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**Using a blog to create and support a Community of Inquiry in Secondary Education**

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Abstract

Understanding how blogs can support collaborative learning is a vital concern for researchers and teachers. This paper explores how blogs may be used to support Secondary Education students’ collaborative interaction and how such an interaction process can promote the creation of a Community of Inquiry to enhance critical thinking and meaningful learning.

We designed, implemented and evaluated a science case-based project in which fifteen secondary students participated. Students worked in the science blogging project during 4 months. We asked students to be collaboratively engaged in purposeful critical discourse and reflection in their blogs in order to solve collectively science challenges and construct meaning about topics related to Astronomy and Space Sciences.

Through student comments posted in the blog, our findings showed that the blog environment afforded the construction of a Community of Inquiry and therefore the creation of an effective online collaborative learning community. In student blog comments, the three presences for collaborative learning took place: cognitive, social, and teaching presence. Moreover, our research found a positive correlation among the three presences –cognitive, social and teaching– of the Community of Inquiry model with the level of learning obtained by the students.

We discuss a series of issues that instructors should consider when blogs are incorporated into teaching and learning. We claim that embedded scaffolds to help students to argue and reason their comments in the blog are required to foster blog-supported collaborative learning.
Introduction

Collaboration is a central tenet of the Social Web. Social technologies have become key features of leisure and work places, and also are starting to have a key role in education. Web 2.0 technologies have opened up new possibilities for open learning (Cole, 2009; Moskaliuk, Kimmerle, & Crest, 2009). In a short time we have shifted from a static Web in which users had a passive role to a dynamic, collaborative and participatory Web in which users have an active role, creating and sharing knowledge in a global Web setting.

However, some researchers have highlighted the discrepancies between the learning practices implicit in Web 2.0 technologies and educational practices in current schooling (Lim, So, & Tan, 2010). Different authors have agreed that Web 2.0 classes need to emphasise a learning culture based on participation, collaboration, inquiry, creativity, dialog and knowledge creation (e.g. Lim et al., 2010; Mercer, Warwick, Kershner, & Kleine Staarman, 2010; Wegerif, 2007).

One main concern of educational researchers is how to support teachers and learners to move forward to an eLearning 2.0 paradigm, and provide the educational community with valuable knowledge about how Web learning activities should be designed in order to promote collaborative knowledge creation models and what competences students need to develop in order to be able to participate fully in collaborative knowledge creation activities.

Extending this line of argument, our paper explores how blogs may be used to support Secondary Education students’ collaborative interaction and how such an interaction process can promote the creation of a community of inquiry to enhance critical thinking and meaningful learning. Our paper falls under the trend of research of Computer-Supported Collaborative Learning (CSCL) and aims to foster a deeper understanding of the nature, theory and practice of a blog-supported collaborative learning in Secondary Education.
To this end, we designed, implemented and evaluated a science case project in which fifteen secondary students used a blog environment, with the specific aim of establishing and supporting a collaborative interaction, while engaging in collaborative writing tasks.

With our study, we hope to contribute to the discussion about the pedagogical parameters that need to be considered in the design of Web 2.0 supported collaborative learning environments in Secondary Education in order to support students to open wide and deep dialogue and inquiry spaces for thinking and learning together in the new global communication era.

Theoretical Framework

Collaborative Learning

From the socio-cultural theoretical perspective learning is conceptualized as knowledge construction through participation and negotiation, when language is used in context as a primary mediating tool (Vygotsky, 1978). A key theme in socio-cultural approaches to learning is to explore how social interaction in joint activities can mediate learning.

In this respect, Mercer and Littleton (2007: 25) argue that collaboration involves “a co-ordinated joint commitment to a shared goal, reciprocity, mutuality and the continual (re)negotiation of meaning.” In collaborative activities, it is crucial that the social interaction is focused on the ideas of the participants and that the participants are willing to share their ideas and change their minds. A key concept, related to this idea is intersubjectivity, which, according to Rommetveit (1992), is attained by reciprocal perspective setting and perspective taking. Linell (1998: 225) argues that, for collaborative projects to be successful and truly collaborative, all parties must be “mutually other-oriented”. In this respect, Leseman, Rollenberg, and Gebhardt (2000) used the concept of co-construction to illustrate the active
participation in a collaborative activity, marked by the semantically coherent relations between each participant’s contributions to the joint activity.

In collaborative activities, it thus seems crucial that the social interaction is focused on the ideas of the participants and that the participants are not only willing to share these ideas, but do so in a respectful and open-minded manner.

**Community of Inquiry as a perspective to enhance collaborative learning**

In the context of using Web 2.0 technologies to support collaborative constructivism, Garrison and Akyol (2009: 23) pointed out that collaborative learning through the use of Web 2.0 tools “goes beyond simple interaction in the sense that is clearly focused on a problem or dilemma where students are deeply engaged in purposeful discourse to construct meaning and collaboratively share meaning and validate understanding”.

To achieve deep learning in online collaborative learning environments, Garrison, Anderson, and Archer (2000) proposed the Community of Inquiry (CoI) model that provides a well-structured model and set of guidelines to create effective, collaborative learning communities in online learning environments. This model posits that three presences are required for collaborative learning to take place: cognitive, social, and teaching presence and the interaction of all three presences are required before meaningful learning can occur in an online environment (Garrison et al., 2000; Garrison & Akyol, 2009).

Cognitive presence is defined as sustained communication between members of a community that leads to meaning making. Four phases are included in the processes of meaning making in cognitive presence: triggering event, exploration, integration, and resolution. Cognitive presence has been founded as the core element necessary for higher learning (Kanuka & Garrison, 2004).
Social presence is defined as the ability of participants to connect within a community in a trusting and purposeful environment and to form personal relationships with other community members (Garrison & Akyol, 2009). Social presence is a key element for collaboration by supporting cognitive objectives through its ability to instigate, sustain and support critical thinking in a community of learners (Garrison & Anderson, 2003). There are three categories or indicators of social presence: affective expression, open communication, and group cohesion.

Teaching presence is defined as the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes (Anderson, Rourke, Garrison, & Archer, 2001). By using the term ‘teaching’ instead of ‘teacher’, this presence emphasizes the possibility of distributing the responsibilities and roles of a teacher among participants. Therefore, facilitating discourse is described as enabling and encouraging the construction of personal meaning as well as shaping and confirming mutual understanding. Direct instruction, does not refer to transmission and acquisition of knowledge but to the appropriate facilitation of discussion and reflection such as diagnosing misconceptions, injecting knowledge from diverse sources, or summarizing the discussion (Garrison & Anderson, 2003).

The intersection of all three presences, as components of the CoI framework, is necessary for learners to reach levels of critical thinking that lead to meaningful learning.

Our study aims to analyse the collaborative processes of students working together in an innovative blogging project in order to know how secondary students actively construct social, cognitive and teaching presence and if these presences lead to learning.
Blogs to support collaborative learning

A blog is a text-based online environment that allows for embedding links to other online resources. Stefanac (2007) characterized blogs as easy-to-update websites by dated entries displayed in reverse chronological order. They allow people with little technical knowledge to quickly publish their thoughts, opinions, and emotions online, and share their writings with their friends and families or, potentially, the entire Web population. As opposed to other Web-based publishing environments in which webpage content is updated by substituting old materials with the new ones, blogs preserve old posts, in addition to new entries. Viégas (2005) pointed out this permanent archive of the blog activity creates context for readers who can refer to earlier entries.

In the context of Higher Education, the exploration into the pedagogical benefits of blogs tends to focus on two areas: blogs as reflective devices and blogs as interactive devices (Deng & Yuen, 2009). There seem to be a number of particular affordances of blogs to support reflective learning. Xie and Sharma (2011), in a recent review of empirical research about the use of blogs in Higher Education to enhance learning, highlighted the following five affordances of blogs to support reflective learning: a) blogs allow students to externalize their reflective reasoning through writing; b) blogs can provide a mechanism for students to develop insights into assumptions and beliefs that render or impede their judgments; c) blogs can also prompt students to offer evidence, elaboration, justification, and critically evaluate solutions; d) blogs can engage students in active transactions among assumptions, motivations, and descriptions, and hence promote reflectivity, and e) blogs allow students to view the progress of their thoughts over time and can represent an individual’s growing knowledge base.

The other key strand of research on educational blogging focuses on its social values and its potential to foster interaction and collaborative learning. A distinctive property of the
blog environment to enhance social interaction is enabled through commenting and linking to other websites or blogs. Deng & Yuen (2011) pointed out that the interactive and linking mechanisms open the possibilities for connections and discussion and create a space for collaborative learning in which mutual peer support can be provided. Furthermore, blogs are socially reflective mediums that allow for interaction among bloggers and their audience.

Therefore, there are theoretical and some empirical evidences that show blogs are characterized by a variety of unique and powerful features to enhance deep collaborative learning. In this line of argument, Cameron and Anderson (2006) examined the advantages and disadvantages of blogs to create a CoI and they conclude that blogging has distinct advantages to enhance social, cognitive and teaching presence and therefore to trigger meaningful learning.

Although it is claimed that blogs may afford opportunities to support meaningful collaborative learning, there are still relatively few reports that show how this objective can be realised in educational settings. This is even more noticeable with Secondary Education students as most research using Web 2.0 technologies and blogs is conducted in Higher Education (Deng & Yuen, 2011; Xie & Sharma, 2011).
The research study

Purpose of the study

Our aim in this study is to examine the potential of the blog environment for supporting Secondary Education students’ development of the key learning components of a CoI that could lead critical thinking and meaningful learning. To this end, we designed, implemented, and evaluated a science case project in which fifteen secondary students used a blog environment, with the specific aim of establishing and supporting a collaborative interaction, while engaging in collaborative writing tasks.

For this purpose, we will answer the following four research questions:

1. Can the secondary students’ online social interaction in the blog environment be characterized in terms of cognitive, social, and teaching presence of the CoI framework developed by Garrison, Anderson, and Archer (2000)?
2. What characteristics does cognitive, social and teaching presence have in the blog environment?
3. Do the individual contributions reveal any emergent roles or individual profiles during the collaborative process in the blog environment?
4. Is there any relation between the individual profiles related with CoI presences and learning?

Method

A case-based study was designed in which fifteen secondary students in their 7th and 8th year and two instructors participated. The participants belonged to a public Secondary School situated in an urban area in Lleida, Spain, with mainly middle socio-economic status.

Students worked as a class in a science blogging project during 4 months. We asked the students to be collaboratively engaged in purposeful critical discourse and reflection in
their blogs in order to solve collectively science challenges and construct meaning about topics related to Astronomy and Space Sciences. For the purposes of this paper, we followed and analyzed in depth the work in the blog environment of the fifteen students who participated in our study.

**The blog project**

In the following, we expand the four main pedagogical features of the science blog project: (1) the blog design; (2) the science challenge activities to be solved in the blog; (3) the instructional blogging process, and (4) the scaffolds to support collaborative learning in the blog: sentence openers as embedded scaffolds.

**(1) Characteristics of the Blog designed in the science project**

The design of the blog of our project took into account technical and pedagogical considerations. A free WordPress version was installed in a university server. Three types of blogs were then created: the technical support blog, the teacher blog, and the student blog. The technical support blog was used to provide general information about how to use the blog, and also to solve student questions. The teacher blog was used by the teacher to propose the challenges that each student had to solve firstly on her/his own and also to give scaffolds to solve it. The student blog: each student had her/his own blog. All student blogs had the same design and were provided by our research group. All student blogs were linked and students could consult and post all classmates easily.

The three types of blogs (the technical support blog, the teacher blog, and the student blog) had the same structure and elements. Each blog had three main tabs: (a) Workspace (Initial default tab), in which students could write and post comments, (b) Instructions (What do I have to do?), and (c) Technical support (How do I use my blog?). Technical support tabs and instructions were only for consultation. Figure 1 presents a screenshot of the blog and the
instructional elements designed to support collaborative learning, in the clockwise direction and starting from the left:

Left → 1) sentence openers as scaffolds / ideas to start a kind of comment, 2) Table of comments recently, 3) File, 4) Search tab.

Top → 5) Picture header, title, and author of the blog and main tabs.

Right → 6) Blog administration table, 7) Blog link to technical support, 8) Link to blog master, 9) Links to classmate blogs.

Figure 1. Screenshot of the students’ blog designed in our study

(2) The science challenge activities to be solved in the blog

Each challenge activity was specifically designed in order to promote CoI and to enhance interaction and negotiation processes among peers. Besides, challenges could be
solved following different processes and there was not a unique solution; therefore, students could interact, discuss, argue and negotiate divergent viewpoints in solving the challenge (Table 1).

Table 1. Blog science challenge activities, scientific communication process and curricular content related

<table>
<thead>
<tr>
<th>Blog science challenge activity</th>
<th>Scientific Communication / Process</th>
<th>Curricular Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How would you design a space suit?</td>
<td>NONE (just blogging)</td>
<td>Space physic conditions and materials</td>
</tr>
<tr>
<td>2. Were there spacewomen?</td>
<td>Poster</td>
<td>History of spacewomen</td>
</tr>
<tr>
<td>3. How to weigh a spaceman in the ISS?</td>
<td>Methods / Experiment</td>
<td>Physics problems</td>
</tr>
<tr>
<td>4. How would you design a city on the moon?</td>
<td>NONE (just blogging)</td>
<td>Exobiology</td>
</tr>
<tr>
<td>5. Could you design an experiment to know the sun-earth distance?</td>
<td>Methods / Experiment</td>
<td>Experimentation</td>
</tr>
<tr>
<td>6. Could you explain the key astronomy elements?</td>
<td>Presentation</td>
<td>The Universe</td>
</tr>
</tbody>
</table>

(3) Instructional blogging process

The instructional process was composed by six different inquiry blog science activities. Initially, each activity was structured and phased as follows:

- **Phase 1. Individual resolution of the challenge** (one week). The teacher presents the challenge to be solved by the students in the teacher’s blog. The students read the challenge and the scaffolds provided by the teacher to better solve the problem. If there are no doubts about the task, students start to solve the problem by searching and selecting the information that comes from the Web. Once the information is selected, students build their individual proposal and upload it as a post in their own blog. Each
student also includes an explanation of the process followed to solve the science activity.

- **Phase 2. Collaboration among students: visiting and commenting on other blogs** (one week). Following the first proposal posted by each student, the collaborative process starts. Students have to explore their classmates’ blogs and comment on them in order to help their classmates to improve the challenge resolution. Thus, they can write comments to as many posts as they want. Students are encouraged to use the sentence openers proposed in order to make different kinds of comments that could help their classmates to improve their challenge resolution. In order to ensure that all students had comments, each student has assigned one classmate’s blog to visit and comment on. However, students are encouraged to comment on more than one blog. The instructors also write their comments during this phase to help students in their resolution process.

- **Phase 3. New versions and presentations** (one week). Taking into consideration all the community comments and also their classmates’ proposals, every student can improve their challenge resolution by adding a new post in his/her own blog. Selected students’ works are orally presented in the classroom and afterwards a class discussion is opened up, discussing how the science challenge was solved and also how the blogging community had helped in this resolution.

(4) **Scaffolds to support collaborative learning in the blog: sentences openers as embedded scaffolds**

Our innovative blog project utilised a “thinking together” approach (Mercer, 2000) to help students to develop an intersubjectivity orientation towards each other’s perspectives and to support the creation of a CoI in the blog environment. Sentence openers were provided as
scaffolds to support the writing and the argumentative process of commenting on classmate blogs. The set of sentence openers were available in each student blog and were clustered into five different categories: (1) giving information (e.g., *In my opinion...*; *For example...*); (ii) asking for someone else’s point of view (e.g., *What do you think about...*?; *Could you give an example of...*?); (iii) expressing disagreement (e.g., *I do not agree with...*; *because...*); (iv) giving reasons and summaries of the discussions (e.g., *To summarize...*; *We think...*; *So,...*), and (v) expressing agreement (e.g., *I agree with...*; *because...*). Figure 2 shows an example of a student blog, in which part of one activity and the comments posted on it can be seen (in the Catalan language); on the left side of the screenshot the sentence openers provided are highlighted.

Figure 2. Screenshot of a blog in which we highlight the scaffolds provided in the form of sentence openers to promote collaboration
Data collection

In this study, we collected the following two main sets of data: (1) the comments posted by each participant and logged into the server and (2) the blog science challenge activities performed by each student and also logged into the server.

Data analyses procedure

Table 2 gives an overview of the variables analyzed in our study, their description, measurement, and the instrument used for their data collection. In the following, we will describe the data analysis procedure of each set of variables: (1) comments posted, and (2) activities performed.
Table 2. Set of data, data collection instrument, description, measurement and variables analysed

<table>
<thead>
<tr>
<th>Set of data</th>
<th>Data collection instrument</th>
<th>Description</th>
<th>Measurement</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Comments posted</td>
<td>Blog system</td>
<td>Students posted comments on their colleagues’ blogs and on their own blogs</td>
<td>Each comment was assessed: - as a whole message, and - as a set of meaningful units</td>
<td>- Num. of comments posted - Num. of meaningful units of comments posted (cognitive, social, and teaching presence)</td>
</tr>
<tr>
<td>2. Activities performed</td>
<td>Blog system</td>
<td>Each student had to perform six blog-activities</td>
<td>Each activity performed was assessed by a rubric</td>
<td>- Individual learning score (absolute) - Individual learning score (relative)</td>
</tr>
</tbody>
</table>

(1) Comments posted

The first set of variables is related to the comments posted by the participants. Each comment was assessed in two ways: as a whole message and as a set of meaningful units. The coding process of the meaningful units consisted of two steps: (a) dividing the messages into meaningful units, and (b) assigning a code to each unit. Each meaningful unit was analysed in terms of cognitive, social, and teaching presence (Garrison, Anderson & Archer, 2000). Appendix 1 shows the coding scheme used to assess each meaningful unit.

Two raters familiar with the blog environment and the coding scheme coded 20% of the meaningful units and interrater reliability was calculated. The similarity between the two raters, expressed in Cohen’s Kappa was $k=.82$. Hence, the rest of the protocols were analysed by one rater.
Through this analysis, the following two variables were obtained: (i) the total number of comments, and (ii) the total number of meaningful units of comments posted and related to the different CoI presences (cognitive, social, and teaching presence).

(2) Quality of the science activities performed: individual learning score.

Each activity solved in the blog was assessed in terms of learning quality by a 4-point rubric composed by the following seven criteria: amount of information, quality of information (Hakkarainen, 2003), creativity, originality, use of symbolic code, problem-solving resolution level, and reporting of the problem-solving resolution. Appendix 2 shows the rubric used to assess the activities performed by students.

Two raters familiar with the activities and the rubric assessed 16% of the activities and interrater reliability was calculated. The similarity between the two raters, expressed in Cohen’s Kappa was $k=.96$. Hence, the rest of the protocols were analysed by one rater.

As a result of the assessment, an individual learning score was obtained in an absolute and relative manner.

In addition, the Pearson correlation coefficient was used to determine the relationship among the variables described above, with 95% and 99% confidence intervals.

**Results and discussion**

**Research question 1. Can the secondary students’ online social interaction in the blog environment be characterized in terms of cognitive, social, and teaching presence of the CoI framework developed by Garrison, Anderson, and Archer (2000)?**

Table 3 shows a description of the comments posted by the 15 students who participated in the blog environment collaborative process. We considered each comment posted by the students as a whole and we also segmented the comments into meaningful units.
We coded each meaningful unit as cognitive, social or teaching presence. As can be appreciated in the table, the collaborative learning that took place in the blog environment allowed the active construction of cognitive, social, and teaching presences. According to Garrison et al. (2000), the integration of the three presences is required for meaningful learning to take place in online environments. Thus, we can conclude that the secondary students who participated in our innovative blog environment constructed a CoI. From our perspective, the pedagogical use of the blog in our project enhances an appropriate online environment for meaningful learning.

Table 3. Description of comments posted (15 students)

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments posted</td>
<td>87</td>
<td>5.80</td>
<td>7.73</td>
</tr>
<tr>
<td>Meaningful units</td>
<td>480</td>
<td>32.00</td>
<td>52.75</td>
</tr>
<tr>
<td>-Cognitive Presence</td>
<td>130</td>
<td>8.67</td>
<td>14.06</td>
</tr>
<tr>
<td>-Social Presence</td>
<td>230</td>
<td>15.33</td>
<td>25.06</td>
</tr>
<tr>
<td>-Teaching Presence</td>
<td>120</td>
<td>8.47</td>
<td>14.85</td>
</tr>
</tbody>
</table>

Furthermore, we can see dissimilar proportion among the three key presences. As shown in Figure 3, the social presence is higher compared with the cognitive and teaching presences.

Figure 3. Meaningful unit proportion of cognitive, social, and teaching presences posted in student comments
Research question 2. What characteristics do the cognitive, social, and teaching presence have in the blog environment?

In order to understand better the construction of the CoI in our blogging science project, in the following paragraphs, we have expanded each element –cognitive, social, and teaching– by exploring their characteristics and showing excerpts made by student posts.

Cognitive presence

Garrison et al. (2000) defined cognitive presence as sustained communication between members of a community that leads to meaning making. Cognitive presence implies the following four categories: triggering event, exploration, integration, and resolution. The dominant cognitive category in our blogging community is the resolution category. An example of this cognitive presence is presented in the following Extract 1 (each line of the extract contains a meaningful unit; each cognitive presence meaningful unit is marked with an arrow):

 Extract 1:
Let’s see... I think it’s quite good, since you wrote it and you didn’t copy-paste
→ I think you talk more about their use
→ instead of about how they are made.
But congratulations it’s very good

An explanation of a major presence of resolution categories (cognitive presence) could be due to the nature of the instructional process followed in the blogging project, in which students were asked first to solve each science challenge individually and afterwards comment on each other’s resolution to the challenge. Thus, students were focused on the resolution of the science challenge proposed.

Although the nature of the instructional process followed in our project could lead to students being focused on the cognitive resolution category, exploration and integration categories might be fostered in a blogging CoI. As regards the exploration category, Cameron
and Anderson (2006) explain that often, learners answer a question based more on their immediate knowledge rather than the exploration and the development of reflective and deep knowledge. In this line of argument, the asynchronous nature of blogs may allow learners the opportunity to explore a topic before responding, potentially leading to a more complex and reflective level of discussion.

Regarding the integration category, it has been stated that blogging promotes discourse while other online conferencing systems encourage discussion (Wrede, 2003). In this context, discourse is described as being about making connections among ideas, people, and communities, possibly using several media over time that continues until participation stops; whereas discussion is described as a debate or dialogue on a topic.

Since exploration and integration are critical categories to maintain the cognitive presence in a CoI and blogging has some affordances that may promote them, they should be fostered among participants. As examples of how these kinds of cognitive presence could be promoted in our blogging project, we can mention the following two: students might be encouraged to focus on the science content presented in their classmates’ blog activities: debate it, give new content, establish new connections, etc. Another example to foster cognitive exploration and integration among the blog participants could be asking students to make more links between the ideas presented in different blogs or to make links to other webpages—which is another blog affordance, as suggested by Downes (2004).

**Social presence**

Social presence refers to the participant’s ability to connect within a community environment and to form personal relationships with other community members (Garrison & Aykol, 2009; Rourke, Anderson, Garrison & Archer, 1999). Social presence includes the following three categories: emotional expression, open communication, and group cohesion.
Among our blog participants, we can see that there is a redundancy of expression of emotions, which are visible by means of emoticons and other similar symbolic code. Extract 2 is an example of a student comment with these characteristics (the social presence meaningful units are marked with arrows):

Extract 2:

⇒ Hiiii!!!!
your work is very good!! like it was no such a pain as O.J.’s
and I was no bored as I read it
⇒ hehe
⇒ XD
but next time you could insert any images otherwise it’s all text and I don’t like texts
⇒ u know
⇒ :$ 
So, it’s super!!!
⇒ well bye
⇒ ur beautiful
⇒ love u so much!!!
⇒ <3
⇒ (l
⇒ TAKE CARE!!
⇒ Att: YOUR FRIEND
⇒ A.D.!!!!

In our study, student comments also showed other important social presence categories, i.e., open communication (indicator: risk-free expression), in which students showed that they were mutually aware of their classmates’ activities and comments, and they were following their classmates’ work (Garrison et al., 2000). However, this kind of comments is less abundant among our blog participants. In Extract 3 we present a comment categorised as an open communication category:

Extract 3:

⇒ thank you for your opinion,
⇒ think u r right
I’ll do it in another way
=)

Finally, there is an important category of social presence–group cohesion. This category encourages collaboration and exposes group feelings (Garrison et al., 2000). This kind of social interaction was very scarce among the students who participated in our
blogging community. In Extract 4 we present an example of this social presence (group cohesion meaningful unit is marked with an arrow):

Extract 4:
I can't understand this thing of key words
➞ could you give a hand on this
thanks
A.C.!!!!

Teaching presence

Teaching presence involves three categories: instructional management, building understanding, and direct instruction. Teaching presence can be attributed to teachers or students (Cameron & Anderson, 2006). In our blog community, teaching presence has also been found. An instructional management category was performed by the teacher whereas building understanding and direct instruction were performed by students. For the purpose of this study, we only analysed the teaching presence attributed to students.

The majority of student teaching meaningful units referred to highlighting the strengths of the work or the weaknesses that could be improved. This could be a starting stage of the teaching category of building understanding, because students shared personal meaning and expressed agreements or disagreements (Garrison et al., 2000). However, students did not give reasons and arguments in order to make their thinking more visible to their classmates. From our point of view, in future research, it would be beneficial to explicitly teach students how to give reasons and arguments to their statements in order to promote a better building understanding among the community.

The other teaching category present in our community was direct instruction, in which students expressed what or how their colleagues could proceed in order to better solve the challenge. In Extract 5, a comment with direct instruction is presented (the arrow shows a direct instruction meaningful unit):
Research question 3. Do the individual contributions reveal any emergent roles or individual profiles during the collaborative process in the blog environment?

We can distinguish three different student profiles, as regards the proportion among the three key presences, which are illustrated in Figure 4. Profile 1 has a clearly dominant proportion of social presence. Students who presented this profile were focused on expressing their feelings in a spontaneous way and maintaining the cohesion of the group. Although these points are important in a CoI, the scarce reference to the science content to be explored, integrated, and solved (cognitive presence), as well as the lack of tackling different approaches to improve the science activity (teaching presence) might make this profile insufficient for constructing a CoI in a blog environment.

Profile 2 features a higher proportion of cognitive presence. Students who presented this profile were focused on cognitive issues to improve their classmates’ activities; however, they did not take into consideration how they provided this information to their classmates (teaching presence) and how group cohesion could be affected by such information (social presence). Social presence has been considered as a mediating variable between cognitive presence and teaching presence (Colomina & Remesal-Ortiz, 2011). In addition, social presence is essential for the development of cognitive presence, which in turn is influenced by teaching presence (Halic, Paulus, & Spence, 2010). Therefore, this profile might not give an appropriate contribution for constructing a CoI.

Finally, Profile 3 is characterized by a balanced proportion of the three presences. The students who presented this profile in some way assumed some characteristics of the teacher’s role because they focused on helping their classmates to be aware of what lacked in their
activity and giving appropriate information in order to improve classmate task resolution. From our point of view, this profile might be a positive contribution for the construction and maintenance of the CoI, and consequently for learning, since the integration of the three elements –cognitive, social, and teaching– is required so that meaningful learning can occur (Garrison & Akyol, 2009). Therefore, students working in a CoI should be aware of the three presences in order to post balanced comments that could scaffold each other.

![Figure 4. Meaningful unit proportion of cognitive, social, and teaching presence posted by three different student profiles](image)

Research question 4. Is there any relation between the individual profiles related with CoI presences and learning?

Table 4 shows the positive correlation between the comments posted (variable 1) and individual learning (variable 2). Moreover, the three key presences are related with the individual learning. However, the cognitive presence is the most related variable, followed by teaching presence, and finally by social presence. Therefore, our study confirms that cognitive presence is the core element necessary for higher learning (Kanuka & Garrison, 2004). According to Downes (2004), blogs not only have the potential for high levels of external communication but they also provide a way to engage participants in an intrapersonal conversation, which means, in a discursive exchange with the author. This might improve the students’ cognitive abilities and skills during the collaborative blogging process.
Table 4. Correlation among variables

<table>
<thead>
<tr>
<th></th>
<th>Num. of comments posted</th>
<th>Cognitive Presence (meaningful units posted)</th>
<th>Social Presence (meaningful units posted)</th>
<th>Teaching Presence (meaningful units posted)</th>
<th>Individual learning (activities performed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Num. of comments posted</td>
<td>1</td>
<td>.983**</td>
<td>.871**</td>
<td>.935**</td>
<td>.881**</td>
</tr>
<tr>
<td>Cognitive Presence</td>
<td>1</td>
<td>.805**</td>
<td>.947**</td>
<td>.915**</td>
<td></td>
</tr>
<tr>
<td>Social Presence</td>
<td>1</td>
<td></td>
<td>.870**</td>
<td>.661**</td>
<td></td>
</tr>
<tr>
<td>Teaching Presence</td>
<td>1</td>
<td></td>
<td></td>
<td>.855**</td>
<td></td>
</tr>
<tr>
<td>Individual learning</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusions

The main aim of this study was to examine the potential of the blog environment for supporting student development in the key learning components of a CoI that could lead critical thinking and meaningful learning.

The analyses of the students’ comments posted in the blog designed in our project confirm that our innovative blog environment promoted the construction of a CoI and therefore, the creation of an effective online collaborative learning community. In the students’ blog comments the three presences for collaborative learning took place: cognitive, social, and teaching presence (Garrison et al., 2000).

Moreover, our study found a correlation between the three presences with the level of learning obtained by the students. Therefore, our study confirms that the three presences of a CoI lead to learning. It is remarkable to highlight that the highest correlation was found with
the cognitive presence. Therefore, our study also confirms that cognitive presence is a core element for promoting higher learning (Kanuka & Garrison, 2004).

Finally, our study also revealed that students performed a proportion of the three presences differently and displayed different profiles during the collaborative process in the blog environment. From our perspective, the individual profile that is characterized by a balanced proportion of the three presences is the one that most positively contributes to the construction and maintenance of the CoI since the interaction of the three presences is required before meaningful learning can occur in an online environment (Garrison & Akyol, 2009).

The study revealed a series of issues that instructors should consider when blogs are incorporated into teaching and learning. First, the necessity of teacher guidance to give strength to the construction processes of CoI, especially at the beginning of the collaborative process, as suggested by Cameron and Anderson (2006). Teachers could give positive support to the students’ comments to foster confidence among participants.

Second, embedded scaffolds to help students to express their reasons when they comment in the blog are required. If a classmate comment is supported by reasons and argumentative explanations, we expect it to be better considered and understood by the reader. Reasons and argumentative explanations could be supported by embedded scaffolds through the collaborative process. We embedded these kinds of scaffolds in each student blog by means of sentence openers, as explained in previous sections. However, students did not introduce them properly in their thinking and writing. We call for more pedagogical attention to be given in designing specific instructional actions in improving the students’ arguments in their blog comments and posts. Previous educational research studies have already studied the successful impact of the “thinking together” approach and the use of sentence openers as scaffolds to prepare students to collaborate in an online environment and to improve their
collaborative process (i.e., Pifarré & Kleine Staarman, 2011). From our perspective, these pedagogical actions might have a positive effect on student comments, and in turn on the creation of a more trustful sense of community. A sense of community has been identified as significant predictors of perceived learning (Halic et al., 2010).

One of the limitations of our study is its exploratory nature and the small sample of the population considered in this study might be a slightly limited segment to extend the results to a wider segment.

To sum up, our research showed the potential of the blog environment designed in our study for supporting the students’ development in the three key presences of a CoI –cognitive, social, and teaching. Besides, our study confirmed that the development of the three presences as key elements to collaboration by supporting meaning making had led to an improved individual learning. Our future research will focus on confirming this exploratory result with a larger study group and assessing student perception about collaborative learning as facilitated by a blog-supported discussion that could explain in a more detailed manner how blog affordances may be pedagogically used to better support the creation of a CoI that could lead to meaningful and collaborative learning.

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References


## Appendix 1. Community of Inquiry Coding scheme (Garrison et al., 2000)

<table>
<thead>
<tr>
<th>Elements</th>
<th>Categories</th>
<th>Indicators (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Presence</td>
<td>Triggering Event</td>
<td>Sense of puzzlement</td>
</tr>
<tr>
<td></td>
<td>Exploration</td>
<td>Information exchange</td>
</tr>
<tr>
<td></td>
<td>Integration</td>
<td>Connecting ideas</td>
</tr>
<tr>
<td></td>
<td>Resolution</td>
<td>Apply new ideas</td>
</tr>
<tr>
<td>Social Presence</td>
<td>Emotional Expression</td>
<td>Emotions</td>
</tr>
<tr>
<td></td>
<td>Open Communication</td>
<td>Risk-free expression</td>
</tr>
<tr>
<td></td>
<td>Group Cohesion</td>
<td>Encouraging collaboration</td>
</tr>
<tr>
<td>Teaching Presence</td>
<td>Instructional Management</td>
<td>Defining and initiating discussion topics</td>
</tr>
<tr>
<td></td>
<td>Building Understanding</td>
<td>Sharing personal meaning</td>
</tr>
<tr>
<td></td>
<td>Direct Instruction</td>
<td>Focusing discussion</td>
</tr>
</tbody>
</table>
Appendix 2. Rubric to assess the activities performed by students

<table>
<thead>
<tr>
<th>Criteria</th>
<th>1 point</th>
<th>2 points</th>
<th>3 points</th>
<th>4 points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amount of Information</strong></td>
<td>Not enough to solve the problem</td>
<td>Enough to solve the problem</td>
<td>More than enough to solve the problem. (Problem is solved and extra information is explained)</td>
<td>Wealth of information (Needed information is explained. Besides, more information related to the solution of the problem is also provided)</td>
</tr>
<tr>
<td><strong>Quality of Information</strong></td>
<td>Separated, low level facts</td>
<td>Partially or well-organised facts</td>
<td>Partial explanation</td>
<td>Explanation</td>
</tr>
<tr>
<td>(Hakkarainen, 2003)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Creativity (New solutions)</strong></td>
<td>Nothing new</td>
<td>Provides a solution that other colleagues have provided similarly</td>
<td>It provides an original solution based on solutions previously provided</td>
<td>Provides one or more solutions to problems that are original and had not previously been provided. (The solutions aren’t based on other solutions previously provided)</td>
</tr>
<tr>
<td><strong>Originality</strong></td>
<td>All the information is copied.</td>
<td>Partial Copy. (Translation)</td>
<td>Not copied. In their own words, the document shows a new structure but ideas are the same as what they read on the Web.</td>
<td>Not copied. Everything is written in their own words and cites. New ideas are explained in a new structure</td>
</tr>
<tr>
<td><strong>Ways to represent the information</strong></td>
<td>Just text</td>
<td>Just Text &amp; Smiley</td>
<td>Text + images (No links or videos)</td>
<td>Multimedia (Text + video or images or links)</td>
</tr>
<tr>
<td><strong>Problem Solving Resolution Level</strong></td>
<td>Problem not solved.</td>
<td>Problem not sufficiently solved. It is impossible to guess a total solution of the problem</td>
<td>Problem partially solved. (Enough parts of the problem are solved so it is possible to guess a total solution for the problem)</td>
<td>Completely solved</td>
</tr>
<tr>
<td><strong>Resolution process explanation</strong></td>
<td>No Explanation</td>
<td>Some of the elements are explained</td>
<td>Many elements are explained (more than three)</td>
<td>Process is fully explained in detail</td>
</tr>
</tbody>
</table>