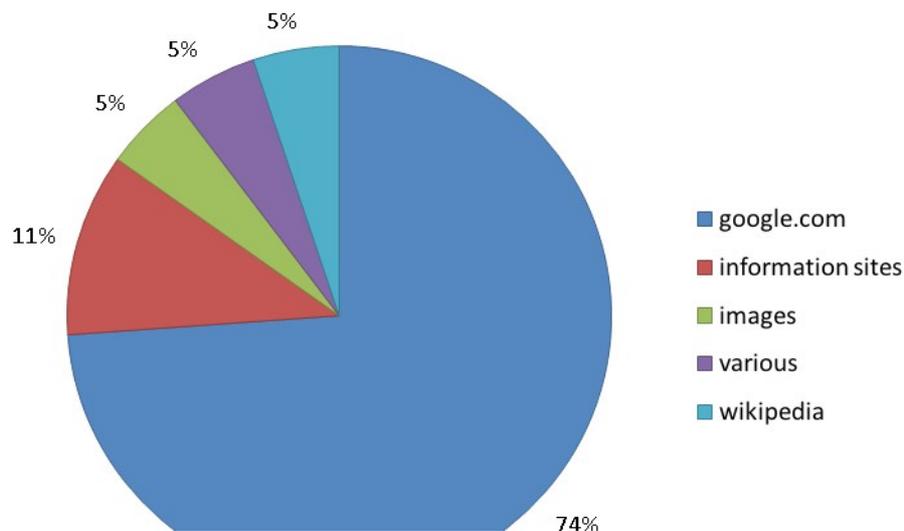


Figure 1: Children who have the laptop since the first grade. Websites where they looked for information during the reading tests (Total time = 1,5 hours).



**Figure 2: Children who have the laptop since the third grade. Websites where they looked for information during the reading tests (Total time = 1,5 hours).**

#### 4.1 Individual writing

We collected evidence about the differences in children's handwriting and computer writing processes and results.

Firstly, the unstructured observation of children supported by the analysis of interviews (data gathered from 22 children, 3 teacher, 2 school manager) suggested that the introduction of laptop in school activities increase writing motivation through increase control, epistemic curiosity, task involvement and persistence.

Then, the data collected seem to confirm the independent development of digital and handwriting sensorimotor processes.

We observe a difference that is statistically significant between number of words in handwritten or computer written texts. The computer-based writing appears to be slower. We know that the process of writing includes sensorimotor, perceptual and cognitive activities [9]. In the digital writing, the graphemic representation, when we pass from the cognitive representation of real referents to the sensorimotor action, is interpolated by the visual identification on the keyboard and the process to search or remind the position of the right key.

Furthermore, writing with a computer, the phase of planning and the sensorimotor action are necessarily dissociated from the monitoring act which is made by raise the head and look at the video. It is interesting to notice that, even if both the children who started their formal learning of writing with the XO laptop and the children who had the laptop introduced since the third grade, wrote more words in the pencil-paper based tests, the number of words they could write per text grew, on average (with a comparable variance) according to the frequency of laptop use in classroom and seems not to take great advantage by the previous writing pencil-paper based experience.

If children wrote more words when it was asked them to write with pencil and paper, they wrote more complex texts when using the laptop. The texts produced with laptop, count more sentences, more cohesive (pronouns, ellipsis, lexical substitutions) and more connective elements (above all: connectives of time, place, cause and effect).

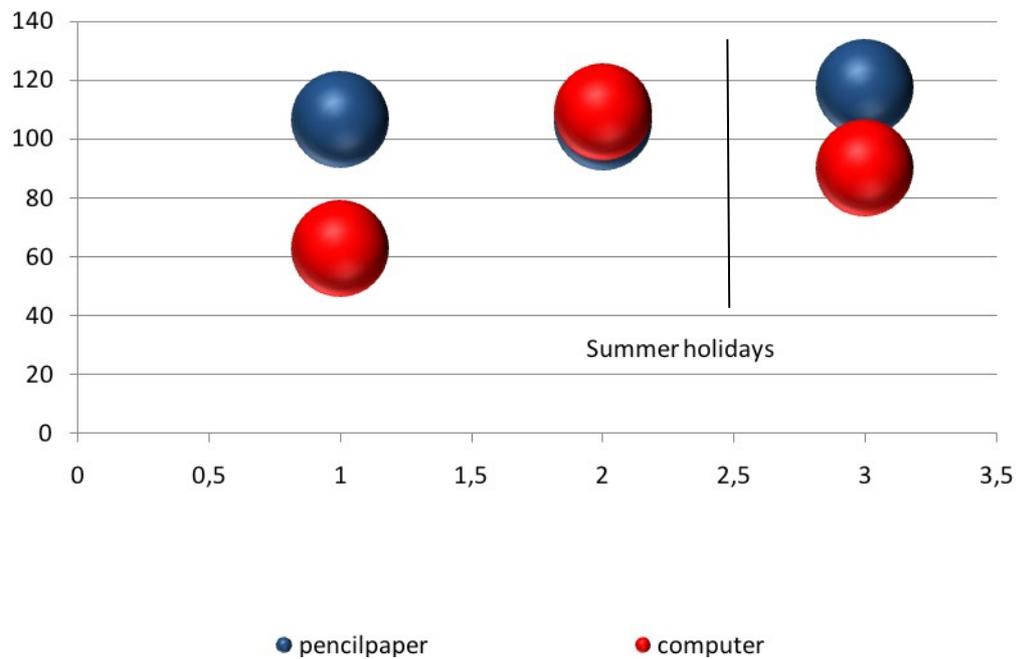
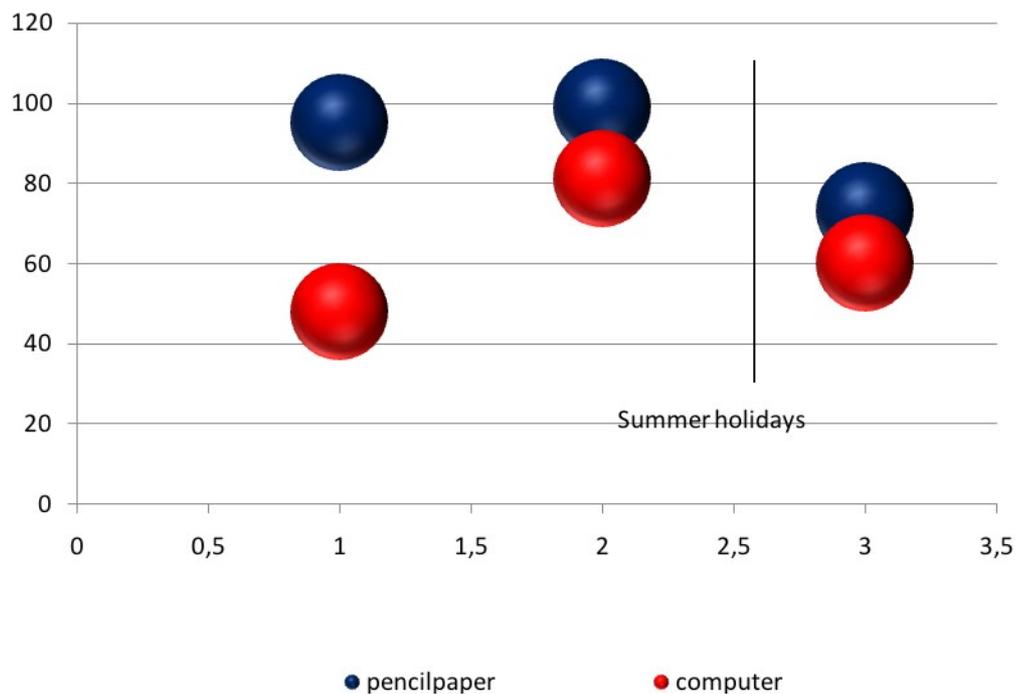


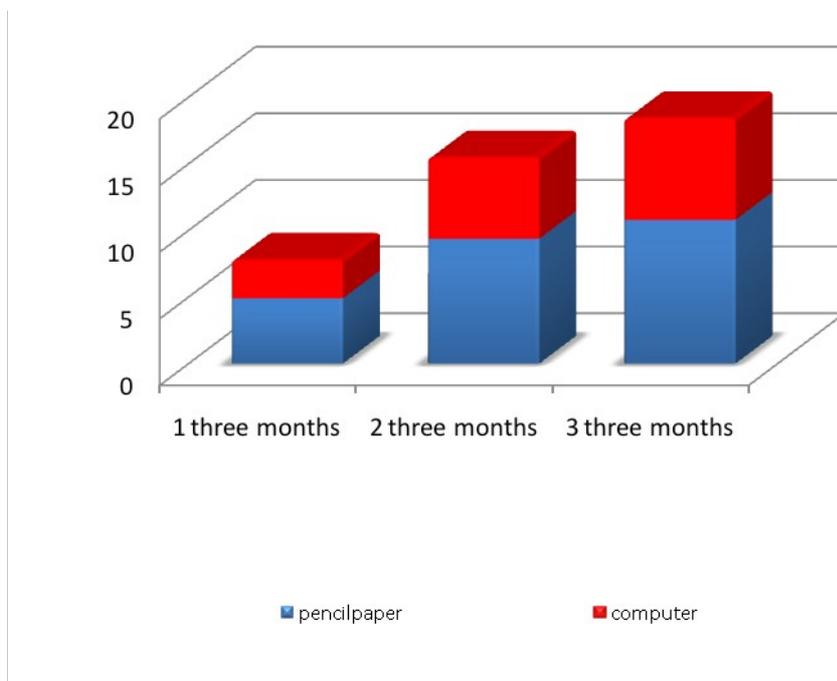
Figure 3: N° of words per text on average - children who use the laptop for writing since the first grade.



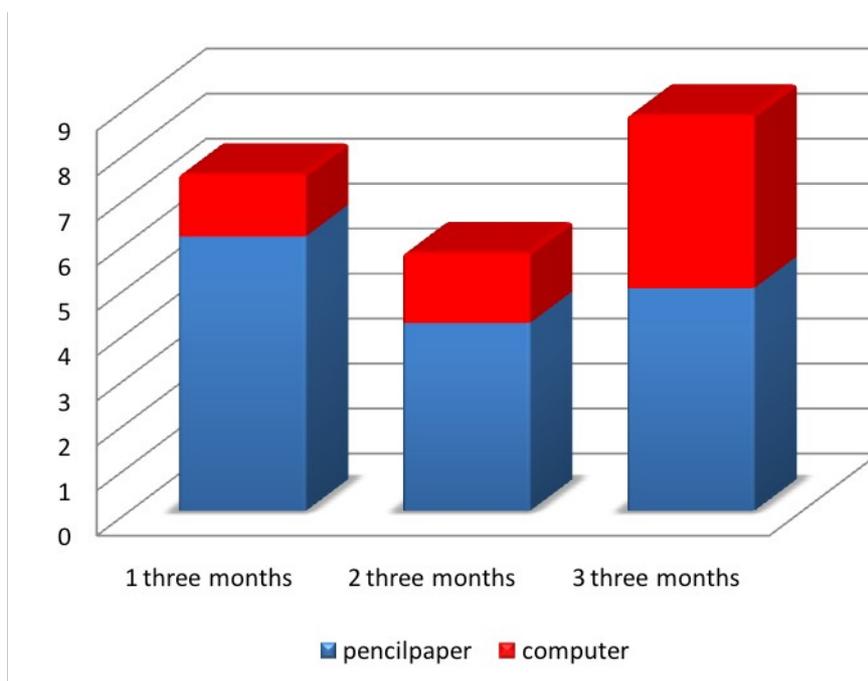
**Figure 4: N° of words per text on average - children who use the laptop for writing since the third grade.**

Instead, there is no a statistical relationship between the use of a word processor with orthographic corrector and the number of non-standard words in their text. The observation suggested that children (and probably teachers) did not know how it works.

In handwriting, punctuation helps authors to structure and hierarchically organize their texts on the predefined space on paper. It is interesting to notice that, writing with laptops, children (especially children who use the laptop for writing since the first grade, Figure 3) used, on average, a consistently lower number of punctuation marks per sentences.

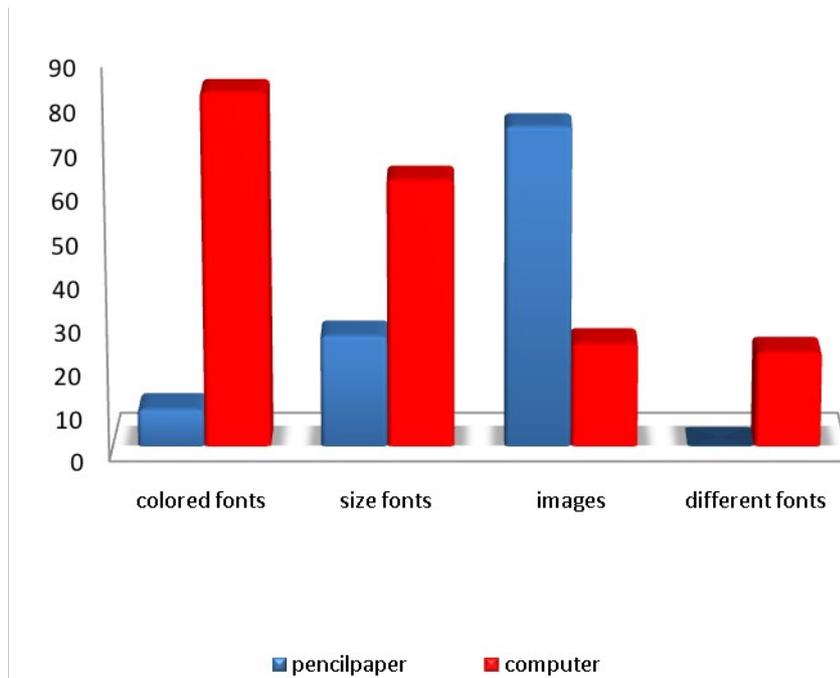


**Figure 5: N° of punctuation marks per text on average - children who use the laptop for writing since the first grade**

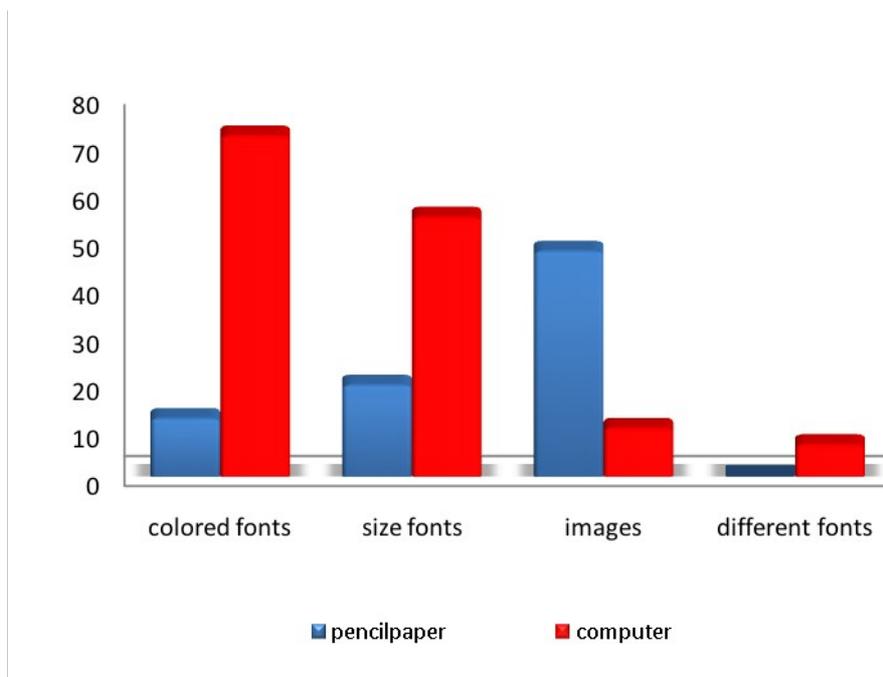


**Figure 6: N° of punctuation marks per text on average - children who use the laptop for writing since the third grade**

In addition, the results show a difference in the number of graphic elements on average per text between handwritten and digital texts that is statistically significant. Write with the laptop seems to empower children's use of colors and graphic elements to enrich their works (Figure 4,5). Our data are aligned with the hypothesis of a remediation of the traditional text into a new type of text in which iconic, alphabetic and audio-visual elements converged.



**Figure 7: N° of graphical elements per text on average - children who use the laptop for writing since the first grade.**



**Figure 8: N° of Graphical elements per text on average - children who use the laptop for writing since the third grade.**

## **4.2 collaborative writing**

Collaborative writing was experimented with paper-based and computer-based tests. The hypothesis was that children, both in paper-based and computer writing, can benefit when they brainstorm, draft, revise, edit, and share their writing with classmates in teacher-created collaborative writing groups. The results show that there are no relevant differences in quantity of written words between individual or collaborative handwritten texts by both group of children and between individual or collaborative computer-written text by children who use the laptop for writing since the third grade. On the contrary, we observe a difference that is statistically significant ( $p$ -value  $<0,05$ ) between number of words; quantity of sentences per texts; words per sentences; marks of punctuation per text, in individual or collaborative computer-written texts by children who use the laptop since the first grade.

Children collaborative writing, even if it does not have an univocal effect, seem to impact more on the quality of texts. When produced in 1:4 groups, texts include more connective elements ( the 10% more, on average for children who use the laptop for writing since the first grade; the 3% more, on average, for children who use the laptop for writing since the third grade), that it could be the result of a necessary effort of pre-negotiation of meanings with peers. What is more, the collaborative writing, especially with the laptop, empowers the use of graphical elements, but only if at least one child per group was already keen on editing, drawing and adding digital images to texts. If anyone was, they always seem to prefer focusing on conversation and do not care about colors, shapes or adding images to text.

## **5 Preliminary conclusions and future objectives**

This research agrees overall with the study New Millennium Learners [11] which shows that ICTs have had a positive impact on children's academic performance. The data collected show that ICTs have had a positive impact on children's writing performance. Writing with the laptop improve the quality of texts, the spatial organization and the visual pattern of children's texts. However, the positive effect of laptop use on children's writing strictly depends on the frequency of use and the teacher tutoring. The research outcomes show that writing with laptop improve children's motivation to literacy. Overall, the use of the digital media in class, for children who are little stimulated by the parental and social context, brings powerful motivation to the learning and the practice of writing.

However, the basic assumption underlying our research approach is that it is not the quantity of technology available at school that makes the difference, but the degree to which it relates to the fields of experience already explored by the children and the extent to which it is used to encourage active and creative learning on their part.

Future objectives are to deepen the two-way relationship among literacy, digital competence and digital literacy; to explore the relationship between digital competence and literacy in the hypertextual scenery; to provide teachers a concrete model as to how the digital media and collaborative online activities may be consciously and effectively integrated into teaching programs.

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