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INTERACTION PATTERNS OVER TIME IN ONLINE DISCUSSION

Ibis Álvarez[1], Denisse López-B.[2], Eulàlia Hernández[2]

[1]Universitat Autònoma de Barcelona (Spain)
ibismarlene.alvarez@uab.cat
[2]Universitat Oberta de Catalunya (Spain)
dlopezben@uoc.edu
ehernandez@uoc.edu

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ABSTRACT

The following study aimed at exploring and understanding how higher education students develop interconnections and interaction patterns over time during an online collaborative task using a form of online discussion. A micro-genetic study was carried out by zooming in into four groups of students that showed extreme grading results in their final product. The study took place in a Psychology course at the Universitat Oberta de Catalunya (UOC) where 63 students participated in a two-week online discussion using two different interactive tools. These two different types of online discussion did not appear to affect students' interaction patterns, but groups using the Annotation tool did focus more on cognitive matters, while the space for discussion at the UOC had a more balanced focus on both social and cognitive dimensions. Continuous and meaningful feedback also proved to provide important conditions for this type of online collaborative task, which requires students to construct and maintain a shared conception of a problem over time.

KEYWORDS

Peer-feedback; Online discussion; Socio-cognitive regulation; Higher Education.

INTRODUCTION

The collaborative nature of an asynchronous online discussion forum, as student-centered peer e-learning, provides good opportunities for joint construction of meaning.

Nevertheless, educational practice shows that students - individually and as a group – often have difficulties to manage their time properly during a collaborative task and teachers suspect that much of students' 'talk' is procedural or off-task". The use of peer feedback in an online learning environment offers a number of distinct advantages, including: increasing the flow of feedback, providing new learning opportunities for both givers and receivers of feedback, humanizing the environment, and building a community (Corgan, Hammer, Margolies and Crossley, 2004; Ertmer et al, 2007).

As collaborative learning is a coordinated activity that consists of a continued attempt to construct and maintain a shared concept of a problem, it has a highly co-regulatory nature (Lipponen, Rahikainen, Hakkarainen and Palonen, 2002). This provides both opportunities as well as challenges to the collaborative learning process. Devoting efforts to create and maintain a shared conception of a problem can be a valuable and powerful learning activity in itself. However, the time and effort that is thus consumed cannot be devoted to processing the learning material itself. As stated by Dixon, Dixon and Axmann (2008), participating in threaded discussions demands a significant amount of time to read, reflect upon and respond, and they have highlighted this as one of the major difficulties.

The term "learning" is commonly taken as referring to individual cognitive processes by which individuals increase their own knowledge and understanding. The collaborative aspect, on the other hand, explicitly extends learning to groups of individuals interacting together. Students not only have to externalize, share and discuss their thoughts but they also need to employ strategies to regulate their cognitive and social interaction (Jonassen, Davison, Collins, Campbell and Bannan, 1995; Stahl, 2003).

Working with others efficiently in order to solve a cooperative task depends greatly on the ability to self-regulate behavior. Self-regulated learning is a cyclic, recursive and active process encompassing motivation, behavior and context (Winters, Greene and Costich, 2008); which consists of carrying out a task without having to be directed by anyone else, making decisions on their own, being able to seek and take on help and even knowing when and how to request it.

In a text-based online environment this process becomes even more problematic, as students have to rely purely on the use of physical and semantic artifacts (Stahl, 2003). In addition, students tend to transfer the strategies employed in face-to-face environments, which have been shown to be less effective in virtual environments (Delfino, Dettori and Persico, 2008; Whipp and Chiarelli, 2004).

Our theoretical perspective coincides with a socio-cultural approach to learning, where e-feedback must be regarded as a joint activity, presupposing interactions between actively participating students and teachers (Dysthe, 2007). As we have pointed out, in online asynchronous environments - especially in cooperative and in collaborative learning

tasks - educational interaction relies on the use of written discourse. This semantic artifact is the basic tool to collectively understand, co-regulate, make proposals, negotiate and construct meaning (Järvela and Hakkinen, 2002; Lipponen et al., 2002; Mercer & Littleton, 2007; Zimmerman and Tsikalas, 2005; Wegerif, 2006). In this sense, students' written-discursive activity is partly responsible for their ability to achieve higher levels of inter-subjectivity and, therefore, advance towards 'shared' and ever more complex representations of the contents and tasks of the joint activity.

According to Vygotsky's perspective, learning is more a matter of participation in a social process of knowledge construction than an individual endeavor. "Knowledge emerges through the network of interactions and is distributed and mediated among those (humans and tools) interacting" (Cole and Wertsch, 1996, cited by Lipponen et al, 2002, p.3).

By means of language and social interaction, in line with the socio-cultural approach to learning, behavior regulation becomes increasingly more self-regulated. Students' regulation process evolves over time and interactional patterns – on social and cognitive dimensions– arise. The time dimension of students' collaboration represents an important issue when solving tasks of this kind. Working collaboratively demands coordination, assumption of responsibilities and perseverance throughout the task. In this context and in order to construct and maintain a shared concept of a problem, a continuous and meaningful feedback is required.

Temporality, however, does not only come into play in quantitative terms (e.g., duration, rates of change), but in its order of appearance. Since human learning is inherently cumulative, the sequence in which experiments are encountered affects how one learns and what one learns (Ritter, Nerb, Lehtinen and O'Shea, 2007). Because of computer-supported collaborative learning (CSCL), researchers are privileged in the sense that they have direct access to processes as they unfold over time (via tracking).

While in other scientific studies one can find many theoretical models to support the analysis of construction of meaning during collaborative tasks in online and asynchronous learning environments in higher education (i.e. Gunawardena, Lowe and Anderson, 1997; Singh, Hawkins and Whymark, 2007), there is comparatively little research that makes use of the information contained relating to the order and duration of events (Reimann, 2009).

The studies analyzing the construction of meaning during collaborative tasks have encountered variations in how students communicate (provide feedback) in order to share and co-construct meaning during the development of such tasks. In relation to the 'time' dimension, Zumbach and Reimann (2003) observed that providing feedback to group members on interactional aspects was much more effective in the early stages of groups' lifetimes than later and that, hence, this information should be phased out over time in order to reduce the cognitive load (the "costs").

In this line, research carried out by López-B (2009) explored the strategies employed by students to regulate their behavior in a university's virtual learning environment, whilst carrying out cooperative learning tasks with argumentative demands, from a double perspective – the social angle of cooperation - and joint construction of meaning – the cognitive angle. This author found that students alternate and combine strategies to regulate the social and cognitive dimensions of their performance during their interactions.

The study presented in this article aims at continuing and extending the previously mentioned study by giving response to the following central research question: how do learners engage with others, and how do they develop interconnections and interaction patterns over time during an online discussion?

The first objective set was to identify the regulation strategies employed by students when participating during an online debate, which focused on the critical understanding of a scientific text.

Secondly, and understanding these strategies as 'peer feedback', we proceeded to explore the possible impact of them, in the quality of student's final product. Additionally, we set up a third and last objective with an exploratory character: compare the development of the groups' work regarding the technological tool used for discussion.

The next section gives more details about the characteristics of the analyzed collaborative task, as well as the methodology applied for collecting and analyzing data for this study.

METHODOLOGY

The study took place at the Open University of Catalonia (UOC) in an online psychology course with 63 students in their third year or beyond. Students were randomly divided over twelve groups, six of them using the debate space provided by the virtual campus of the UOC (N=33) and the other six groups using the external Annotation tool (AT) (N= 30).

The debate area of the UOC's virtual campus has the structure of a regular discussion forum, with discussion threads and the possibility to attach documents. The Annotation tool (AT, www.annotationtool.com) offers a virtual and asynchronous environment to facilitate collaborative discussions over specific documents. In this tool users interact by making annotations (comments) over certain segments of a document and by reacting on each others' comments. Each annotation made begins a discussion thread and the resulting hierarchy has the same structure as the one in a discussion forum.

Using one of the aforementioned tools, each group independently discussed a scientific article from the course readings, focusing around three teacher-generated questions about the contents of the article. Then, each group analyzed and discussed a case study, applying the previously-constructed knowledge, and created a written report. Finally, an overall evaluation of the whole activity was made by grading each group's written report. The following grading scale was employed for the evaluation:

A) BEST UNDERSTANDING

Contextualizing statements that reframed the situation by considering the circumstances under which the situation will or will not hold (i.e., a qualifier) or by comparing a given situation to a new one that is similar in significant respects (i.e., an analogy).

Reasoned interventions showing consensus by integrating their own reflections with the information offered by the others *(Integration aimed at consensus).*

B) HIGHLY SATISFACTORY UNDERSTANDING

Hypothetical or abstract propositions. Reasoned interventions offering proposals, alternatives and/or complements to the information exchanged, with the intention of reaching an agreement *(negotiating meaning)*.

C) QUITE SATISFACTORY LEARNING WITH UNDERSTANDING ON A DECLARATIVE LEVEL

Textual propositions that referenced information presented in the text. Non-argumentative interactions offering information with textual content or expressing points of view on the content to be analyzed, without making any reference to previous statements.

D) NON-SATISFACTORY LEARNING

Misunderstanding of the ideas in the text. Ideas unrelated to the text. Literal copy of paragraphs without any comments.

In order to create a valid and reliable assessment of students' reports, we relied on the teachers' professional expertise, which was used to apply these criteria in previous courses as well.

To analyze students' interaction, we employed a microgenetic method, which can illuminate the path, rate, breadth, variability, and source of change (Flynn, Pine and Lewis, 2006; Siegler, 1995). To observe how students' interactions evolved over time, we are presenting data from only four of the twelve groups. Taking into account that the main interest of this study is related to the exploration of the possible impact of students' interaction patterns throughout the collaborative discussion and in the quality of students' written reports, we selected those groups with extreme grading results in their evaluation, two for each virtual environment, to emphasize the differences. A total of 21 students were distributed over 2 subsets. Each subset contained two groups: a) groups with highest grades (G-A) using the UOC environment represented by 6 students (5 female and 1 male) and the one using the AT represented by 5 students (4 female and 1 male); b) the groups with lowest grades (G-B) using the UOC environment was made up of 6 female students and the one using the AT of 5 students (4 female and 1 male). A more descriptive study comprising the complete data information can be consulted in Hernández, Alvarez, López-B and Van der Pol (2010).

The microgenetic qualitative analysis of students' interactions started from the subject units contained in each message (in line with Henri, 1992). To categorize these subject units, we used a previously developed and validated coding scheme (López-B, 2009) that identifies a total of 14 categories for the social and the cognitive aspects of regulation. These categories went through a process of definition, adjustment, re-definition, combination, exclusion or precision until achieving the present uniform system (see appendix for a full description of the categories). The coding scheme was created from a combination of a deductive analysis and an inductive one.

For the first analysis, different research studies and literature referring to (a) face-to-face and virtual education that have contributed with definitions of categories in cooperative discourse (i.e. Arvaja, Salovaara, Hakkinen and Järvelä, 2007; Boakaerts and Minnaert, 2006; Dillenbourg and Fischer, 2007; Järvelä and Hakkinen, 2002; Vauras, Iiskala, Kajamies, Kinnunen and Lehtinen, 2003; Volet, Summers, and Thurman, 2009; Wegerif, Mercer

and Dawes, 1999); (b) categories, models and characteristics of behavior regulation in cooperative and written argumentative tasks (i.e. Angeli, Valanides and Bonk, 2003; Salonen, Vauras and Efklides, 2005; Reznitskaya, Kuo, Glina and Anderson, 2008; Weinberger and Fischer, 2006; Zimmerman, 1997) were revised.

The inductive analysis resulted from the exploration of data, where categories emerged. Together with the external judges it was established what would signal agreement: concurrence on the identification of codes in the same subject units. Each of the judges categorized this independently, taking into account that each subject unit had to be coded either into one category or, in special cases, into a combination of two categories. In this process, each coding discrepancy was resolved through discussion, ideas were exchanged on the least precise categories, some definitions were improved and others were complemented with more examples. The judges agreed on the codification of 55 subject units, representing an 81% agreement.

RESULTS AND DISCUSSION

Next, and following the corresponding objectives set for this article, we will share the most significant findings from this exploratory study. Table 1 summarizes the results of the content analysis.

		Cognitive Feedback								Social Feedback							
		SRL				Shared Regulation				SRL				Shared Regulation			
Groups with better scores	Week	G-AUOC	%	G-A AT	%	G-A-UOC	%	G-A-AT	%	G-AUOC	%	G-A AT	%	G-A-UOC	%	G-A AT	%
	1	2	13%	0	0%	2	10%	0	0%	0	0%	0	0%	0	0%	0	0%
	2	2	13%	0	0%	1	5%	0	0%	0	0%	0	0%	0	0%	0	0%
	3	0	0%	2	11%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	4	1	7%	3	17%	3	14%	2	10%	1	11%	1	14%	1	11%	0	0%
	5	1	7%	0	0%	2	10%	4	19%	1	11%	1	14%	2	22%	1	17%
	6	4	27%	1	6%	1	5%	2	10%	0	0%	0	0%	2	22%	1	17%
	7	3	20%	3	17%	3	14%	5	24%	4	44%	0	0%	0	0%	2	33%
	8	1	7%	0	0%	3	14%	0	0%	0	0%	0	0%	2	22%	0	0%
	9	1	7%	0	0%	4	19%	0	0%	2	22%	0	0%	2	22%	0	0%
	10	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	11	0	0%	3	17%	0	0%	4	19%	0	0%	2	29%	0	0%	0	0%
	12	0	0%	3	17%	0	0%	0	0%	0	0%	1	14%	0	0%	1	17%
	13	0	0%	0	0%	2	10%	0	0%	1	11%	0	0%	0	0%	0	0%
	14	0	0	3	17%	0	0%	4	19%	0	0%	2	29%	0	0%	1	17%
	Total (TU)	15	100%	18	100%	21	100 %	21	100%	9	100 %	7	100%	9	100 %	6	100%
Groups with worst scores	Week	G-B-UOC	%	G-B-AT	%	G-B-UOC	%	G-B-AT	%	G-BUOC	%	G-B-AT	%	G-B-UOC	%	G-B-AT	%
	1	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	2	1	20%	0	0%	0	0%	0	0%	1	33%	0	0%	1	25%	0	0%
	3	1	20%	0	0%	1	11%	0	0%	0	0%	0	0%	0	0%	0	0%
	4	0	0%	3	38%	0	0%	1	8%	0	0%	1	50%	0	0%	1	25%
	5	0	0%	1	13%	0	0%	0	0%	0	0%	0	0%	0	0%	1	25%
	6	2	40%	3	38%	2	22%	4	31%	0	0%	1	50%	1	25%	1	25%
	7	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	8	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	9	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	10	1	20%	0	0%	1	11%	0	0%	0	0%	0	0%	0	0%	0	0%
	11	0	0%	0	0%	0	0%	1	8%	0	0%	0	0%	0	0%	0	0%
	12	0	0%	0	0%	2	22%	0	0%	1	33%	0	0%	1	25%	0	0%
	13	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	14	0	0%	1	13%	3	33%	7	54%	1	33%	0	0%	1	25%	1	25%
	Total (UT)	5	100%	***8***	100%	9	100 %	***13***	100%	3	100 %	2	100%	4	100 %	4	100%

Table 1. Summary of results observed

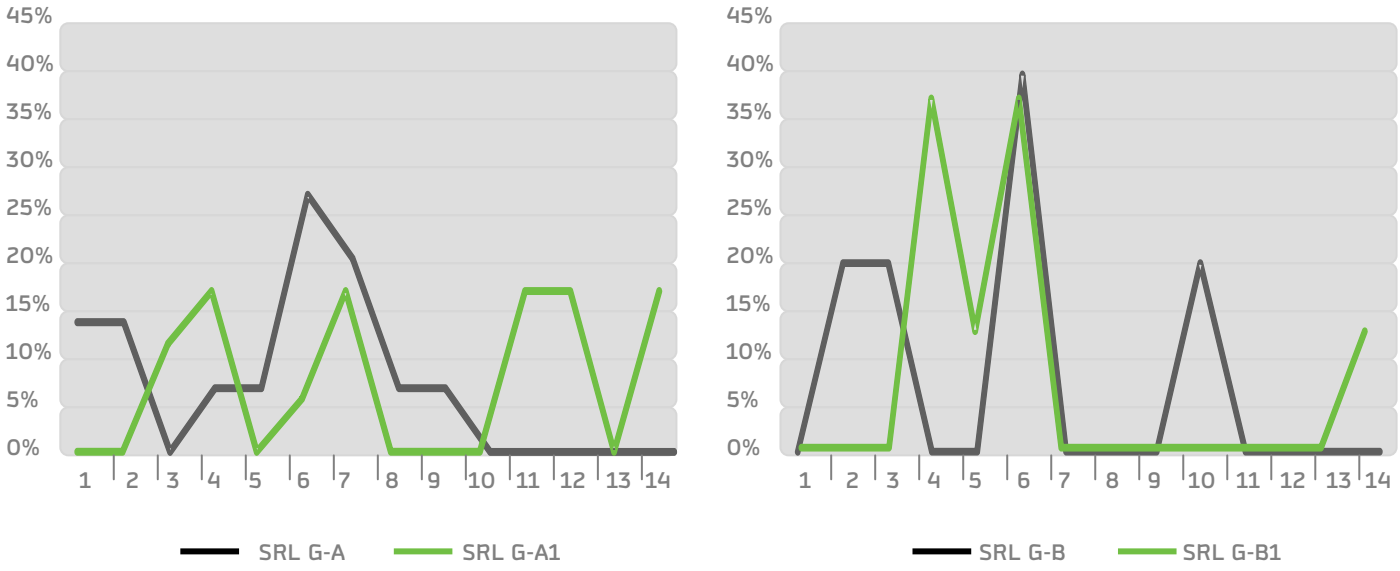
Notes: Groups with letter 'A' represent the ones with highest grades. The subscript 'AT' distinguishes the groups that have used the Annotation Tool as a communication support. The gray shadow highlights the days where a discussion took place.

Results will be presented following the regulations modes in the cognitive and social dimensions.

A) INTERACTION ASSOCIATED TO SELF-REGULATED LEARNING (SRL) IN THE COGNITIVE DIMENSION OF CO-REGULATION

As regards the groups with highest grades, regular individual contribution is maintained in both cases. See figure 1.

Figure 1. Interactions associated to SRL in the cognitive dimension of co-regulation



Note: This type of feedback refers to Exteriorization.

Exteriorization favors the beginning of discussion threads and stimulates joint construction of meaning. It is important to notice that '*Exteriorization*' does not necessarily mean contributions with essential or meaningful ideas. In the case of the groups with the lowest grades, for example, even though the frequency of this type of feedback is high, it is not related to a better construction of arguments, ending up most of the time in an accumulation of existing knowledge rather than in the negotiation or construction of new knowledge.

In the AT group (A1) this kind of feedback appears at the end of the first week and increases again at the end of the second week. This can be interpreted as a strategic interaction which ends up having a positive effect. On the one hand it seems to be a response to SRL in this case of '*Exteriorization*', so that the group incorporates the individual contribution to the discussion, showing the students' effort to maintain the necessary interdependence in the collaborative learning task the group is performing. Individual contributions - in this

case, ideas put into consideration through Exteriorization - are received by other students, leading the exchange through Elicitation strategies, which encourage Negotiation, construction of meaning and synthesis (*Integration of ideas aimed at consensus*). Thus, during collaborative discussion we see what Reznitskaya et al. (2008) calls 'flow of reasoning', a process that comes along with the improvement of the quality of reasoning.

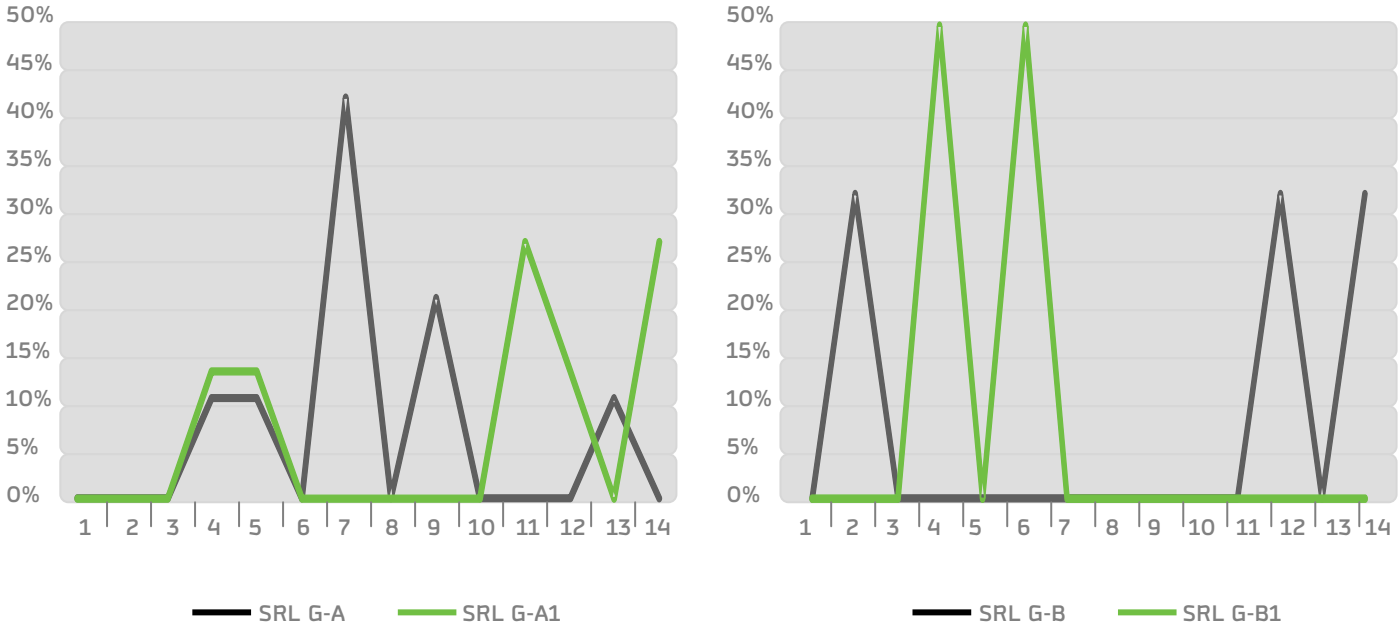
In the groups with lowest grades in both environments, unlike the ones with the highest grades, we can observe an increase in this type of feedback at the end of the first week. This increase barely appears at the end of the second week for the group working with AT, facilitating the appearance of new topics that are not discussed and are left unfinished. In contrast, the group that worked in the UOC campus, although the individual contribution focuses on the first week, in the middle of the second one, students bring new ideas that can have a slightly more favorable effect, at least with respect to the amount of content that the group might collect. However, if these ideas or individual contributions are not interesting enough for the other participants and do not imply an elicitation, it seems that the topic is not worth discussing, and therefore these ideas end up as a collection of scattered, shallow ones. This may also explain the grades in the written report of these groups, which contained few ideas without reasoning.

We also observed that the UOC group (GA) starts in the first week and then has another increase in the middle. In contrast, the AT group (GA1) maintains this kind of feedback during the discussion. Overall, in this last group the number of subject units in this category is larger compared to the other groups. This can be explained by the nature and design of this tool, which lets users focus on specific content, confirming the results of Van der Pol, van den Berg, Admiraal and Simons (2008).

B) INTERACTION ASSOCIATED WITH SRL FOR GROUP CLIMATE MANAGEMENT IN THE SOCIAL DIMENSION OF CO-REGULATION

Students in best-performing groups offer more feedback (SRL) to their peers in order to keep up the social dynamics of the group. Students often report on what they are doing (Individual Monitoring) and bring their previous knowledge or experience to what is being discussed (Self-Evaluation) See figure 2. These strategies are truly useful for the group as they promote respect for others' opinions, shared responsibility concerning the learning task and help the students to awaken and / or maintain their attention and interest on what is being discussed.

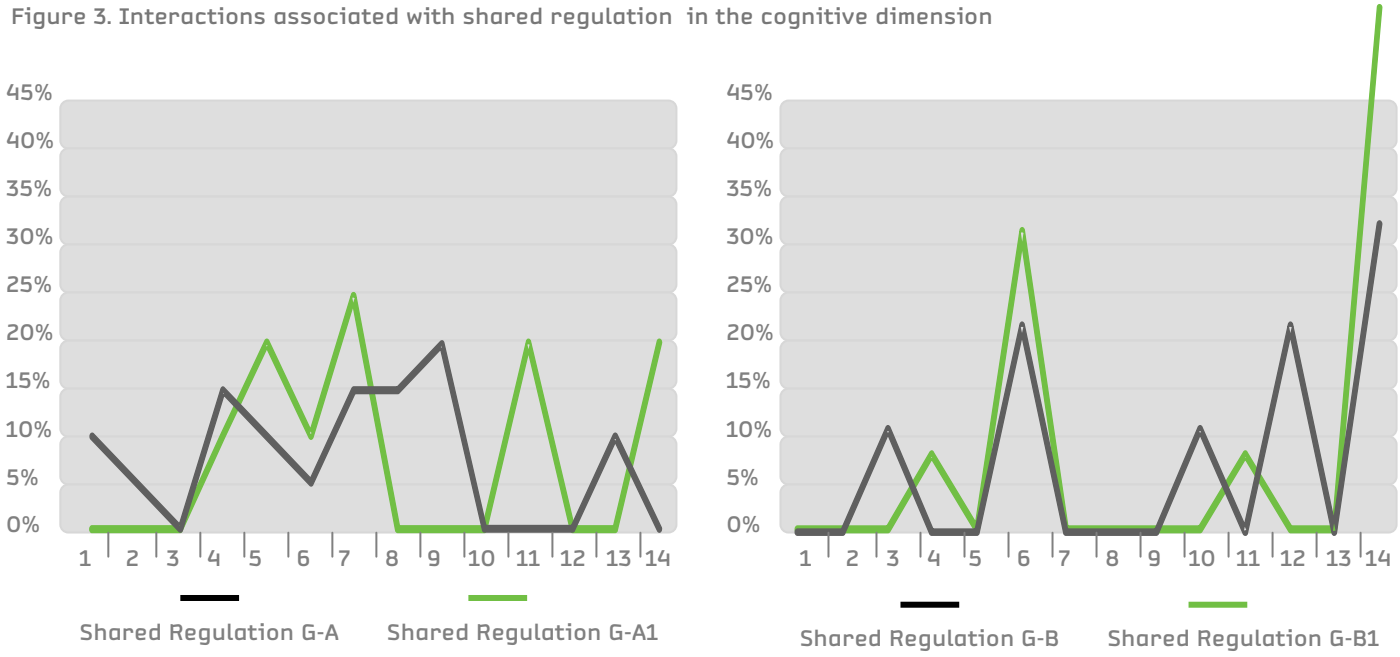
Figure 2. Interactions associated to SRL for group climate management



C) INTERACTION ASSOCIATED WITH SHARED REGULATION IN THE COGNITIVE DIMENSION

The analysis shows that this kind of feedback (shared regulation) is much more frequent in groups using the AT. Figure 3 makes this result more visible.

Figure 3. Interactions associated with shared regulation in the cognitive dimension



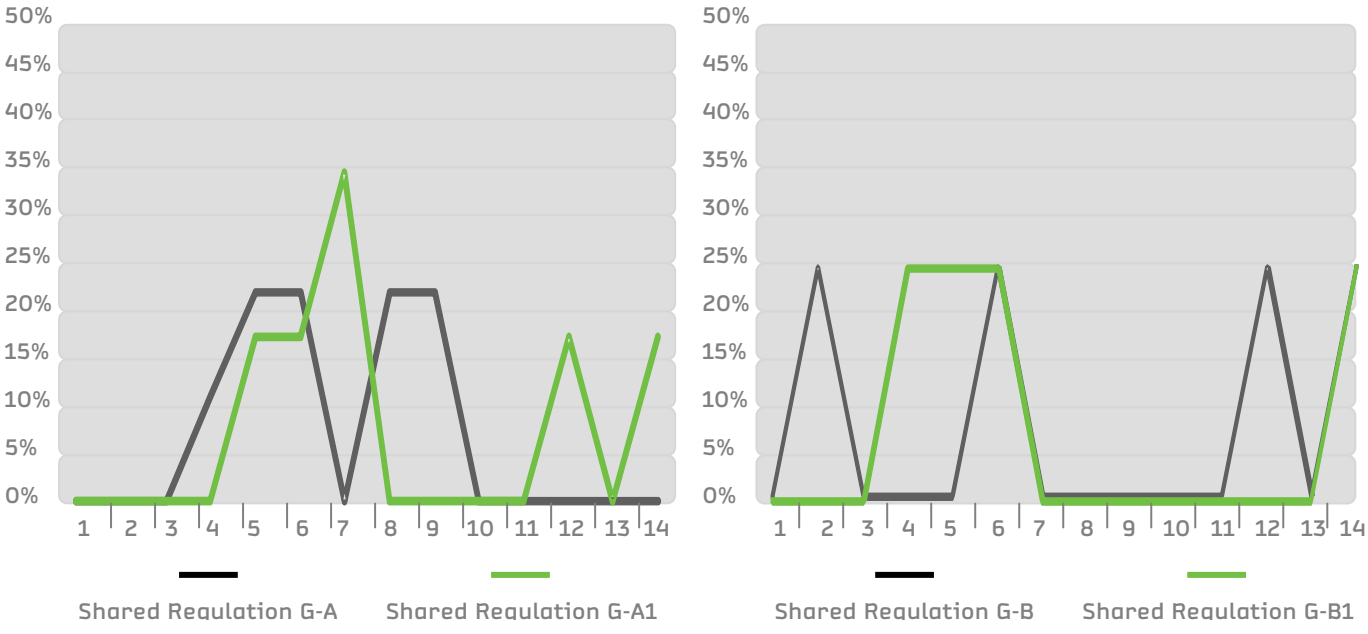
Note: These types of feedback refer to: Negotiation, Elicitation, Integration aimed at consensus.

Regarding the groups with the highest grades (GA and GA1), the time range where these types of strategies can be observed is wider. As noted before, it appears later in the week, as feedback to individual contributions. However, the continuity of contributions over time for the groups with the lowest grades (GB and GB1) makes the discussion more difficult. The time to perform the task is delimited and discontinuous contributions lead to open threads without conclusion, because students cannot negotiate or integrate ideas being discussed.

D) INTERACTION ASSOCIATED WITH SHARED REGULATION IN THE SOCIAL DIMENSION

Concerning this kind of feedback, students in better-performing groups (GA and GA1) show a more regular use of these strategies to regulate their interactions. See figure 4.

Figure 4. Interactions associated with the Shared regulation in the social dimension



During discussions, the strategy named "Mutual perspective" stood out among the messages involving the contribution of other group members. This strategy is in fact very favorable for joint construction of meaning in collaborative groups, especially in an online learning environment where written communication is the only signal that can guide action (Järvela and Hakkinen, 2002; Wegeriff, Mercer and Dawes, 2006). With this type of feedback each participant can not only add their contribution to the set of inputs (interdependency), but they can use the 'message history' to "talk to others" when writing messages.

Also, the feedback associated with shared regulation in the social dimension is the most usual strategy in the UOC campus, which can probably be explained both by the greater familiarity of students with this tool, as well as by its collaboratively-oriented design. As stated by Stahl (2003), in order to engage in collaborative activities, students must come to

recognize the meanings of artifacts, and interpret these meanings from their own perspectives.

Finally, it should be noted that there are some differences in the application of the peer-feedback strategies between the groups analyzed, especially for shared regulation in the cognitive dimension.

Groups working with the AT show higher single employment rates and combinations of this type of feedback; a call for reasoned-participation from others (Elicitation) makes Negotiation and Integration of ideas easier.

Regarding the modalities of feedback that students employ to regulate the group's social activity, there are also some differences between the groups according to the communication tool they used. Regarding students' SRL, Monitoring and Self-evaluation prevails (monitoring stands out significantly in the UOC campus, particularly in the group with higher grades). In the AT, the group with lower grades did not employ this kind of feedback. If there is no other signal, the absence of such a message could be interpreted as an "absent student", which could discourage and even frustrate participants during the collaborative task affecting group's climate management.

CONCLUSION AND IMPLICATIONS FOR PRACTICE

In our study, we hypothesized that groups with better grades in their final written report – demonstrating a higher quality of reasoning – were also the groups that maintained continuous and focused interactions in their discussion space. Through the microgenetic explorative analysis of the four groups with highest and lowest grades it was possible not only to confirm this hypothesis, but also to observe the interaction patterns followed by the groups in order to achieve such a result.

The most notable interaction strategies observed in the groups with best grades combined social and cognitive SRL in a balanced and in a continuous way, such as: Individual Monitoring, Self-evaluation and Exteriorizing; and shared-regulation such as: Mutual perspective, Negotiation, Elicitation, and Integration aimed at consensus. In contrast, the interaction patterns in the groups with lower grades showed not only a less strategic combination of social and cognitive self- and shared regulation but also a very discontinuous interaction. All this has an effect on constructing and maintaining a shared concept of the issue discussed. The most notable interaction strategy employed by these groups was 'Exteriorizing' as a cognitive self regulation; and Negotiation and Elicitation for the shared regulation.

The strategic combination of social and cognitive regulation strategies found by the groups with best grades, which are possible through the continuity of their interactions, coincides with the results found in a previous study of Lopez-B (2009).

The virtual environment which supported groups' discussion did not seem to affect the way students engaged in the activity, but the results show that groups using the tool for annotations focused more on providing feedback on cognitive matters, and therefore the employment of such strategies, while the space for discussion at the UOC had a more

balanced employment of strategies in both social and cognitive aspects through a collaborative discussion.

We have noted a lack of feedback related to planning, in contrast to the majority of studies along the SRL lines (Zimmerman and Tsikalas, 2005). We consider that this may be related to specific characteristics of the task, since it was a short-term task, an extremely detailed one, and it was also an experimental situation.

Results suggest some implications for practice in online learning environments.

First, from the different strategies employed according to the technological tool, one can assume that it is important to know which behaviors are promoted by each one in order to ask the students to use them. Thus, as the Annotation tool focuses more on cognitive than on social regulation, it seems easier to use it to make the students go straight to the task objective. This could be especially useful, for example, when students have scarce previous knowledge, when the time for the task is short, or even in groups with lower social skills. In addition, having the opportunity to choose between two different tools for discussions could be a chance for teachers to attend to students' differences in cognitive styles.

Second, as both relational and content-related strategies seem to be necessary for a better performance, combining both tools (or at least their functionalities) seems to be the best way to succeed in collaborative discussions demanding a written document as a final product. The forum could be used to schedule and to regulate the procedure, and at the same time the annotation tool could serve to perform in the content-related part of the task. Ideally, both functions would need to be integrated in one single tool.

Third, despite the tool being used, groups with higher grades show more cognitive feedback. The ones using the UOC's space show this feedback in specific moments and the ones using AT show it throughout the task. It could be interesting to train students in giving specific cognitive-oriented feedback by means of, for example, exercises where the student has to ask relevant questions about a text, or even using a template training specific strategies.

Finally, even though our results show that self- and shared continuous regulation correlate with better performance, students did not plan their discussion well. We believe more planning activities could increase the continuity of students' interaction, therefore we suggest teachers ask the students to plan and pace their activity, in order to promote regular feedback. Usually, questions and formulations only include explicit objectives and materials, but few say something about procedural instructions. Giving students more orientation in this point could possibly contribute to a better performance in online collaborative learning.

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APPENDIX

CATEGORIES AND DESCRIPTORS

Categories of social regulation with descriptors

Regulation modes	Descriptor
External:	Structuring the task (OrT): Questions and suggestions on the organization, procedure, roles, resources, timing, format text, control of the task, etc. Social Reinforcements (RS): Emotive interventions supporting the ideas or performances of others because they positively impact on cognition or motivation of the rest of the group.

Self-:	Self-evaluation (AeV): Interventions showing assessment of previous knowledge or experience; which may contribute to the successful completion of the task or showing what solving the task will mean in terms of meeting the demands of their daily context. Situating the learning process itself (SA): Students understand the objective of the task, relate it to previous knowledge and consider what they need to do in order to achieve the objective. Individual Planning (PI): Students consider the available time and resources they have, in order to determine their contribution and voluntarily take on responsibilities. Monitoring participation (MI): Controlling management of their own participation.
Shared:	Call for accountability/ participation from others (IR): Interactions requesting help or collaboration from their peers, in keeping with the organization and development of the task. Mutual perspective (PM): Interactions communicating a mutual agreement, an idea is considered, evaluated and reinforced. Short and quick consensus (Ccr): Interactions showing agreement or neutrality with a suggested idea.

Categories of cognitive regulation with descriptors

Regulation modes	Descriptor
External:	Clarifying the task (ExT): Non-argumentative interactions around the common objective. The objective of the task is analysed, clarified, reformulated, and reviewed.
Self-:	Exteriorising (EX): Non-argumentative interactions offering information with textual content or expressing points of view on the content to analyse, without making any reference to previous statements.
Shared:	Elicitation (Eli): Interventions which directly or indirectly demand a reaction from another peer, in keeping with the content of the task. Negotiating meaning (NS): Reasoned interventions offering proposals, alternatives and complements to the information exchanged, with the intention of reaching an agreement. Integration aimed at consensus (IoC): Reasoned interventions showing consensus by integrating their own reflections with the information offered by the others.