



HAL
open science

Affording Emotional Regulation of Distant Collaborative Argumentation-Based Learning at University

Claire Polo, Stephane Simonian, Rawad Chaker

► To cite this version:

Claire Polo, Stephane Simonian, Rawad Chaker. Affording Emotional Regulation of Distant Collaborative Argumentation-Based Learning at University. *International Journal of Educational Technology*, 2022, 23 (1), pp.1-39. 10.23095/ETI.2022.23.1.001 . hal-03911438

HAL Id: hal-03911438

<https://hal.science/hal-03911438>

Submitted on 23 Dec 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Affording Emotional Regulation of Distant Collaborative Argumentation-Based Learning at University.

Abstract

We study emotion regulation in a distant CABLE (Collaborative Argumentation Based-Learning) setting at university. We analyze how students achieve the group task of synthesizing the literature on a topic through scientific argumentation on the institutional Moodle's forum. Distinguishing anticipatory from reactive emotional regulation shows how essential it is to establish and maintain a constructive working climate in order to make the best out of disagreement both on social and cognitive planes. We operationalize the analysis of anticipatory emotional regulation through an analytical grid applied to the data of two groups of students facing similar disagreement. Thanks to sharp anticipatory regulation, group 1 solved the conflict both on the social and the cognitive plane, while group 2 had to call out for external regulation by the teacher, stuck in a cyclically resurfacing dispute. While the institutional digital environment did afford anticipatory emotional regulation, reactive emotional regulation rather occurred through complementary informal and synchronous communication tools. Based on these qualitative case studies, we draw recommendations for fostering distant CABLE at university.

Keywords: *argumentation, collaborative learning, emotion regulation, higher education, forum, affordance*

1. Introduction

With a disciplinary “arguing to learn” perspective (Andriessen, Baker, Suthers, 2003), many university teachers do not explicitly target argumentation skills, but design Collaborative Argumentation Based-Learning (CABLE) tasks to foster distant socio-cognitive conflict (Roschelle & Teasley, 1995) for disciplinary improvement. Nevertheless, engaging productively in such tasks requires appropriate group emotions to solve the socio-cognitive conflict on the cognitive plane and not only on the social plane (Authors, 2016). To understand how groups manage conflict during their work, a metacognitive perspective, addressing the regulation of the learning processes, both at individual and group levels, is needed. Such research could, then inform how instructional design can help the students regulate the conflict associated to CABLE tasks in distant collaboration. In this paper, we suggest that addressing anticipatory emotional regulation, which is to say, paying attention to building a positive socioemotional working climate before conflict arises is essential to foster an efficient reactive emotional regulation when tensions emerge, helping the students handle its cognitive content. Within an ecological perspective on affordance, we study how students successfully establish and preserve a positive working climate, managing conflict in a constructive way. In a discussion section, we specifically question the tools provided for distant collaboration regarding their affordance for CABLE regulation. Our argument is illustrated by an in-depth qualitative empirical study.

We investigate how students and teacher in a French university structure a literature review group work about adult education and make use of different tools in their environment to regulate the learning processes. More specifically, we study the emotional regulation of the CABLE task, either through the institutional Moodle forum or with other tools belonging to the environment of the participants. In this study, we focus on two groups of students facing great tensions, putting their forum discussions in perspective with complementary data gathered through group and individual final reports on the task. We aim at understanding what happened within the group asking for teacher regulation, as compared with the other group who proved capable of self-regulating similar initial tensions. Hence, our first research question (RQ1) addresses students' reactive emotional regulation practices in a context of such online CABLE setting, comparing the two groups (hypothesizing a difference, H1). We also question group differences in terms of *anticipatory emotional regulation*: can they help us better understand the socio-cognitive processes that the students are engaged in? (RQ2). Our idea is that through such differences of anticipatory emotional regulation practices, groups may have achieved distinct previous working climate, which determined how they faced the socio-cognitive conflict (H2). Our third hypothesis is that articulating argumentation and collaboration help self-regulate group work in terms of emotions (H3). Furthermore, we wonder to

which extent the institutional formal environment provided to the students affords both the completion of the CABLE task and its anticipatory and reactive emotional regulation (RQ3). Within an ecological perspective on affordance, the environment designed by the teacher should allow for achieving all the dimensions of the activity, including its socioemotional one (H4). Our qualitative case study comprises students' and teacher's discourse analyses, in particular using a coding scheme for anticipatory emotional regulation. Our argument is illustrated by an in depth qualitative empirical study. After specifying our theoretical background (2), we describe more precisely the pedagogical setting studied, our research questions, hypotheses and dataset in a methodological section (3), and then turn to our analyses and main results (4), before the concluding section, which includes a discussion section drawing possible larger implications of this research regarding instructional design (5). In this discussion section, we address the matter of how designers and educators can foster distant CABLE.

2. Theoretical background: emotional regulation in CABLE

2.1 The field of Collaborative Argumentation-Based Learning (CABLE)

In their introduction to a recent special issue on technological and pedagogical innovations for CABLE, Noroozi, Weinberger and Kirschner (2021, p. 499) define it as follows:

Students engaging in collaborative argumentation can acquire and co-construct knowledge through discourse when sharing and elaborating on their individual knowledge representations and developing new knowledge as a group. Moreover, argumentation supports taking and defending positions, negotiating meaning, discussing opposing and/or alternative viewpoints, resolving differences of opinion, and expanding one's understanding.

Indeed, CABLE encompasses a variety of pedagogical situations in which educators and/or designers believe in the power of argumentation to learn by co-constructing new knowledge thanks to confronting viewpoints. Embodied in students' dialogue, such confrontation is meant to produce a socio-cognitive conflict (Roschelle & Teasley, 1995), a cognitive problem that can be solved thanks to group reasoning.

In this context, effective argumentation "explores complex problem spaces and generates and identifies relations between different pro- and counter-arguments" (Noroozi, Weinberger and Kirschner (2021, p. 499). It supposes the members of the group fully engage with understanding each other's view, in order to elaborate on it more or less critically. The literature insists on such uptakes for assessing the quality of CABLE, notably through automated discourse analysis, apprehended for instance as indicators of 'dialogism' (Dascalu et al., 2015) or as transactive, other-oriented contributions (Gweon et al., 2013). An study also shows that online 'listening' measured by several indicators of engagement with others' posts determines the depth of online 'speaking' (quality of own posts) (Wise, Hausknecht & Zhao, 2014). Still, building on each others' ideas in a critical, though constructive way requires learning regulation. Nevertheless, the socioaffective aspect of such regulation has been little investigated so far. We here propose to start filling this literature gap by addressing emotional regulation in CABLE.

2.2 Emotional regulation of CABLE as both reactive and anticipatory

Emotional regulation of pedagogical interactions is a growing concern for the learning sciences, embracing processes occurring both at the individual, group and class level (2.1.1). Past studies have shown that emotions play a specific role in argumentative contexts, both on the cognitive and the social planes; which we need to consider for fully understanding interactions in CABLE (2.1.2). However, literature on emotional regulation tends to focus on reactions to emotions perceived as detrimental to learning, while previous work emphasized how beneficial are some emotions for learning. We believe that such anticipatory facet of emotional regulation needs to be considered to better foster CABLE (2.1.3).

2.2.1 Teacher-led, self and group emotional regulations

Traditionally, learning regulation falls into teacher's competency, specifically in authoritative settings. In this perspective, the teacher is responsible for leading the activity, ensuring that each member of the classroom group is in an emotional state appropriate for learning - sanctioning, when needed, offensive acts or reassuring less confident students. Complementary to this key role of the teacher, self-regulated learning theory has pointed students' own work to plan, monitor and evaluate not only the cognitive but also the affective aspects of their learning activity (Pintrich, 2000; Winne & Hadwin, 1998; Zimmerman, 2000). Learners, through such regulation process, may even modify their emotions (occurrence, intensity, duration), with a positive effect on their motivation and achievement (Wolters, 2003).

As the learning setting becomes dialogic and collaborative, the matter of learning regulation at the group level arises. A diversity of concepts were developed to address such phenomenon: co-regulation, collective or collaborative regulation, shared regulation, socially shared regulation, socially shared metacognitive regulation, socially shared metacognition, social metacognition (Hadwin et al., 2018, Huang, Zheng & Kim, 2021). Here we use the term 'group regulation' to refer to students' regulating activity at the group level, without any *a priori* judgement about the extent to which such activity is truly *collaborative* or *shared* among the group members that would jointly target and *co-regulate* a precise aspect of their learning. In CABLE, group regulation matters more than individual regulation (Huang, Zheng & Kim, 2021) and can even lead to improvement of individual metacognitive skills for students with low-level of self-regulation of learning (Lee, Yang, 2014). Last but not least, Jarvenoja and Jarvela (2009) have shown that students may specifically regulate emotions in a collaborative learning context. With a linguistic approach to regulation, our present study on emotional regulation encompasses any communicative act regulating individual or group activity on the affective plane.

2.2.2 The role of face-work and self-identity footing in argumentation

Such communicative approach recognizes the specificity of argumentative interactions regarding the preservation of participants face. In CABLE, the students have both to ensure that the collaboration keeps on going through usual face-work (Brown & Levinson, 1988), and to explore the socio-cognitive conflict by showing overt disagreement and justifying it with arguments, a face-threatening, dispreferred attitude in daily conversations (Pomeranz, 1984). Displaying emotions regarding their *faces*, the members of a group may figure out the contextually relevant in-between politeness system and align on a self-identity footing allowing them to engage collectively into argumentation (Authors, 2017). Revealing the social functions of emotions in reasoning, such interactional alignment contributes to group emotional regulation. What is at stake is notably to avoid the socio-cognitive conflict, which is a priori beneficial for learning (Roschelle & Teasley, 1995), to be solved on the social plane only, either avoiding cognitive disagreement by developing *cumulative talk* or turning to personal fights of opinions in *disputational talk* (Authors, 2016). As a matter of fact, even though conflict is needed and might be fruitful in an argumentative-based learning situation, it would only be so if appropriate regulation of emotions on the social plane prevent it to turn into a *dispute*.

2.2.3 A need for acknowledgement of anticipatory emotional regulation

Research on emotional regulation has little studied this type of phenomenon so far, mostly focusing on the metadiscursive level, involving explicit monitoring of affective arousals. For instance, some studies consider the benefits of talking about emotions related to the task or the collaboration for group emotional awareness and regulation (Järvenoja & Järvelä, 2013; Näykki, Isohäätä, Järvelä, Pöysä-Tarhonen, & Häkkinen, 2017; Näykki et al., 2014). The literature on emotion regulation typically deals with identifying the socio-emotional challenges and the strategies that the teacher or the students, individually or interacting, develop to cope with them (e. g. Jarvenoja and Jarvela, 2009). In this sense, regulation is apprehended as a *reactive* process to "negative" emotions that threaten learning.

Besides, part of this literature also mentions the display of ‘positive’ emotions, associated with higher-quality group regulation of learning. Surprisingly enough, the field considers these positive ‘socio-emotional interactions’ as spontaneous co-occurring phenomenon but not as results of a regulatory work. Still, clear indicators of active monitoring, evaluation and adaptation are identified to describe such positive interactions, such as, at the metadiscursive level: encouragement (Bakhtiar et al., 2018, Kwon et al., 2014), complimenting (Lajoie et al., 2015), motivational statements (Bakhtiar et al., 2018, Järvelä, Järvenoja, et al., 2016), socio-emotional support (Isohätälä, Näykki & Järvelä, 2019) and consideration of divergent views (Isohätälä, Näykki, Baker & Järvelä, 2018). Some also occur at the discursive level, in a more implicit way: attentive listening and openness to divergent ideas (Ucan and Webb, 2015); signs of joint listening and respect, inclusion, and group cohesion (Rogat & Linnenbrink-Garcia, 2011); displaying a sense of community (Kwon et al., 2014), joint participation (Isohätälä, Näykki & Järvelä, 2019), tentativeness of claims, and moderate tension relaxation (Isohätälä, Näykki, Baker & Järvelä, 2018). To date, no conceptual framework has clearly integrated such relation into regulation theory. Since reasoning together results from a subtle balance between opposing arguments and sustaining a positive socio-emotional climate (Isohätälä, Näykki, Baker & Järvelä, 2018), the interactional work establishing and maintaining such climate should be considered as fully regulatory. Facilitating coping with them but occurring at the foreground even before socio-emotional challenges arise, we call for the recognition of such *anticipatory emotional regulation*.

2.3 Distant CABLE as a pedagogical situation requiring specific affordances

Distant teaching frames CABLE interactions and its emotional regulation by the use of specific communicative instruments. Therefore, understanding how they afford argumentation and affective metacognitive regulation is necessary.

2.3.1 Ecological approach to affordance

When designing a distant course aiming at CABLE, the teacher provides the students with an environment made of potentialities to meet these different, thus simultaneous, goals of the learning situation. If a potentiality is effectively perceived by the students as they work towards the corresponding goal, we judge the instrument associated as *affordant*. If the students do not perceive such potentiality of the environment, then the associated instrument does not *afford* the corresponding goal. Such a definition of *affordance* is consistent with the literature as a concept describing the relationship between the subject and the environment focusing on perceptual “properties” allowing the subject to determine his or her ability to act in order to meet his or her needs (Norman, 1988; Reed, 1988; Turvey, 1992; Stoffregen, 2003; Authors, 2020).

An ergonomic approach to *affordance* would then focus on how to design environments making human action easier or, at least, possible (Norman, 1988). Still, to understand students’ and teacher’s practices, a phenomenological approach to affordance is also necessary, aiming at unveiling how they interact the parameters of their ecological situation (culture, intentions, formal rules, physical abilities) (Turvey, 1992, Stoffregen, 2003, Niveleau, 2006, Morgagni, 2011, Authors, 2020). In the case of a technology-enhanced learning, the pedagogical script and global orchestration play a great role on the *affordance* of the digital instruments provided to the students. The degree of prescription is a determining variable: a script that specifies the meaning of a tool related to the task promotes homogeneous *affordances* (Authors, 2016b). More specifically, we here study *affordance* as situated properties intending to achieve collaborative argumentation-based learning and its emotional regulation.

2.3.2 Specific affordances for distant CABLE: brief state of the art

Many distinct digital environments have been used to foster CABLE, and empirical studies have explored their affordances regarding this goal. Online discussion forums are asynchronous

collaborative learning setting (Suthers & al., 2008; Kim & Kentenci, 2019) that, according to Garrison and colleagues (2001), enable social exchanges and lead to knowledge construction. In his study comparing synchronous vs asynchronous writing collaboration in an online course, Mabrito (2006) also found that asynchronous conversations focused more (and in more ways) on the writing task and objectives. He cites Meyer (2003), who points that threaded discussions allowed students “to reflect on what was said and to take their time to develop a useful response” (Meyer, 2003, p. 61) more than face-to-face sessions. Obviously, asynchronicity alone cannot lead to CABLE, and asynchronous tools need to be combined with appropriate pedagogical activity and guidance. In particular, project-based approaches seem to foster student-student knowledge co-construction (Koh, Herring & Hew, 2010). Besides, a study on the use of a forum in higher education shows that students develop barriers to engage in critical discourse, notably because they sometimes perceive criticism as personal attacks (Rourke, Kanuka, 2007).

In order to increase the quality of argumentation in online collaborative learning settings, specific scripts were successfully implemented, supporting students in developing more complex argumentative structures, but without improving acquisition of domain-specific knowledge (Stegmann, Weinberger, Fischer, 2007). A recent study found that students learn best with medium-level scaffolding regarding argumentative scripts targeting the sequence of social discourse (Vogel, et al., 2021). Such finding may be due to the fact that overscripting reduces the room for implicit self- and group-regulation. In CABLE, the nature of the prompts also affects group interactions: problem-representation ones help integrating feedbacks, while full problem-solving ones help challenging peers’ assertions (Tawfik et al., 2021). Our interpretation is that the first ones fosters the ‘collaborative’ aspect of the activity by providing a common perception of the problem, and the second ones its ‘offensive’ side by insisting on argumentative assessment of claims.

Eventually, even if the literature stresses the need for addressing the matter of group emotional regulation in CABLE (cf. 2.2), we found no study on the affordance of specific design choices for enabling it. The only recommendation that we found is that encouraging discussion about group process is more productive than discourse about individuals’ actions (Kuhn, Capon, Lai, 2020).

Such theoretical background allowed us to be aware of the technical potentialities in the environment of the students to achieve their CABLE task. In section 4.4 we discuss this aspect on the basis of the available data, raising interpretative hypotheses about the perceived relevancy of the institutional formal environment provided for task completion, anticipatory and reactive emotional regulation of CABLE. Such discussion allows us to draw more specific implications of this research for future pedagogical design, in the concluding section (5).

3. Method: studying emotional regulation in a distant university CABLE task

Methodologically, our linguistic approach relies on in-depth qualitative discourse analysis paying attention to argumentative and collaborative markers. Rather than defining an a priori model of what good argumentation or genuine emotional regulation should look like, and trying to apply it to our data, we defined the relevant indicators in a dialogue between the data studied and the literature. The validity of our work is ensured in two ways. First, we are as transparent as space limit allows in giving concrete examples of how we apply our analytical categories to discourse units (cf. table 1 and excerpts in sections 4.2, 4.3), so that the reader can directly evaluate their relevancy, according to the epistemological principles of conversation analysis (e.g. Seedhouse, 2005). Secondly, we provide inter-reliability figures for the new analytical categories that we have designed (cf. table 2). In this third, methodological section, after specifying the pedagogical setting studied (3.1), we describe our multimodal dataset (3.2), our research questions and hypotheses (3.3) and present the analytical grid used for anticipatory emotional regulation (3.4).

3.1. Pedagogical setting: collaborative literature review through forum debate

We study an asynchronous online collaborative learning setting, as part of a distance master degree in Educational Sciences offered by a French university (2019-2020). As part of a specializing course in adult education, the teacher instructed students in their first year of master degree to work

collaboratively on a research question linked to adult education through asynchronous discussions, producing a literature review on the issue. The teacher, who is also a researcher and the third author of this paper, chose an asynchronous, simple Moodle forum, to organize his students' distant collaborative and argumentative work. He gave the following instructions about the online assignment: 1. work in groups of 3 to 5, 2. choose a topic linked to adult education, 3. read existing literature about the topic, 4. decide collectively on a research question regarding the topic, and, once stated, 5. answer it through a theoretical synthesis structured into a set of relevant hypotheses.

The teacher specified that each step had to be carried out through arguing in the group discussion space on the course Moodle forum. After 6 weeks, each group had to upload their deliverable on the forum, consisting of the group literature review report itself, and an individual complementary document for each member of the group (personal theme synthesis, a relevant hypothesis that was not selected for the group work, feedback on the teaching method, and 3 reading notes). The teacher also told the students that their participation to the forum discussion would be taken into account for their final evaluation. Hence, the use of the forum was here *prescribed* by the teacher as a key component of the task.

3.2 Profile of the participants & multimodal dataset

Every year, this course globally meets the goals set by the teacher, the students using the forum extensively for their discussions all along the task. In 2019-2020, the participants in the study are students engaged in a master degree of educational sciences, with a specialization in adult education. Most of them have previously followed the online bachelor degree in educational sciences. Many of them have chosen to enroll in this online program because it allows them to maintain a professional activity at the same time. The total number of students is 25, 75% of which are females, organized in 6 working groups. All of them were received in this course, the final scores ranging from 'quite good' to 'very good'. However, one group used the forum to call out for teacher external regulation, which draw our attention to the matter of emotional regulation of such task. We then initiated a research on the basis of the forum discussions of the 6 groups of the course, their final collective and individual reports, and the email some of the students exchanged with the teacher.

In this paper, we focus on the data related to two groups, including the one mentioned above in which great tensions had raised, putting forum discussion in perspective with final reflexive narratives on the collaborative work. We aim at analyzing what happened here (in group 2, consisting of 3 females), in comparison with another group where similar cognitivo-emotional tensions were self-regulated (group 1, consisting of 1 female and 2 males).

3.3 Research questions & hypotheses

In order to study how these two groups self-regulated emotions related to the CABLE task and understand why group 2 finally asked for teacher regulation, we structure our investigation around 3 research questions and 4 hypotheses.

First, we study how the two groups emotionally regulate the cognitive disagreement when conflict arises, which is to say, what are their *reactive emotional regulation* practices? (RQ1). In this respect, we hypothesize that conflict self-regulation differs between the two groups, explaining that one finally needs extra external regulation by the teacher (H1). To better understand the metacognitive practices at stake, we also question group differences in terms of *anticipatory emotional regulation*: can they help us better understand the socio-cognitive processes that the students are engaged in? (RQ2). Our second hypothesis is that each group presents a specific pattern of *anticipatory emotional regulation* before the conflict arises, providing more or less grounding for self-regulation once it burst out (H2). Our idea is that through such differences of anticipatory emotional regulation practices, groups may have achieved distinct previous working climate, which determined how they faced the socio-cognitive conflict. Our third, hypothesis is that a group fruitfully articulating argumentation on the cognitive plane and collaboration on the social plane through displaying appropriate emotions is more likely to self-regulate the task than a group that would focus on one single side of the conflict (H3).

Last but not least, we wonder to which extent does the institutional formal environment provided to the students afford both the completion of the CABLE task and its anticipatory and reactive emotional regulation (RQ3). Our hypothesis in this respect is that the environment designed by the teacher should allow for achieving all the dimensions of the activity, including its socioemotional one (H4).

Moreover, we designed a coding scheme, specifically to address RQ2 regarding anticipatory emotional regulation of CABLE, little studied as such so far. It is presented in the next section.

3.4 A coding scheme for anticipatory emotional regulation of CABLE

On the basis of previous literature and empirical observations, we designed a grid for analyzing anticipatory emotional regulation, specifically for this study. After a first draft based on the literature, we refined the coding scheme inductively at applying it to our data. By definition, *anticipatory emotional regulation* may occur at any time during group work, before conflict arises, at expressing disagreement or after a dispute was overcome, to prevent it from resurfacing. Theoretically, high quality *anticipatory emotional regulation* should frame collaboration on the long term, establishing a positive socioemotional climate, beneficial for CABLE. Table 1 presents the analytical categories created to study anticipatory emotional regulation with authentic examples of associated typical linguistic instantiations.

Table 1. Grid for individual and group anticipatory emotional regulation in CABLE

Level	Code	Definition	Examples of linguistic marks
INDIVIDUAL	level of participation	planning own work	first person (<i>I, my</i>) time marker (<i>tomorrow, Friday</i>) mentioning a task (<i>revising</i>)
	self-efficacy	valuing own work	<i>to + verb of the task</i> <i>fruitful, interesting, deep, contribution, progress, achieve, allow, clarify</i>
	reflexivity	self-correction, self-criticism, change of strategy	questioning work quality: interrogations verbs: <i>confess, need, should</i> time markers: <i>after + reflection, reading</i>
	perseverance	attitude facing a challenge (criticism, unplanned event, etc.)	repetition of own idea new content elaboration conciliation work: <i>alterning I and you</i>
GROUP	displaying a more or less collaborative and argumentative attitude	politeness	Calling: <i>names, colleagues, friends</i> Opening and closing: <i>hello, dear, bye</i>
		relating individual acts to group work	mentioning the status of contributions: <i>proposition, hypothesis, mean, elaborate</i> relating to previous contributions asking for feedbacks from others
		mitigating propositions (continuum from doubt expression to orders)	verbal mode (conditional, "shall",...) <i>maybe, quite, indeed, little, clear, necessary, obvious, propose, think, seem, look, consider</i>
		motivating others: valuing others' work, encouraging	<i>improvement, thank, relevant, efficient, good, clear, better, help, enrich, bring</i>
		criticizing others' ideas and work	<i>limit, not allow, not exhaustive, superficial, risk, weakness, only, just, not fully</i>
	referring to group activity	mentioning the task or the general sense of the activity	repeating or rephrasing words of the task mentioning a shared general objective (passing the exam)
referring to shared norms about what a good work is		norms about the assignment (structure, size) norms about collaboration (consensus) norms about the project (feasibility)	

		instrumental regulation by using affordant communicative technologies	meaning associated to synchronous conversation, the forum, or other media function of new threads
		planning group work	list of remaining subtasks time schedule dividing subtasks
		creating group rules to work together	on communication tools (=instrumental) on working methods on decision-making

Unusually, the corresponding codes are not mutually exclusive, allowing for attributing several functions to a single utterance, consistently with the multifunctional nature of utterances (Bunt, 2011). They apply to discourse segments of different sizes, based on semantic units. One thread (19 messages, 89 segments) was coded independently twice by the two first authors, with an average agreement of 89% and 99% after discussion, and a global average Cohen's kappa of 0,88. Since Cohen's indicator was made for mutually exclusive codes (Cohen, 1960), which is not the case here, we calculated inter-coder reliability considering two alternatives for each category (as if they were single separated grids): applying or not applying the code. The kappa for each code is inventoried in Table 2, together with the average kappa and kappa of each of the three global category of (1) individual anticipatory emotional self-regulation, (2) group anticipatory emotional regulation through attitude display, (3) anticipatory emotional regulation through referring to group activity.

Table 2. Cohen's kappas for the grid of anticipatory emotional regulation

Level	Category	Category kappa	Code	Code kappa	Average kappa
INDIVIDUAL	individual self-regulation	0,86	level of participation	0,70	0,73
			self-efficacy	0,84	
			reflexivity	0,49	
			perseverance	0,88	
GROUP	displaying collaborative and argumentative attitude	0,96	politeness	1	0,97
			relating to group work	1	
			mitigating propositions	1	
			motivating others	1	
			criticizing others' ideas	0,87	
	referring to group activity	0,90	task or activity	0,86	0,89
			shared norms	0,80	
			instrumental regulation	0,95	
			planning group work	0,94	
creating group working rules			0,92		

All the kappas are positive, indicating more agreement between coders than two random distributions would get. For all codes but one, the kappa are higher than 0,7, and for all but two they are higher than 0,8, the scores generally used to validate coding schemes in quantitative studies (e. g. Krippendorff, 2004). The code 'reflexivity' is the only one not validated by this measure, even if the inter-coder agreement rate for it was of 97%, with a kappa of 0,49. This may partly be explained by the fact that very few occurrences of this code were identified in the sample dataset

coded twice (3 in total). Still, kappas and average kappas at the level of the three larger categories are all above 0,7, most of the disagreement between coders occurring within the same categories.

4. Results: divergence of emotional regulation scenarios but convergence regarding the affordances of the institutional technological environment

After a quantitative overview of the discussions in the two groups (4.1), we look at what occurs at the very moment of the expression of disagreement, with the *reactive emotional regulation* undertaken (4.2), and then go back to what happened before, describing their *anticipatory regulation* practices (4.3). We then turn more specifically to instrumental emotional regulation, addressing the affordances of the institutional technological environment for CABLE both at the cognitive and metacognitive level (4.4).

4.1 Quantitative overview of the forum discussion in the two groups

The six groups wrote a total of 402 messages on the forum. Group 2 (n = 3, 3 girls) produced more content than Group 1 (n = 3, 1 girl, 2 boys) (Group 1: 51 messages, 10 266 words; Group 2: 126 messages, 18 889 words). Hence, Group 2 wrote nearly one third of all the messages of this course, using the forum a lot, as requested by the teacher. Therefore, its failure to self-regulate the conflict cannot be explained by low participation to the task. We hypothesize that such need for external regulation relates to the anticipatory emotional regulation practices developed in this group before the conflict (H2). To explore such hypothesis (H2), we chose to compare its activity of with the one of group 1, because it also comprises 3 students (most of the groups being of 4 members or more) and faced similar disagreement, occurring at the same stage of the assignment: the elaboration of a research question. Such a comparison is helpful, not as a controlled experimental study, but as an ecological research about how students deal with the emotional regulation of CABLE in an authentic setting when confronted to similar challenges.

4.2 Two reactive emotional regulation scenarios

These two groups faced strong disagreement at defining their research question, raising tensions, which led to different reactive emotional regulation scenarios, confirming H1. Please note that in the following empirical data, we changed students and teacher's names to preserve their anonymity, and translated their speech into English in a literal way, allowing for precise linguistic analysis.

4.2.1 Group 1: overcoming tensions through group emotional self-regulation

Disagreement arises between Djamel and Clémence from the 3rd message written on the 1st forum thread of the group "Themes and research question", about whether their work should focus on school or include non-formal education. Such disagreement, in messages 3 and 4, gives birth to well-structured and respectful argumentation from both sides. Clémence subsequently opens a new discussion thread "Research question and hypotheses", dedicated to this debate about the research question, but framing it in relation to the next step of the task, defining associated hypotheses. Djamel only answers in the initial thread (message 5), at 0h40, rendering the emotional tension explicit and expressing a feeling of low group efficacy associated to discouragement:

It is visible that we start again from scratch the discussion initiated from January 21st on WhatsApp and going on now on the forum.

On the one hand, he shows little individual self-regulation, his motivation decreasing facing this challenge, but on the other hand, he is at least able to express his feelings and does not just leave the discussion, allowing for others' reaction. Clémence is responsive and assertive, at 11h17 she explains that she is confident in the group progress, seeing disagreement as part of the collaborative learning process:

I think that we are advancing in our collaborative work but we just disagree. [...] About the research question, I propose you to use the other conversation thread do that we do not lose our ideas in the debate.

After addressing Djamel's emotions, she goes back to the task, inviting him to continue this discussion in the new dedicated thread. Doing so, she provides him with external regulation, both on the affective (motivating him), cognitive (referring to the task) and instrumental (creating a new thread) planes, displaying a very collaborative attitude. The day after, Izel writes his first message on the forum, directed to Djamel only, aligning with Clémence both on the content of their exchanges (he also believes that they should not limit their work to school) and on the invitation to react in the other thread:

To move on, I propose you to go to the discussion thread on the research question to define one related to our theme.

From that point, the exchanges about the research question take place in the dedicated thread, the instrumental regulation strategy being de facto accepted. Izel, also writes, at the same time, a message to the whole group in the 2nd thread, providing Clémence with a constructive critical feedback on the research question she proposed. She immediately thanks him for his contribution, and proposes a revised research question the day after. Two days later, she writes another, quite different proposition, that Izel refuses to consider, referring to a previous group agreement reached on Whatsapp:

Thank you for your effort Clémence, but I think it is better to stick to the research question that we discussed on Whatsapp, validated by Djamel. So for Djamel and I, we prefer to work on the following question [...].

Here Izel only directs his message to Clémence and writes on behalf of Djamel. Djamel reacts 2 hours later, elaborating on this question that he attributes to Izel only. But 6 days later, Djamel criticizes this proposition without providing alternative. After 3 days, Clémence invites the group to open one thread per concept, starting with "Appropriation", where she starts from the research question agreed on Whatsapp, showing that she finally aligns with the group previous decision recalled by Izel. When Djamel goes to this thread, he engages with the concept at stake without ever questioning this research question again, also implicitly accepting it.

This group proved capable of overcoming the tension raised by disagreement without falling into a dispute by expressing their emotions, using synchronous discussion when needed (Whatsapp), and establishing working rules on the collaborative process (sticking to consensual decisions, structuring the debate through discussion threads). In the final individual reports, the 3 students mention this challenge (Izel: "The main difficulty in our work was identifying a research question", Clémence: "I had difficulty in defining the research question", Djamel: "The 1st step from the theme to the research question took a lot of time"). Djamel even qualifies this disagreement as "stressful". But they all declare overall satisfaction with the collaboration: "mutual help and bienveillance", "very interesting debate" (Izel); "the exchanges were polemical but each time the exercise proved constructive" (Clémence); "a period of discussion, enrichment of knowledge, [...] argumentation, confronting viewpoints and sharing ideas and references" (Djamel).

4.2.2 Group 2: appeal to teacher regulation and recurring group conflict

Surprisingly, the very 1st message of the second group appears in the thread 'Needing clarifications Mr Charles', Coralie asking the teacher on January 1st whether the forum should be used to determine the research question or to debate once it is established through another media. This is surprising because Coralie could have emailed the teacher directly, the forum been rather dedicated to group exchanges supervised by the teacher. Actually, within the data of the 6 groups, it is the only case when the first message is not addressed to the peers but to the teacher. The teacher answers 12 days later that they can use another communication modality as long as they somehow

reflect their exchanges in the forum. On February 5th, at night, Maryse launches a thread dedicated to defining the research question. In her 1st message, she supports a proposition attributed to Noemie and rejects an idea from Coralie. The early morning after, the conflict arises with Coralie's reaction directed to Maryse only, attacking her personally by describing her attitude as not collaborative:

Hello Maryse, as I can see, from the beginning you decide what should be relevant or not, kept or not, whatever I can say. We are not your students Maryse, I do not call this a collective work. You speak on your name, you impose your ideas without nor waiting for Noemie's reaction neither considering my remarks.

After expressing such dissatisfaction with the collaboration, Coralie, in the same message, accepts the suggested question. She even elaborates on it in a following post. Two hours later, Maryse displays a high emotional reaction to Coralie's accusation, starting with "Woh!...", and feeling unfairly and publicly offended. Within an hour, Coralie reacts by sticking to her position and transferring the responsibility of the publicity of the conflict to the two other students for refusing synchronous exchange, implicitly proposing it for instrumental regulation. The group had already discussed on Discord, Maryse and Noemie then pressing Coralie to move to the institutional forum as she, in turned, wanted to stay on an informal channel. Coralie declares then that she is "ready" to "close this sterile debate" and "move on" from their question, adding related content in another post. Two hours later, Noémie tries to look neutral writing a message with impersonal and passive forms:

Exchanges with tension took place [...] If no online conference could take place, it is [...] because we lack time. Besides, we have the obligation to exchange on the forum [...]. And we will transcend this step by following our work on the research question.

Noémie's attempt to regulate the conflict is strongly based on the task instructions. She then proposes to structure their work by elaborating a content plan. After two days of "silence", the girls go back to work, the conflict seems over. But the thread ends one week later with Coralie rising doubt again about the research question. The same day, she also opens a new thread "Needing help Mr. Charles", where she asks for his advice both on group communication modality and on the research question. After 5 days, he answers by addressing the communication aspects only and suggesting, as Coralie did before, synchronous exchange to regulate group work:

it would be preferable, when naming people, [...] to do so in private. An email would have been a better choice. [...] sometimes, live exchange makes it possible to clarify doubts and misunderstanding. [...] I invite you to exchange quickly by phone, and I trust in you to solve the problems and find a consensus together intelligently.

The teacher then chooses not to answer about the cognitive problem of elaborating a research question, which is part of the group task, but insists on the affective plane by expressing that he is confident in the students' ability to manage the conflict. He also asks the group to let him know about its evolution after the synchronous exchange prescribed. Maryse then emails the teacher explaining that the relationship with Coralie has been "difficult" from the beginning and that she stopped communication on Discord, hoping that less "outbursts" would take place in the institutional forum, favoring politeness and respect. In her perspective, the forum was already a form of instrumental regulation. Noémie creates a new thread to plan a Skype meeting, taking place three days later. The day before, Noémie also emails the teacher, describing Coralie as disrespectful from the beginning, confessing that she is "little serene" about the synchronous conversation to come and saying that she will propose to divide the work in three individual parts, not trying to reach consensus on the content anymore. The conflict remains latent, having moved from the cognitive plane (disagreement on the research question) to a relational plane (opposing Coralie to the dyad of Maryse and Noémie). From Coralie's viewpoint, the two others exclude her to avoid engaging in a scientific debate because of her divergent opinion. On the other side, Coralie appears

as a traitor for having publicly disclaimed her peers and appealed to the hierarchy. Becoming mostly socio-affective, the conflict cannot be solved by the division of the work only, and it reappears continuously, any doubt or disagreement triggering emotional negative tension. The last thread of the forum, created one week before the deadline, is emblematic of this unceasing conflict rebirth: while it was supposed to host a few final revisions, it totalizes 25 messages and presents 3 “hot points” of overt disagreement threatening the still delicate collaboration. Discussion about the nature of patient-caregiver interactions fosters interesting arguments, but the students are not emotionally ready to constructively build on each others’ contributions: they let the author of this part of their assignment to maintain the controversial sentence or, as she finally does, to cut it off. The two other points reveal great mistrust within this group, dealing with naming or not the author of each part of the final document and the (more or less editable) format in which individual reflective reports should be gathered. In such reports, everybody expresses dissatisfaction with the collaboration: limited “group elaboration”, “misunderstanding”, “tensions” affecting my usual pleasure to debate, “emotionally difficult” in which I could persevere thanks to social support outside the course (Maryse); “when two people understand each other and the third one does not, then this student should be ‘shot’ because she constitute an obstacle for their work”, “frustration”, “discomfort”, “mutual misunderstanding”, “the law of the jungle” (Coralie); “laborious experience”, “conflict”, “some consensus could not be reached”, “the point of no return was reached” with public defamation (Noémie).

4.3 Two different anticipatory emotional regulation patterns

We applied our grid for anticipatory emotional regulation (3.4) to the forum conversations of the two groups. Results show different patterns that may explain their divergence in solving a similar conflict, confirming H2.

4.3.1 Group 1 anticipatory emotional regulation practices

Izel only contributes to the discussion after the conflict happens. At the individual level, unsurprisingly, since the work just begins, very little planning appears. Clémence is the student displaying the more self-regulation practices (the 2 own work planning utterances so far and most of the following ones), specifically in terms of self-efficacy (valuing her work 3 times). She also proves reflective (1 utterance) and once capable of insisting when not considered, doing so at the first person, emotionally expressing her ‘staying convinced’ that the research question should not be limited to school. Djamel only shows perseverance embodied in repeating twice his challenged opinion (focusing on school).

At the group level, politeness is very developed, either through institutionalized greetings practices (3 by Djamel, 11 by Clemence who totalizes all the 4 closing occurrences), systematic name signatures, and by warmly calling others. There is no reaction to any of the 4 spelling mistakes made on the names of Clémence and Djamel. They address the two others by calling them directly by their first names and Djamel gradually replace them by ‘colleagues’ or ‘group members’, emphasizing collaboration. Such ways of directly and explicitly addressing others gradually disappears from Clémence’s messages until reacting to Djamel’s message revealing the conflict, when she responds using his name again. Djamel also stops addressing them in his opening when expressing disagreement in his 3rd message. Later, when Izel steps into the discussion, he starts with ‘Good morning Djamel’ but includes the two students when posting in the second thread ‘Good morning Clémence, Djamel’ to signify the move from conflict regulation back to group work. Both students introduce their ideas mitigating them to express a collaborative intention (9 times); but Djamel also imposes his view three times with utterances like “I remind you that”. In turn, he refers 8 times to Clemence’s discourse as she only refers to his 3 times. He asks for others’ feedback three times in his first message, then stops; while Clemence asks for their reaction ending all her posts but one. She also mitigates more her propositions as tentative ideas to be modified through group work (7 times vs twice for Djamel), while he expresses them as unquestionable (19 times vs once for Clémence). The girl globally displays a much more collaborative attitude than the boy, but the two students pay attention to keep on motivating each other (Djamel does it 3 times, Clemence

twice). Consistently with such results, Djamel also displays an overtly argumentative attitude 4 times while Clemence only does it once.

Little group regulation deals with the activity, maybe due to the fact the work is just starting. Still, Djamel and Clémence both label twice the ongoing conversation as building up a research question. Working norms only appear when Djamel expresses a problem in his 3rd message: precision and feasibility, need for unceasing advancement. Clémence then stresses the norm that disagreement is part of the cognitive collaborative process, and Izel points out that the research question should be open and relevant. Three utterances instantiate instrumental regulation: Clémence using a specific post to summarize her reading and creating a new thread for the next step, Djamel declaring that what is discussed on Whatsapp should not be repeated on the forum, these last two practices becoming group rules. No time planning yet, but the students list remaining tasks: enriching the bibliography, observing and arguing about the link between training and employment, specifying the context, making and justifying choices.

4.3.2 Group 2 anticipatory emotional regulation practices

Only Maryse's first message preexists the expression of the conflict. Interestingly, it contains no politeness usual greetings, and mentions others only to distinguish between *their* previous ideas, one supported, the other rejected. Then, Maryse's collaborative attitude displayed by making the status of her proposition explicit, relating to previous contributions and asking for feedback is contradicted by the ending, directed to the group, but implicitly focusing on Coralie (supporting idea she rejects), about ratifying her choice (*Can we imagine launching our research about this question?*). Coralie treats such ambiguous message as a personal offense and conflict arises.

Even if the conflict reappears cyclically, group 2 succeeds in advancing arguments and counterarguments related to the task in moments of lull, when students' discourse shows more indicators of anticipatory emotional regulation. More specifically, from Noémie's reaction calming the conflict down to the time Coraline questions the new, collaboratively build research focus, and re-asks teachers' help, most of the 23 messages present politeness markers such as institutionalized opening (19) and closing (4) and signatures (11). In this phase, the students also directly address each other by their first name, specifically Noémie and Coralie (respectively 11 and 8 times), Maryse only writing "Noémie" and "Caroline" twice each. She rather does not designate them or uses "ladies" (twice), a word reused by Coralie 3 times. Noémie shows great concern for group cohesion and once writes "Good morning the two of you". The 3 students actively display a collaborative attitude in terms of relating to group work, specifically Coralie (31 utterances vs 18 for Noémie and 19 for Maryse), mitigating proposition (total of 90 occurrences, of which 42 are Maryse's) and motivating others, specifically Noémie (22 times vs 14 for Coralie and 9 for Maryse). But they are also pretty critical about others' ideas and work, Noémies' 3 negative feedback being directed to Coralie; as do 4 of Maryse's seven. Coralie is the one displaying the most challenging argumentative attitude, criticizing others' work 17 times. They also use gradually a more and more offensive tone, especially Coralie, who produces almost the same amount of affirmative (30) and imposing (27) verbal modes as mitigated ones (35).

Referring to group activity, there is a great consensus on the task itself, very often mentioned as a common ground (71 occurrences). Students also generally agree on the work norms mentioned (efficiency in a context of restricted time, keeping moving forward despite of doubts or conflicts, relevancy, basing arguments on literature, consistency, clarity, complementary in collaboration) and on the remaining tasks (defining the research question and hypotheses, structuring ideas, exploring the pros and cons of each hypothesis), even if they do not time plan yet. They emphasize group consensus and get to an agreement on the principle of dividing the writing into hypotheses (matter of task distribution raised by Maryse, division suggested by Noémie, accepted by Coralie). Only little instrumental regulation appears: Noémie defends the idea to use the institutional forum to communicate, Coralie asks the others to post precise references, and they start exchanging editable files through the forum.

4.3.3 Articulating the collaborative with the argumentative in group regulation

At the end of the day, practices of anticipatory emotional regulation are observed in the two groups, either before conflict arises or once it seems overcome (for real in group 1 but provisionally, in group 2, before teacher external regulation). At the individual level, the degree and nature of self-regulation differs from one student to another. For instance, some plan their work pretty much while others rather reflect on it or easily persevere when they face challenges. When individuals clearly express their feelings related to the ongoing task, it makes it possible for other members of their group to provide them external regulation at the level of the group, for instance by motivating them or providing them the feedback that they need. Still, such a regulatory configuration would only occur would there be enough trust in each among the group members. Here, it is the case for group 1, but not for group 2. Actually, the two groups rather succeed in self-regulating by referring to their activity (globally agreeing on the task, norms of quality, group planning, and at least some aspects of group rules and instrumental regulation). But discursive markers show that they unequally manage to articulate the collaborative and argumentative dimensions of the task. The discussion trajectory surrounding the conflict, regarding the display of collaborative attitude (messages in white), argumentative attitude (messages in black) and collaborative argumentative attitude presenting linguistic features of the two formers (messages in grey), is different from group 1 (figure 1) to group 2 (figure 2). Please note that in figures 1 and 2, the discussion threads appear in light grey blocks comprising individual messages (attributed to each student with the first three letters of the corresponding pseudonym), that can display an attitude either collaborative (white squares), argumentative, at least towards one of the other students (black squares), or mixt (dark grey squares). Time goes from the left to the right, and the arrows or vertical line stand for an immediate (continuous line) or indirect or delayed (dotted line) move to another thread or to another communicative tool. The informal synchronous tools used appear in light grey round forms. In figure 1, the students started to use Whatsapp before writing on the forum, which is represented by cutting the left part of the associated circle.

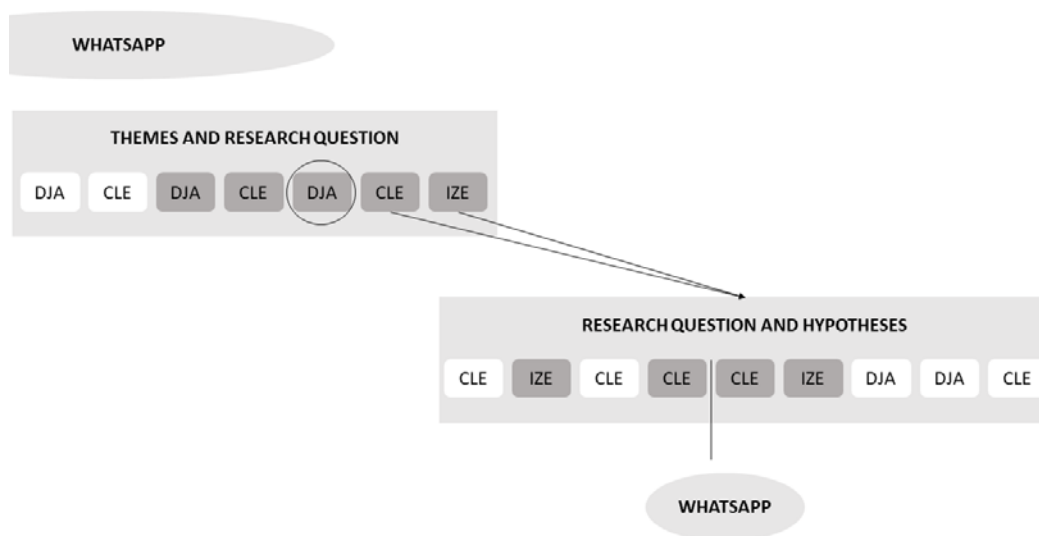


Figure 1. Group 1 discussion trajectory regarding emotional regulation in terms of argumentative, collaborative or mixt attitude display.

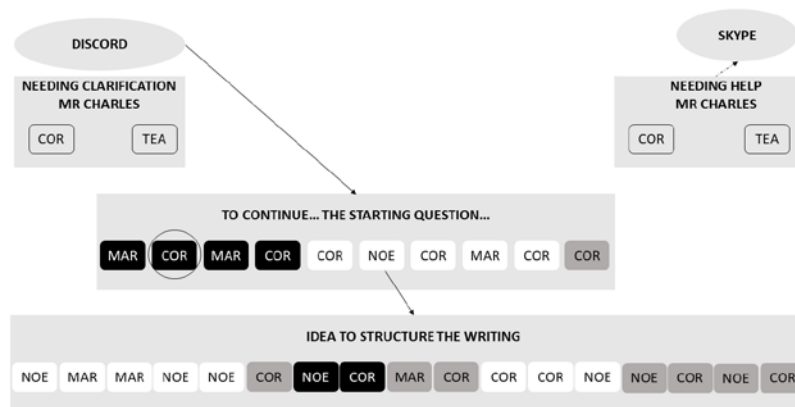


Figure 2. Group 2 discussion trajectory regarding emotional regulation in terms of argumentative, collaborative or mixt attitude display.

In group 1 (see figure 1), students spend a great effort from the beginning in displaying politeness and respect to each other's work by referring to what was previously argued, and sometimes motivate each other. When conflict arises (circled 5th message on the first forum thread), they build on these existing linguistic resources to reaffirm their willingness to keep on collaborating. Such positive working climate does not prevent them from expressing disagreement or negative emotions, but they do so without falling into personal attacks, recognizing that such tensions are part of the collaboration. The messages generally involves both the display of a collaborative and an argumentative attitude. In contrast, in group 2 (see figure 2), disagreement is directly associated with relational issues, either blaming Maryse, or later Maryse and Noémie on one side; or blaming Coralie on the other side, without perceiving it as a normal dimension of the CABLE task. The three of them do an extensive linguistic work to display a collaborative attitude, but mostly after the conflict happened (fully made explicit by the circled second message of the thread "To continue... the starting question"), only then using politeness terms. The girls succeed in decreasing the emotional tension this way, but they do so avoiding the cognitive issue about the definition of the research question. When Coralie tries to discuss it again, displaying a collaborative argumentative attitude, the others do not answer, and start elaborating a structure for the group writing, in a new thread. Even if she accepts such instrumental regulation move, and collaboratively take part to this new thread of discussion, she first asks for the teacher's help, and later directly questions the research focus again, first in a collaborative argumentative way, but with emotional tension rising again as she perceives Noémie's critical only reaction as an offense. Then, Maryse's both collaborative and argumentative message suggesting new ideas on the research question then seems to solve the problem, Coralie answering in a message on a similar tone, reaching a well justified agreement. But as the group gradually turns to displaying more mixt (collaborative and argumentative) attitude, emotional tension increases again with Noémie and Maryse discovering that Coralie has asked for teacher regulation. At the end of the day, in this group, the effort made to display a collaborative attitude alternates with very offensive argumentative contributions, presenting own ideas as unquestionable truth and strongly criticizing others'. Consistently with the perceptions written in the final individual reports, it seems that the anticipatory emotional regulation remains superficial in group 2, the collaborative features just serving to hide or limit the expression of an unceasingly resurfacing dispute. This alternation pattern between offensive argumentation and formally collaborative utterances makes the latest difficult to believe, in comparison with the more balanced and homogenous tone of interactions in group 1, collaboratively argumentative. Regarding H3, such results confirm that fruitfully articulating argumentation on the cognitive plane and collaboration on the social plane through displaying appropriate emotions is more likely to foster group self-regulation. To specify, this case study suggests that the form of displaying these two attitudes should be consistent through time in order to build and maintain trust within the group. In other words, if you never know whether you will get a motivating fruitful feedback or an offensive criticism from your peers, you cannot feel safe to collaborate truly in an argumentation-based task.

4.4 Convergence regarding affordances for CABLE and its emotional regulation (QR3)

The distant setting of the task studied led us to question the affordance of the digital environment, both in terms of task completion and its *anticipatory* and *reactive emotional regulation*. In particular, the forum discussions analyzed reveal students' perception of the possibilities offered by different instruments regarding emotional regulation of CABLE. In this section, we first address affordance of the institutional environment for the task itself (4.4.1), then for its *anticipatory emotional regulation* (4.4.2), and finally for its *reactive emotional regulation* (4.4.3).

4.4.1 An institutional environment affording scientific collaborative argumentation

The results detailed upper (cf. 4.1, 4.2, 4.3) show that the instructions provided by the teacher on the meaning of the discussion forum in the collaborative task allowed the affordance of this instrument at different levels: building arguments, relating and structuring them, discussing them, sometimes by constructing counter-arguments. To do so, the students used not only the forum itself but also its associated functionalities as creating different discussion thread, sharing files and internet links. Thus, the teacher could let the students be autonomous on the forum regarding completion of the task itself thanks to his clear prescription at launching the pedagogical script both about the expectations (problem, hypothesis, etc.) and the places of interaction. Even if he does not really interact with the students on the argumentative aspects of the task themselves, the students know that he has access to all their conversation on the forum and believe in his reliable presence, which motive them to do their best to develop robust proposals and counter-proposals based on precise scientific literature. In particular, group 1 created a thread dedicated to collect definitions and associated references for each key concept of their report in order to make it easier to establish their final bibliography but did not exchange files on the platform. On the contrary, group 2 made a great use of file exchanges to select the arguments and converge into a final common report in their last thread entitled 'document to finish'.

4.4.2 An institutional environment affording anticipatory emotional regulation of CABLE

Even if great differences appear between the two groups (cf. 4.3), the performances of group 1 from the beginning of their work, and of group 2 when engaged in collaborative phase or mixt phases (white and grey boxes in fig. 2), on the institutional platform show that it can afford *anticipatory* emotional regulation of CABLE. Thanks to unlimited space for writing, the forum allowed all the students developing subtle discourse in order to avoid offending each other at disagreeing or suggesting alternative propositions. This was embodied by greetings, varying the degrees of tentativeness of claims, valuing own and others' contributions, encouraging them to feel free to give their opinion and feedbacks, repeating an idea that has not been uptaken at first, planning own and group work, establishing group rules and rendering explicit a common ground of shared norms and vision of the task.

4.4.3 Failure to fully afford reactive emotional regulation of CABLE and need for informal synchronous complementary to the institutional environment

In turn, in terms of reactive emotional regulation, instrumental action was little undertaken through the institutional environment. Some of its functionalities were perceived as useful qualities by the students to embody their regulatory intentions and undertake corresponding actions. It mostly consisted in opening new forum threads altogether to distinguish between conversation topics and working steps, and to calm a "hot" discussion putting it into perspective with the global learning process to follow. Group 2 also dedicated discussion threads to regulation only, to exchange with the teacher or plan a synchronous meeting. But indeed, the provided formal environment proved not sufficient since reactive emotional regulation also needed to be facilitated by synchronous instruments, which use was even encouraged by the teacher as a way to solve the conflict in group

2.

5. Discussion and conclusion: how to foster emotional regulation of CABLE?

5.1 The need for *anticipatory* and *reactive* emotional regulation to reach a balance between collaboration and argumentation in CABLE

CABLE supposes the students to be able to collaborate arguing together, hence to let emerge a socio-cognitive conflict (Roschelle and Teasley, 1995) and regulate it fruitfully. In a French distant university course of adult education, we compared how two groups of three persons emotionally regulate their work both at the individual and at the group level, the first one reaching self-regulation while the second one has to call out for teacher regulation. The groups not only differ in the way they react to the conflict (our first hypothesis being validated), but also in terms of what we call *anticipatory emotional regulation*, their previous effort in creating a positive working climate (confirming our second hypothesis). More specifically, group 2 faced difficulties in articulating trustworthy the collaborative and the argumentative dimensions of CABLE, providing evidence of our third hypothesis, stating the need for such articulation to succeed in regulating CABLE on the metacognitive level. Group 2 finally turned to a cyclical dispute. In contrast, group 1 could regulate their conflict through using pre-established emotional regulation resources, as, for instance, kind ways of calling each other. Interestingly, as mitigated propositions expressing doubt are not always heard in face-to-face debates, even educational ones, tending to be associated with a low rhetorical style (Authors, 2019), the tentativeness of contributions here appears as an element of *anticipatory emotional regulation* favoring group reasoning by the display of a collaborative attitude.

Disagreement may only be handled constructively, both on the social and cognitive planes, if appropriate positive socioaffective climate is actively built and maintained throughout collaboration thanks to *emotional anticipatory* and *reactive regulation*. By showing how group emotional regulation occurs in such an ordinary CABLE setting, our research focuses on a literature gap and provides a fruitful conceptual distinction between anticipatory and reactive processes. It also contributes to making such theoretical framework operational for educational interaction analysis thanks to a grid describing anticipatory emotional regulation (cf table 1) and an illustrative case based on authentic excerpts of student discourse. Of course, the teacher plays a great role in triggering such positive climate in his initial orchestration of the activity (rules, task, communication tools, evaluation, time planning) which can be partly considered as *anticipatory emotional regulation*. He may also contribute to *reactive emotional regulation*, either by welcoming the display of emotions, providing students with affective support, stopping emotional expression to focus back on task, and adapting activity orchestration. His regulation in the present case appears as mostly instrumental, focused on communicative tools. Such attitude fosters *group emotional self-regulation*, consistently with the professional collaborative skills targeted for these students as future adult educators. Consequently, we reflected upon the technical environment that could foster autonomous emotional regulation of CABLE.

5.2 Designing and orchestrating a technical whole affording CABLE

The Moodle formal forum and associated functionalities was globally *affordant* here, allowing for correct task completion. Though, our study reveals that even if it did afford pretty well the CABLE exercise and associated *anticipatory* emotional regulation, it was not sufficient, in itself, to afford *reactive* emotional regulation. Indeed, reactive emotional regulation as well as part of task organization as a decision-making needed to be facilitated by synchronous communicative instruments. Actually, the two groups spontaneously started their work with such informal tools (WhatsApp for group 1, Discord for group 2). Thus, the affordance of the discussion forum should be understood as a 'liaison agent' for task completion within a technical ecosystem (Gibson, 1979; Norman; 1988) including the institutional forum and synchronous non-institutional digital tools. The role of the teacher seems essential here since, on the one hand, he authorizes the students to use synchronous tools, or even encourages them to do so when needed (cf. group 2); and, on the

other hand, he required that task-focused ‘scientific’ argumentation took place on the forum.

Our final interpretative hypothesis is that the discussion forum, e-mail and synchronous non-institutional tools altogether constitute a technical whole *affording* both CABLE and emotional group regulation. This is consistent with the literature: if asynchronous modality provides a fruitful space for collaborative writing, it also gives “fewer opportunities for informal team building” (Mabrito, 2006: 105) than synchronous tools. Collaboration could be richer if both synchronous and asynchronous environments take part to instructional design of online CABLE. Hence, it could then be relevant to ask the students explicitly, in the initial instructions, to use both the forum and the social media tools of their choice. Designers could even script specific synchronous phases of group work in alternation with asynchronous argumentation. In particular, regular synchronous group *discussions* along the 6 weeks of the present activity could directly address matters of anticipatory emotional regulation, for instance with prompting affective questions as Näykki and her colleagues did in the key phases of group work (Näykki et al., 2017).

References

- Andriessen, J., Baker, M. J., & Suthers, D. D. (2003). Argumentation, computer support, and the educational context of confronting cognitions. In J. Andriessen, M. J. Baker, & D. Suthers (Eds.), *Arguing to Learn: Confronting Cognitions in Computer-Supported Collaborative Learning environments* (pp. 1–25). Kluwer Academic Publishers.
- Authors, 2020
- Authors, 2019
- Authors, 2017
- Authors, 2016b
- Authors, 2016
- Bakhtiar, A., Webster, A., & Hadwin, A. F. (2018). Regulation and socio-emotional interactions in a positive and a negative group climate. *Metacognition and Learning*, 13(1), 57–90.
- Brown, P., & Levinson, S. C. (1988). *Politeness*. Cambridge University. Press.
- Bunt, H. (2011). Multifunctionality in dialogue. *Computer Speech & Language*, 25(2), 222-245.
- Cohen, J., (1960) A coefficient of agreement for nominal scales. *Educational and psychological measurement* 20(1), 37–46.
- Dascalu, M., Trausan-Matu, S., McNamara, D. S., & Dessus, P. (2015). ReaderBench: Automated evaluation of collaboration based on cohesion and dialogism. *International journal of computer-supported collaborative learning*, 10(4), 395-423.
- Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence, and computer conferencing in distance education, *American Journal of Distance Education*, 15:1, 7-23.
- Meyer, K. A. (2003). Face-to-face versus threaded discussions: The role of time and higher-order thinking. *Journal of Asynchronous Learning Networks*, 7(3), 55-65.
- Gibson, J. (1979). *The ecological approach to human perception*. Houghton Mifflin.
- Gweon, G., Jain, M., McDonough, J., Raj, B., & Rosé, C. P. (2013). Measuring prevalence of other-oriented transactive contributions using an automated measure of speech style accommodation. *International Journal of Computer-Supported Collaborative Learning*, 8(2), 245-265.
- Hadwin, A. F., Järvelä, S., & Miller, M. (2018). Self-regulation, co-regulation, and shared regulation in collaborative learning environments. In D. H. Schunk & J. A. Greene (Eds.), *Handbook of Self-Regulation of Learning and Performance* (2nd editio, pp. 83–106). Routledge.
- Isöhätälä, J., Näykki, P., & Järvelä, S. (2019). Cognitive and socio-emotional interaction in collaborative learning: Exploring fluctuations in students’ participation. *Scandinavian Journal of Educational Research*. 831-851.
- Isöhätälä, J., Näykki, P., & Järvelä, S. (2019). Convergences of joint, positive interactions and regulation in collaborative learning. *Small Group Research*. Online first.
- Isöhätälä, J., Näykki, P., Baker, M. J., & Järvelä, S. (2018). Striking a balance: Socio-emotional processes and argumentation in collaborative learning. *Learning, Culture and Social Interaction*, 16, 1–19.

- Järvenoja, H., & Järvelä, S. (2013). Regulating emotions together for motivated collaboration. In M. J. Baker, J. Andriessen, & S. Järvelä (Eds.), *Affective Learning Together: Social and emotional dimensions of collaborative learning* (pp. 162–181). Routledge.
- Järvelä, S., Järvenoja, H., Malmberg, J., Isohätälä, J., & Sobocinski, M. (2016). How do types of interaction and phases of self-regulated learning set a stage for collaborative engagement? *Learning and Instruction, 43*, 39–51.
- Jarvenoja, H., & Jarvela, S. (2009). Emotion control in collaborative learning situations: Do students regulate emotions evoked by social challenges? *British Journal of Educational Psychology, 79*, 463–481.
- Huang, Y., Zheng, X., & Kim, H. (2021). Effects of Scaffolding Types and Individual Metacognition Levels on Learning Achievement in Online Collaborative Argumentation. *Educational Technology International, 22*(2), 311-339.
- Kim, M. K., & Ketenci, T. (2019). Learner participation profiles in an asynchronous online collaboration context. *The Internet and Higher Education, 41*, 62-76.
- Koh, J. H. L., Herring, S. C., & Hew, K. F. (2010). Project-based learning and student knowledge construction during asynchronous online discussion. *The Internet and Higher Education, 13*(4), 284-291.
- Krippendorff, K. (2004). *Content analysis: An introduction to its methodology*. Second Edition. Thousand Oaks, CA: Sage.
- Kuhn, D., Capon, N., & Lai, H. (2020). Talking about group (but not individual) process aids group performance. *International Journal of Computer-Supported Collaborative Learning, 15*(2), 179-192.
- Kwon, K., Liu, Y.-H., & Johnson, L. P. (2014). Group regulation and social-emotional interactions observed in computer supported collaborative learning: Comparison between good vs. poor collaborators. *Computers & Education, 78*, 185–200.
- Lajoie, S. P., Lee, L., Poitras, E., Bassiri, M., Kazemitabar, M., Cruz-Panesso, I., ... Lu, J. (2015). The role of regulation in medical student learning in small groups: Regulating oneself and others' learning and emotions. *Computers in Human Behavior, 52*, 601–616.
- Lee, D.-Y., Yang, Y.-C. (2014). The effect of co-regulated learning activities on the improvement of self-regulated learning skills in collaborative learning environments. *Educational Technology International, 15*(2), 49-69.
- Mabrito, M. (2006). A study of synchronous versus asynchronous collaboration in an online business writing class. *The American Journal of Distance Education, 20*(2), 93-107.
- Näykki, P., Isohätälä, J., Järvelä, S., Pöysä-Tarhonen, J., & Häkkinen, P. (2017). Facilitating socio-cognitive and socio-emotional monitoring in collaborative learning with theory-based script. *International Journal of Computer-Supported Collaborative Learning, 12*(3), 251–279.
- Näykki, P., Järvelä, S., Kirschner, P. A., & Järvenoja, H. (2014). Socio-emotional conflict in collaborative learning – A process-oriented case study in a higher education context. *International Journal of Educational Research, 68*, 1–14. <https://doi.org/10.1016/j.ijer.2014.07.001>
- Norman, D. (1988). *The Psychology of Everyday Things*. Basic Books.
- Noroozi, O., Weinberger, A. & Kirschner, P. A. (2021) Editorial to the special issue: Technological and pedagogical innovations for facilitation of students' collaborative argumentation-based learning, *Innovations in Education and Teaching International, 58*:5, 499-500.
- Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-Regulation* (pp. 451–502). Academic Press.
- Pomerantz, A. (1984). Agreeing and disagreeing with assessments: Some features of preferred/dispreferred turn shapes. In *Structures of social action: Studies in conversation analysis*, Maxwell Atkinson & John Heritage (pp. 57-101). Cambridge University Press.
- Reed, E. S. (1988). The affordances of the animate environment : Social science from the ecological point of view. *What is an animal*, 110–126.
- Rogat, T. K., & Linnenbrink-Garcia, L. (2011). Socially shared regulation in collaborative groups: An analysis of the interplay between quality of social regulation and group processes. *Cognition and Instruction, 29*(4), 375–415.
- Rourke, L., & Kanuka, H. (2007). Barriers to online critical discourse. *International Journal of Computer-Supported Collaborative Learning, 2*(1), 105-126.

- Roschelle, J., & Teasley, S. D. (1995). The construction of shared knowledge in collaborative problem solving. In C. E. O'Malley (Ed.), *Computer-Supported Collaborative Learning* (pp.69-197). Springer-Verlag.
- Seedhouse, P. (2005). Conversation Analysis and language learning. *Language Teaching*, 38(4), 165-187.
- Stegmann, K., Weinberger, A., & Fischer, F. (2007). Facilitating argumentative knowledge construction with computer-supported collaboration scripts. *International journal of computer-supported collaborative learning*, 2(4), 421-447.
- Stoffregen, T. A. (2003). Affordances as properties of the animal-environment system. *Ecological psychology*, 15(2), 115–134.
- Suthers, D. D., Vatrupu, R., Medina, R., Joseph, S., & Dwyer, N. (2008). Beyond threaded discussion: Representational guidance in asynchronous collaborative learning environments. *Computers & Education*, 50(4), 1103-1127.
- Tawfik, A. A., Koehler, A. A., Gish-Lieberman, J. J., & Gatewood, J. (2021). Investigating the depth of problem-solving prompts in collaborative argumentation. *Innovations in Education and Teaching International*, 58(5), 533-544.
- Turvey, M. (1992). Affordances and prospective control : An outline of the ontology. *Ecological psychology*, 4(3), 173–187.
- Ucan, S., & Webb, M. (2015). Social regulation of learning during collaborative inquiry learning in science: How does it emerge and what are its functions?. *International Journal of Science Education*, 37(15), 2503-2532.
- Vogel, F., Kollar, I., Ufer, S., Strohmaier, A., Reiss, K., & Fischer, F. (2021). Scaffolding argumentation in mathematics with CSCL scripts: Which is the optimal scripting level for university freshmen?. *Innovations in Education and Teaching International*, 58(5), 512-521.
- Winne, P. H., & Hadwin, A. F. (1998). Studying as self-regulated learning. In D. Hacker, J. Graesser, & A. Dunlosky (Eds.), *Metacognition in educational theory and practice* (pp. 277–304). Lawrence Erlbaum.
- Wise, A. F., Hausknecht, S. N., & Zhao, Y. (2014). Attending to others' posts in asynchronous discussions: Learners' online "listening" and its relationship to speaking. *International Journal of Computer-Supported Collaborative Learning*, 9(2), 185-209.
- Wolters, C.A. (2003) Regulation of Motivation: Evaluating an Underemphasized Aspect of Self-Regulated Learning, *Educational Psychologist*, 38:4, 189-205.
- Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-Regulation* (pp. 13–39). San Diego, Academic Press.