Blog and complex thinking: A case study[*]

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Abstract: The access to a vast array of resources is facilitated by the Internet, which, in its turn, does not promote learning by itself as children and young people often use it passively. As a consequence, the teachers' role is regarded essential so that they are helped to interpret and analyze available information critically. Nowadays, when referring to the web and its importance in the teaching and learning process, people no longer think of read-only contents, but in the supporting infrastructure which allows to create and share contents and a space for collaboration, discussion and ideas associated to the concept Web 2.0. The blog, as a means to deploy the concept "on-line interaction" is, according to Granieri, "The most accessible and natural tool for sharing and publishing, in addition to text, images movies and also sound, will be increasingly disseminated, because of increasing speed of data transmission" (2006, p. 31). It is therefore natural that the use of the blog is more and more frequent as a resource, pedagogical strategy or other capacities at all levels of teaching (Gomes, 2005). Taking advantage of the blog educationally is a recurrent approach in Portugal in recent years. Some work in this area is being closely supervised. The method takes into account the complex thinking model (Jonassen, 1996), more or less explicitly, and is carried out by children and young people in elementary schools. In this paper, a case study is presented based on some blogs, focusing on: the methodology for collection of text and multimedia materials; treatment and analysis of data with the NVivo software; findings and further evolution perspectives.

Key words: blog; complex thinking; NVivo

1. Introduction

> The new technologies have an active and co-structuring role in the models of learning and of knowledge.
>
> (Assmann, 2005)

Nowadays, children and the youth live in a perfectly natural way along with the multiple technologies, using them to communicate, research, share, create and, of course, to learn. Today, digital games, virtual worlds, social software Web 2.0 such as blogs, as well as a myriad of software and educational sites are the realities with which this generation of digital natives (Prensky, 2001) interact in a more informal learning context rather than in school. This intense interaction of children and young people with technologies reflects itself in the way they think and learn, making the teachers' task that helps them use these resources critically, since their spontaneous tendency is to receive both information and contents passively. This reality accentuates the need of a child, from an early stage, to develop reflexive and critical skills in order to learn how to build knowledge.

The integrated model of thinking, proposed by Jonassen (1996) presents a model of complex thinking which integrates basic, critical and creative thinking. This model, explicitly or not, underlies some of the educational

blogs intended for children and young people in basic education, which the author is currently following, namely in the contexts of teaching and supervision of initial and post-graduate student teaching.

In this paper, the author presents an exploratory study based on a number of these blogs. It is an investigative work focussing on a new educational blog analysis angle. Subsequently, due to the easy access to blogs, its public nature and the importance of this matter, the author will continue the study expanding the sample to a broader cluster of blogs and deepening the analysis pertaining both to the quantity of categories and to the inter-relations among them.

2. Study object

Exploratory analysis of blogs is in the light of the integrated model of thinking, presented by Jonassen (1996). The goal is getting acquainted with the phenomenon, assessing its relevance and finding a focus for further research (YIN, 2003).

3. Theoretical guidelines

3.1 ICT (information and communication technologies) in education: The case of the blog

According to Assmann (2005, p. 19), "The information and communication technologies have become a constituent element of our ways of seeing and organizing the world". Frequently, technologies are perceived as a simple means of accessing information and rendering the subject inactive in its reception. Now, if we need information to acquire knowledge and the latter to achieve wisdom (Goldsborough, 2000), technologies must be employed "as the instrument to learning and the collaborative construction of knowledge" (Dias, 2003). The technologies "facilitate the entrance to an enormous and diverse set of resources, but do not directly encourage learning" (Hill & Hannafin, 1997, p. 37) that demands an effort of personal creation.

The author shares the opinion of Carioca, et al., when pertaining to the use of information and communication technologies at school, they claimed that the students "need to develop an approach and a critical conscience concerning the information and communication technologies, seeing as the technology can be used and overused in several aspects" (Carioca, et al., 2005, p. 12). In this context, the role of the teachers and childcare workers is foregrounded so as to help students use these resources critically, since their spontaneous tendency is to receive both information and contents passively.

The blog, as a means of deploying the concept of "on-line interaction" is, according to Granieri (2006, p. 31), "The most accessible and natural of the tools meant to the sharing and publication aside from text, images, films and sounds, that progressively, with the increase in the speed of data transmission, will spread growingly". This means, complimentarily amongst the diverse communication formats, based on the Web 2.0 applications, allows a greater effectiveness in the creation and diffusion of the message. It is therefore natural that the use of the blog is a more frequent resource, as a pedagogical strategy or in other competences in all levels of teaching (Gomes, 2005). Pombo (2007), considering the viewpoints of several authors, found that the use of the blog allows "the development of innovative and transforming activities ... (and develops) in the students the ability of making decisions and defining personal and group objectives, the sense of belonging and responsibility, originality, creativity, communication and socialization, construction of knowledge and their own identity" (p. 3).

Efimova and Fiedler (2004, p. 493) called attention to the fact that one of the most interesting characteristics of learning in a blog is the "support for the development of meta-learning skills. The externalization of inner

conversations and reflective thinking makes this content available for review and development, thus encouraging and amplifying the acquisition of better skills for self-observation and intentional change".

Consequently, the public exposure is inherent to the fact that we are dealing with an on-line resource, which increases the responsibility and the effort to improve students' productions in terms of expansion, deepening, reformulation and even creation of new topics. The comments and the answers to many proposed challenges allow the development of different forms of cognitive skills.

Since the ultimate goal of education is preparing students to be lifelong learners and competent citizens, able to control technology and survive in a technological world, it is up to the school to create learning environments that encourage the development of high-level thinking skills, amid the reflexive, critical and creative thinking.

3.2 From basic to critical and creative thinking: The integrated model of thinking

The integrated model of thinking defines complex thinking as an "interactive system, not a collection of separate skills" (Jonassen, 1996, p. 27). It is, accordingly, a continuous process of articulation and inter-dependence of three basic components: content/basic thinking, critical thinking and creative thinking skills.

Content/basic thinking refers to the fundamental knowledge, "skills, attitudes and dispositions required to learn accepted information such as basic academic content, general knowledge and common sense, and to recall this information after it has been learned" (Jonassen, 1996, pp. 28-29). It includes, therefore, the process of learning and of retrieving what has been learned. Critical thinking, associated to the capacity of reorganizing ideas and knowledge "involves the dynamic reorganization of knowledge in meaningful and usable ways … it involves three general skills: evaluating, analysing and connecting" (Jonassen, 1996, p. 29). Creative thinking, linked to the ability of generating new knowledge, "requires going beyond accepted knowledge to generate new knowledge. The major components of creative thinking are the ability to synthesize, imagine and elaborate" (Jonassen, 1996, p. 30).

During the fulfilment of activities, the students engage in a continuous process of complex thinking in which they combine the three types of thinking mentioned before. In the case of blogs, the presented activities do not always reveal those three types of thinking, which does not mean that they did not occur during the work performed in class.

4. Methodology

4.1 Data collection

In line with Strauss and Corbin (1997), a researcher has to choose a group where he/she can find evidence of the phenomena he/she intends to study. Thus, as this is an exploratory study, the author has selected seven educational blogs, integrated in the curricular work of the class, which were intended for children and young people in pre-school and elementary education, who the author is currently following in the contexts of teaching and supervision of initial and post-graduate student teaching.

It was, therefore, a theoretical sampling which sought not the representation of the sample, but the representation of concepts (Strauss & Corbin, 1997). The author chose blogs in operation for more than a school year and relative to different teaching levels. The first blog to be indicated is for pre-school/kindergarten (3-5 years), the last is for junior high school (12-15 years) and all the others for elementary school (6-9 years). After the URL (uniform resource locator) of each blog, the name of the teacher/administrator is given:

(1) Ádila Faria: http://dajaneladomeujardim.blog.com;

(2) Escola de Ferreiros: http://www.osferreiritas.blogspot.com;

(3) José Dias: http://eirinha-turmae.blogspot.com;

(4) Helena Vilas-Boas: http://magnificos06.wordpress.com;

(5) Helena Daniela Freitas: http://novaeralusitana.blogs.sapo.pt;

(6) Escola do Fujacal: http://oaprendizfujacal.blogspot.com;

(7) Paulo Faria: http://paulofaria.wordpress.com.

All blogs present other communication formats aside from writing: text and image; text and sound; text, sound and image; slideshow and video. They are, hence, multimedia data that can be cropped in NVivo, some as documents, others as externals.

4.2 Data analysis

Following these blogs allowed the author to obtain a holistic vision of the data and to be aware of the large number of categories and the possible connections between them. It was due to this vicinity and familiarity with the data, that the author started to relate them to the integrated model of thinking by Jonassen (1996). Jonassen identified a set of descriptors that allow accomplishing the function of the basic, critical and creative thinking.

Initially, the previous structuring of the categories of analysis based upon those descriptors appeared to be a benefit for the analysis and therefore, the author created such a structure. However, in the early steps of the process, the author deemed this structure an impediment, almost mechanizing the analysis procedures, when what interested the author most was exploring the issues and understanding the phenomena.

As a result, the author decided to alter the strategy of the analysis. The author acknowledged that Jonassen's model was ultimately a strong influence, mainly in the final stage of the analysis process, as noticeable in the findings of this study.

The author opted for the typical grounded theory techniques that the author normally used in the analysis of qualitative data. Glaser and Strauss (1967), creators of the grounded theory, and later, Strauss and Corbin (1997, pp. 57-58), considered that, "The analysis is composed by three types of codes: open coding, axial coding and selective coding ... the separation between each type of coding is artificial ... (it) doesn't necessarily happen in stages. In one session of coding the researcher may need to move from one to the other". In fact, this happened in the author's analysis.

According to the above-mentioned researches, the first and most important moment when performing an analysis is the developing of an open coding as extensive and wide as possible. It involves segmenting, examining, comparing and conceptualizing data through a constant comparative method (Strauss & Corbin, 1997). Concepts "are the basic units the researcher works with" (Strauss & Corbin, 1997, p. 63). Conceptualization of data means no more raw and descriptive data: Concepts are identified and attributed a conceptual label, the code. That code will be used to label similar incidents so that it is also the first step into data reduction. The intention of giving precision and specificity to the concepts creates an increasing number of codes at an initial phase. Concepts are then grouped into conceptual categories, a process called categorizing, which is one more step in data reduction. It is a process of de-contextualization of data: Fragments of text are taken from their natural context and transferred to a conceptual context, the categories. The original data were not changed and with NVivo that it is possible to have an easy and fast access to the original context of a segment coded under any category.

In this stage, many emerging categories were identified. The axial coding consists of a set of proceedings that aim at restructuring the data coded through the open coding. The categories are "analyzed by their specific characteristics and then reorganized according to the connections between them" (Strauss & Corbin, 1997, p. 97).

This examining of the specific characteristics of a category, now under the perspective of an axe, as well as the construction of a network of conceptual connections with other categories, has led the author to the identification of some of the main categories and the subcategories around them. Strauss and Corbin (1997, p. 98) stressed that, "Even though open and axial coding are distinct analyses procedures, during the analyses the investigator alternates between them".

Axial coding function is used to develop the categories and the articulation among them. While open coding is above all intuitive and emerging, axial coding is intentional and more complex. The technique of constant comparison is still used, but in a more focused way, examining one category at a time and trying to find out how other categories and subcategories related to one another. At this stage of the analysis, the author frequently used Jonassen's (1996) descriptors for the basic, critical and creative thinking departing from them, and also from Bloom's revised taxonomy of the cognitive domain (Anderson & Krathwohl, 2001) in order to name concepts/categories of analysis for the various activities presented in each blog.

The most abstract, integrated and complex stage of the analysis is the last one: selective coding (Strauss & Corbin, 1997). Selective coding happens when the analysis circumscribes coding only to central categories. In this final stage, a "story line" is constructed, supported by a central category, which must be easy to find as it reflects what is more important to the participants, and by the connections between it and the other more relevant categories of the study.

The implementation of these conceptual procedures was through NVivo, a "software designed to assist management and analysis of qualitative data .… It can be used to explore trends, build and test theories, and manage, code, interpret, and analyze qualitative data by eliminating the need for many of the manual tasks traditionally associated with qualitative analysis" (Sorensen, 2008, p. 106). In NVivo, firstly, the author categorised the entire corpus through the open coding process; afterwards, via the queries and using special Boolean and contextual operators, the author proceeded to the axial and selective coding. The findings presented next are the outcome of this analysis process.

5. Findings

Jonassen's (1996) integrated model of thinking explains the mental processes which occur in a continuum and articulated way in the construction of knowledge. In this context, to think in a complex form consists in relating and activating in an interdependent way and basic, critic and creative skills. It is therefore an interactive system, not a collection of separate skills.

There are presented separately for the sake of analysis, but the author assumes that underlying critical and creative thinking are always basic skills, the first moment in the process of development of a higher order level of skills.

Even if this study is centred in cognitive competence, the author shall refer briefly the socio-affective competences and the role of the teacher/administrator of the blog.

Considering: (1) the required size of the paper format; (2) the fact that often short extracts do not illustrate adequately the respective category, requiring access to its context; and (3) much of the information in the blogs is in multimedia format, the author shall present the links connecting to the examples which is another advantage of the digital.

5.1 Basic thinking

Basic thinking is thought process which students use to acquire or retrieve from memory previously acquired knowledge. This elementary content thought process represents the competences, attitudes and conditions required for the reception of basic information of contents using this information after it was comprehended.

Identifying and describing links are:

(1) http://osferreiritas.blogspot.com/2009/01/maior-flor-do-mundo-de-jos-saramago.html;

(2) http://magnificos06.wordpress.com/2008/05/;

(3) http://oaprendizfujacal.blogspot.com/2008_06_01_archive.html;

(4) http://dajaneladomeujardim.blog.com/1690539/#cmts.

Sometimes it is the teacher himself/herself who asks explicitly for this type of task.

Remembering, recognising, recalling and reproducing information links are:

(1) http://novaeralusitana.blogs.sapo.pt/tag/distritos;

(2) http://osferreiritas.blogspot.com/2008/11/o-infante-d-henrique_10.html;

(3) http://eirinha-turmae.blogspot.com/ (O Passeio escolar).

Understanding, exemplifying and summarising links are:

(1) http://oaprendizfujacal.blogspot.com/2008/06/os-direitos-das-crianas.html;

(2) http://magnificos06.wordpress.com/2008/02/;

(3) http://oaprendizfujacal.blogspot.com/2008/06/entrevistas-para-conhecer-melhor-o.html.

Applying links are:

(1) http://osferreiritas.blogspot.com/2008/03/o-nosso-p-de-feijo.html;

(2) http://magnificos06.wordpress.com/2006/09/27/;

(3) http://dajaneladomeujardim.blog.com/1785066/;

(4) http://oaprendizfujacal.blogspot.com/2008_05_01_archive.html.

As it can be seen in these examples, almost all the posts blogs of a class refer to the acquisition and application of information, often fragmented, relating to contents from various curricular areas. This work has an educational value because writing about the contents is one more opportunity for students to practice writing, which, in turn, favours comprehension and cognitive development, since writing reaches a more general level of the mental processes (Sablé & Bouyssou, 1995).

Even if writing is predominant, except in the kindergarten blog, the information and/or representation of ideas is often presented in multimedia format (image, sound, slideshow and video), developing digital literacy which is more necessary each day. This articulation of different means and strategies to apprehend contents which the blog provides very easily is an interesting form not only of helping pupils to understand better the contents studied but also of developing higher order thinking skills.

In fact, the complementary quality of text, sound and image in the creation of a non-linear work requires a variety of skills: analysis and definition of criteria for the use of each of the means and their interconnection. Therefore, what may appear as traditional learning, after all, in constant interaction with critical and creative thinking, depending only on the pedagogical intentionality of teachers.

5.2 Critical thinking

Critical thinking is a higher order rational and reflexive thinking. It is manifest when pupils become involved in the dynamic reorganisation of knowledge, giving its meaning. This reorganisation is carried out based on the analysis, evaluation and in the connection between acquired knowledge and other pupils already possessed.

Many creative thinking skills are closely tied to critical thinking skills, so under this topic we can also find elaborating e-synthesizing for instance, which Jonassen (1996) included in creative skills.

Analyzing links are:

(1) http://magnificos06.wordpress.com/2007/05/24/leitura-e-livros/;

(2) http://osferreiritas.blogspot.com/2008/02/todos-crescemos.html.

Monitoring link is: http://paulofaria.wordpress.com/category/teste/ (preparação para o teste).

All the interventions of the teacher/administrator of the blog http://paulofaria.wordpress.com in individual blogs of students.

Expanding and elaborating links are:

(1) http://paulofaria.wordpress.com/category/teste/ (preparação para o teste);

(2) http://ritaduarte.blog.pt/4514625/#cmts;

(3) http://paulofaria.wordpress.com/2009/01/07/batalha-de-aljubarrota/#comments.

Connecting link is: http://osferreiritas.blogspot.com/2009_01_01_archive.html.

Semantic map, less cognitively demanding the cognitive map, helps students to remember and activate prior knowledge by establishing relationships between them and between words:

(1) http://dajaneladomeujardim.blog.com/1694799/#cmts;

(2) http://www.vuvox.com/presentations/0c62aedb9;

(3) http://paulofaria.wordpress.com/2008/12/07/o-velho-e-o-mar-ernest-hemingway/#comments.

Synthesizing links are:

(1) http://magnificos06.wordpress.com/2008/05/21/laboratorios-ciencia-e-tecnologia/;

(2) http://osferreiritas.blogspot.com/2008/11/palestra-com-o-sr-lopes-bancrio.html;

(3) http://paulofaria.wordpress.com/2008/11/02/entrevista-a-valter-hugo-mae/.

Evaluating links are:

(1) http://paulofaria.wordpress.com/2007/06/14/avaliacao-final/;

(2) http://paulofaria.wordpress.com/2007/06/15/o-blogue-que-nos-faz-pensar/;

(3) http://paulofaria.wordpress.com/2007/11/26/esta-ai-o-natal/;

(4) http://paulofaria.wordpress.com/2008/12/16/votacao-no-melhor-blogue/#comments;

(5) http://paulofaria.wordpress.com/2008/03/06/o-reconhecimento-do-vosso-trabalho/#comments.

5.3 Creative thinking

Creative thinking occurs when tasks stimulate the imagination, generating new knowledge. As the author mentioned before, creative skills are complementary aspects of critical thinking, so they are interrelated.

The links of thinking analogically are:

(1) http://novaeralusitana.blogs.sapo.pt/8861.html;

(2) http://novaeralusitana.blogs.sapo.pt/tag/imagina%C3%A7%C3%A3o;

(3) http://magnificos06.wordpress.com/page/17/ Eu sou.

The links of producing original ideas or new products are:

(1) http://dajaneladomeujardim.blog.com/1757660/#cmts;

(2) http://dajaneladomeujardim.blog.com/1785066/#cmts;

(3) http://magnificos06.wordpress.com/2007/02/ O Monstro;

(4) http://novaeralusitana.blogs.sapo.pt/2007/11/;

(5) http://dajaneladomeujardim.blog.com/Histórias/;

(6) http://dajaneladomeujardim.blog.com/Escrita%20Criativa/;

(7) http://paulofaria.wordpress.com/2007/03/21/proposta/;

(8) http://eirinha-turmae.blogspot.com/2008/05/nossa-amiga-professora.html;

(9) http://magnificos06.wordpress.com/2008/02/14/cartas-de-amor-ilustradas/;

(10) http://luisacmfreixo.blog.pt/4075156/#cmts.

5.4 From basic to critical and creative thinking

Elementary knowledge contents are in constant interaction with critical thinking as they constitute the basis from which they operate. In blogs, both the comments, intentional or not, and the explicit action of the teacher/blog administrator promote these processes.

In these examples, comments could lead pupils in the first case to expand, elaborate and relate knowledge, reflect and argue and propose original and reasoned alternatives. It has been agreed that teachers do not always have the opportunity to answer these challenges or even have the time to load all the information on the blog, which does not mean that the issues were not explored in the classroom context, as the author is aware that it often is the case:

(1) http://oaprendizfujacal.blogspot.com/2008_04_01_archive.html;

(2) https://www.blogger.com/comment.g?blogID=6179797685888543441&postID=4623706217699800548;

(3) http://eirinha-turmae.blogspot.com/2008/05/arca-das-trapalhadas.html;

(4) http://historiasdojoao.blog.com/4081250/#cmts.

There are some cases, as the author shall explain next, where the reactions to the stimuli are presented in comments, making in this way visible that from basic thinking, how pupils evolved to critical and creative thinking:

(1) http://dajaneladomeujardim.blog.com/1597311/#cmts;

(2) http://dajaneladomeujardim.blog.com/1531847/#cmts;

(3) http://joaofernandes.blog.pt/4308058/#cmts;

(4) http://paulofaria.wordpress.com/2009/01/07/batalha-de-aljubarrota/#comments.

5.5 Complex thinking: An example

A case will be presented by the author to illustrates the development of the skills that integrated complex thinking, even if the predominant remains critical thinking as an antidote to reproductive, lower-order learning: "Reproductive learning leaves students with fragments of information that are not well connected or integrated" (Jonassen, 1996, p. 24). The author refers to the maps of concepts and graphical representations of knowledge through the concepts and the relations between them. This work shows not only the knowledge of the pupils but also the ways in which each one organises such knowledge. Each pupil's map reflects their individual conceptual understanding of the same subject, therefore, all will be different and none can be seen as "wrong":

(1) http://pedrodfr.wordpress.com/2008/11/25/136/;

(2) http://andreiasofias7.blogs.sapo.pt/13806.html;

(3) http://andreiasofias7.blogs.sapo.pt/13806.html?thread=7406;

(4) http://saracrisf.blogs.sapo.pt/27897.html;

(5) http://www.scribd.com/doc/8416227/Consilio-dos-Deuses.

The creation of a conceptual map is hard work: When doing this work, the pupil is working on his/her own cognitive structure, learning to learn, so he/she has to know the contents, organize and articulate ideas and express them visually. To produce these conceptual maps, pupils have to know and explain similarities, differences,

relations between relative concepts, in this case the epic poem *The Lusiads*. They also had to learn how to use the technology to create maps of concepts.

In this work, pupils were involved in a continuous process of complex thinking, which starting from basic thinking required critical thinking and simultaneously stimulated creative thinking, providing a truly integrative learning situation (Ausubel, 2003).

Pupils need to develop critical and creative thinking since these thinking abilities are necessary to move their learning "beyond memorization or passive acceptance, to understanding and the commitment to persevere until clarity and insight are achieved" (n. a., n. d.).

The role of the teachers in helping improve students' critical and creative thinking abilities is essential.

5.6 The role of the teacher/administrator

Discussion of the teachers' role in fostering critical and creative thinking must begin with a recognition of the teacher as a person whose unique character, interests and desires can not be separated out from the idea of the teachers' role. Good teachers are doing more when they teach than acting according to prescribed roles. Their desire to nurture a love for learning, help students recognize and act upon their capabilities, and establish a classroom climate which is based upon mutual regard and respect that makes their teaching purpose and meaning beyond any technical description of the teachers' role. What is required is that teachers should be authentic individuals who are striving to improve their practice through the use of critical and creative thinking. Acting upon their believes in the importance of critical and creative reflection, teachers would attempt to.

In this point, the author shall select two blogs where the proposals and challenges of teachers/administrators lead towards the development of high order level skills. In the first blog, this intention is visible in the explanation of the educational interest of the activities the children develop as part of the curricular guidelines for kindergarten, both in the posts as in the replies to the comments:

(1) http://dajaneladomeujardim.blog.com/Escrita%20Criativa/;

(2) http://dajaneladomeujardim.blog.com/Experiências/;

(3) http://dajaneladomeujardim.blog.com/1638410/#cmts;

(4) http://jicheleiros1.no.sapo.pt/videoconf.html;

(5) http://dajaneladomeujardim.blog.com/Pais/;

(6) http://paulofaria.wordpress.com/.

The second blog is intentionally oriented towards the development of critical thinking as the author explicitly refers when talking about the activities (http://recursoseb1.com/milp/?p=135).

This is a blog by a Portuguese language teacher where there are links to the individual pupils' blogs. The teacher, in articulation with the work performed in the classroom, loads on his blog the proposed activities. Pupils' replies are mainly presented in their own blogs. The teacher comments these works by the pupils, evaluates them, proposes and follows the alterations requested. The pupils comment and help each other. The intellectual, social and affective involvement of all those intervening in these interactions is quite visible, both in pupils and the teacher.

5.7 Socio-emotional skills

The interaction and sharing attitude is established between pupils, teacher, family and the community suggests that the socio-emotional dimension is important for the learning process. It is realized, mainly in the blog http://paulofaria.wordpress.com/, that pupils, when sharing doubts and knowledge, assume the responsibility of their learning and that of their peers as they answer to their doubts, suggest other study resources, look for

information that they will share later. It can witness, therefore, a great investment in collective work.

(1) http://paulofaria.wordpress.com/2009/01/30/preparacao-para-o-teste/;

(2) http://paulofaria.wordpress.com/2008/11/29/teste-de-lingua-portuguesa-ii/.

Public exhibition of work may include errors which indicate that pupils feel confident when having done their best; they will share it and be prepared to receive criticism and suggestions. Often they ask for help in specific aspects. They agree to correct their work several times, after suggestions from the teacher, peers and other commentators, revealing persistence and a determination to improve. This collaborative and comfortable environment and the constant support by the teacher/administrator interfere in a positive way in the learning process. However, important the technologies may be, it is the author's conviction that "at the core of pedagogical quality lie the human interactions, among which it grows and develops. In the context of ICT as in any other, it will be found in the teacher-pupils interaction … supporting, stimulating and challenging them to learn using ICT" (Efimova & Fiedler, 2004, p. 12).

6. Conclusions and further evolution perspectives

These findings can be concluded that: (1) The users' spontaneous interventions show characteristics of basic thinking; (2) Evidence of critical thinking can be found in two contexts: as reaction to a direct challenge, proposed as a comment by a visitor; or as an answer to the tasks oriented to this type of thinking proposed by the teacher; (3) Creative thinking is rare and appears almost always as a reply to the moderator's incentive or that of an attentive specialised user; (4) The role of the blog administrator/teacher is paramount in the development of critical and creative thinking in the context of blog on-line interaction.

Therefore as this is an exploratory study, the author will present the following guidelines for further research:

(1) Analysing other educational blogs in the light of Jonassen's model;

(2) Studying strategies by using the comment model in order to propose activities oriented towards the development of critical thinking;

(3) Analysing the two blogs (http://dajaneladomeujardim.blog.com and its sequel in http://janelajardim. ning.com and http://paulofaria.wordpress.com/) where the presence of both critical and creative thinking is evident in the light of the conceptual model for on-line learning (Garrison, Anderson & Archer, 2000) whose core elements are cognitive presence, social presence and teaching presence. The socio-emotional skills as the role of the teacher/administrator may be fundamental to the development of the high order level thinking which characterizes complex thinking;

(4) Studying the adaptation of the Garrison, Anderson and Archer's model to the wider field of on-line evaluation. According to Pessoa (2009), "The concept of evaluation requires valuating the methods and the activities which allow the learner to rescue his learning capacity, improve it and integrate it in the contemporary digital society and/or social web".

References:

Anderson, L. W. & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Addison Wesley.

Assmann, H. (2005). *Digital networks and metamorphoses of learning*. Petrópolis: Vozes Editora.

Ausubel, D. P. (2003). *Acquisition and knowledge retention: A cognitive perspective*. Lisboa: Plátano Edições Técnicas.

Carioca, et al. (2005). *ICT in early childhood: Handbook for trainers*. Badajoz: Kinderet Publication.

Dias, P. (2003). *Networks and distributed learning communities*. Retrieved September, 2007, from http://www.cceseb.ipbeja.pt/evolutic2003/cp_1.htm.

Efimova, L. & Fiedler, S. (2004). Learning webs: Learning in weblog networks. In: Kommers, P., Isaias, P. & Nunes, M. B. (Eds.). Proceedings of the *IADIS International Conference Web Based Communities*. Lisboa, Portugal: IADIS Press, 490-494.

Garrison, R., Anderson, T. & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2-3), 87-105.

Glaser, B. & Strauss, A. (1967). *The discovery of grounded theory*. Chicago, IL: Aldine Publishing.

Goldsborough, R. (2000). You have got e-mail. *Reading Today, 17*(5), 11.

Gomes, M. J. (2005). Blogs: A pedagogical tool and a teaching strategy. In: *International Educational Technology Symposium Proceedings*. Portugal: Leiria, 311-315.

Granieri, G. (2006). *Blog generation*. Lisboa: Presença.

Hill, J. R. & Hannafin, M. J. (1997). Cognitive strategies and learning from the World Wide Web. *Educational Technology Research and Development*, *45*(4), 37-64.

Jonassen, D. H. (1996). *Computers in the classroom-mind tools for critical thinking*. Hillsdale, NJ: Prentice Hall.

Pessoa, T. (2009). *Presentation of the panel "on-line evaluation"*. Retrieved January, 2009, from http://challenges.nonio.uminho.pt/pages/temas.html#.

Pombo, T. S. (2007). Weblogs in education: An experience in the teaching and learning of Portuguese and ICT. In: Brito, C., Torres, J. & Duarte, J. (Eds.). *Proceedings of Weblogs in education: Three experiments, tree testimonials*. Setúbal, 55-74.

Prensky, M. (2001). *Digital natives, digital immigrants*. Retrieved September, 2008, from http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf.

Sablé, P. A. & Bouyssou, G. (1995). *Learning thanks to word processor*. Toulouse: Albin Michel.

Sorensen, A. (2008). Use of QSR NVivo 7 qualitative analysis software for mixed methods research. *Journal of Mixed Methods Research, 2*(1), 106-110.

Strauss, A. & Corbin, J. (1997). *Grounded theory in practice*. Thousand Oaks, CA: Sage.

YIN, R. K. (2003). *Case study research, design and methods*. Newbury Park: Sage Publications.

(Edited by Nicole and Lily)