Pre-print version of:
Andriessen, J., Baker, M.J. & van der Puil, C. (*in press*). Socio-cognitive tension in collaborative working relations. In S. Ludvigsen, A. Lund, I. Rasmussen & R. Saljo, R. (Eds.). *Learning across sites; new tools, infrastructures and practices*. London: Pergamon.

SOCIO-COGNITIVE TENSION IN COLLABORATIVE WORKING RELATIONS

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Introduction

In this book learning is studied in relation to the (institutional) context in which it is taking place. More precisely, the investigations aim to examine the tensions occurring when something new is introduced into a learning environment. Such tensions can be a potential source of learning (Yamazumi, Engeström & Daniels, 2005). At the dialogic level, one can observe participants confronting each other, in a more or less rational manner, by means of argumentation. Elsewhere (Andriessen, Baker & Suthers, 2003) we stated that participants confront "each other", rather than, for example, are confronted with "a societal question to be debated", as a means of insisting on the primacy of interpersonal confrontation over so-called "cognitive confrontation". Such a postulate turns, nevertheless, on a view of the microsocial and cognitive dimensions of interaction as two faces of the same coin of sociocognition, or here, socio-cognitive confrontation. In this paper we propose to explore confrontations at the socio-cognitive level by looking at the role of argumentation in collaborative interaction in learning settings. We choose to consider the specific case of argumentative interaction for two main and related reasons. Firstly, it is perhaps the most salient place to study the interplay of socio- and cognitive dimensions of collective activity, since confrontation of ideas can lead to making views explicit, and this can be associated with confrontation of persons and identities. Everyone knows

that a difference of ideas and opinions can 'degrade' into an emotionally charged dispute where mutual respect, self- and other-images are at stake; and also, that if arguers can deal successfully with the interpersonal aspect, they may in fact develop their ideas. Secondly, some progress has been made over the last ten years on understanding how argumentative interaction leads to cognitive change during cooperative learning (see several contributions in Andriessen, Baker & Suthers, 2003). One particular form of such learning is termed broadening and deepening a space of debate, whereby the result is a richer representation of ideas (Baker, 2004; van Amelsvoort, 2006). This last description of learning is what we have in mind when we study the learning effects of argumentation (Andriessen, 2005).

We do not want to claim that these micro-conflicts are the atoms of community progress, but they can be an important ingredient of such progress. Such progress can take place along radically different timescales, from seconds to weeks, months and years. The relationship between socio-cognitive confrontation and progress is also not necessarily one that is contiguous in time: a particular confrontation may be the source of an intrapersonal dialogue taking place over a time interval that goes well beyond the source interpersonal dialogue.

When two students work together in an educational context, they characteristically work on assignments selected by their teacher, and work with partners that they may know as a person, but not necessarily as a collaborator. Under such conditions a certain degree of uncertainty exists with the students concerning their collaboration, more precisely about the way they are going to work together to meet the requirements for the assignment. The issue at stake is that collaborating students, whether they are arguing or not, have at least two 'jobs' to do, they can not do one without the other: solve the problem, including resolving cognitive conflicts, and maintain a workable interpersonal relationship. They have a third, which is to coordinate actions. If an appropriate interpersonal relationship is not maintained, then students may not collaborate effectively on the cognitive level. If too much time is spent on the interpersonal relationship (for passing an agreeable time together, or because it is problematic), then the other job will not get done.

If precise theories and models of cognitive change are becoming more developed, this is less true with respect to the "socio-"side of sociocognition with respect to argumentation. We would like to focus on the socio-cognitive dimension of what we call the collaborative working relationship (van der Puil, Andriessen & Kanselaar

2003). The collaborative working relationship (CWR) is a notion we propose in order to characterise the manner and degree of maturity in which people collaborate in an educational context.

We examine a case of collaborative interaction between two 17-year old students[1], with the goal of presenting an illustration showing the socio-cognitive tensions that emerge during that interaction and to discuss how such tensions relate to learning in a particular educational setting and context. In particular, we elaborate on the idea of argumentative interactions leading to a type of learning we call broadening and deepening a space of debate. We show that the computer interface covers direct social emotional communication, which now takes place mainly through the argumentative interactions about the domain. This means that the learning experience can be seen as a game of tension/relaxation[2].

In what follows, we discuss argumentation and collaborative learning, leading up to a presentation of work in progress that aims to develop an interaction analysis method for understanding the interplay of socio- and cognitive dimensions of computer-mediated argumentative interaction in an educational setting. Our concluding discussion attempts to propose perspectives for our largely programmatic work.

Argumentation and collaborative learning in context

Collaboration and educational practice

Collaboration between individuals can serve numerous purposes. This is also the case for collaboration in learning contexts. What is seen as successful collaborative learning in such contexts is very particular to each specific situation. Neither in educational practice, nor in the research community, has a shared notion of successful collaboration been established (Dillenbourg, 1999; Koschmann, 2003). In addition,

[1] The research reported here was carried out within the SCALE project (Internet-based intelligent tool to Support Collaborative Argumentation-based LEarning in secondary schools, March 2001–February 2004) funded by the European Community under the 'Information Societies Technology' (IST) Programme, and was coordinated by Masoud Saeedi (Royal Holloway, London Univ.). The project is studying the effects of diagram-tools on the quality of interaction in computer-supported collaborative argumentation-based learning. More Information about the project can be found at: http://www.euroscale.net.

[2] This notion is in part inspired from work on narrative tension/relaxation structures in Western tonal music, for example as they are described in the seminal work of Lerdahl & Jackendoff (1983).

ideas about what kinds of knowledge (and to what extent) can be considered valuable targets for learning are changing, in theory (Lipponen, Hakkarainen & Paavola, 2004), and in practice (Kollias, Mamalougas, Vamvakoussi, Lakkala, & Vosniadu, 2005). For evaluating collaboration in educational practice this means that not only desired outcomes in a specific situation (and the ways they are supposed to be achieved) have to be clear but also the significance of such outcomes in the learning context, for the researcher, but more importantly, for the actors in the educational practice.

To illustrate how a learning context affects the goals for collaborative learning we use the scenario concept that was proposed by Andriessen & Sandberg (1999). The educational context for collaborative learning can be arranged or interpreted in a manner corresponding with a specific pedagogical scenario which represents a basic set of values, beliefs, goals, and assumptions about learning. Within a scenario, these basic reference points are "translated" into pedagogical models, guidelines, and practices. Andriessen and Sandberg identify three distinct learning scenarios for collaborative learning, namely transmission, studio, and negotiation. The identification of different scenarios assumes that a group of learners can study a similar knowledge domain along different dimensions.

The most important differences between the scenarios concern their conceptions of the purpose of education. In the transmission scenario, education should strive for the acquisition of knowledge and skills that is generalizable across domains. The main source of knowledge is the teacher (or authority), and negotiation mainly involves dealing with the norms and values of this teacher. The studio scenario upholds crucially different conceptions concerning the goals of education. Students here acquire metacognitive knowledge and skills requiring (among other things) the social and practical skills to collaborate with peers as well as with coaches (compare Paavola, Ilomäki, Lakkala, & Hakkarainen, 2003). In the negotiation scenario, students, in groups, are involved in activities that characterize and transform their practice. In the negotiation scenario, transformation involves careful negotiation, being absorbed in the process of co-elaboration of knowledge, by mindful and responsible use of discourse. The following table[3] shows the the pedagogical dimensions of the scenarios.

[3] Compared to Andriessen & Sandberg (1999), this table and the description of the goals of negotiation have slightly changed

Table 1

Different scenarios and different learning goals

Mission	Transmission	Studio	Negotiation
Acquisition of knowledge and skills	Drill & practice, lectures and reading	Collaborative, project-based learning	Knowledge transformation
Learning to learn	Generalization	Metacognition & reflection	Discursive practice
Learning to participate	Acquiring expertise	Social & practical skills	Negotiate and be responsible

Whereas learners' collaboration may evolve with each experience, learning itself also evolves, from transmission-reception towards learner management of knowledge and progress (Andriessen, Baker, & Suthers, 2003). Evaluation of collaboration at the individual level is insufficient; collaboration is a characteristic of the group. That is why the notion collaborative relation is developed: to grasp how a group collaborates. In this chapter, we mainly examine the minimal group: the dyad.

By introducing collaborative learning tasks that focus on knowledge elaboration and transformation in the regular classroom environment (characterized as based on transmission of knowledge), a discrepancy between two cultures is created, namely: the traditional perception of learning and the interactive culture of collaborative learning. Because of this discrepancy, learners need to adapt to this different culture (van der Puil & Andriessen, 2005). Contrary to the traditional learning situation in which a teacher dominates and structures the practice of learning and where all participants know what is expected of them, there often is no tradition of collaborative learning that can be observed in the everyday classroom. In other words, participants, when brought into a collaborative situation, do not have a clear idea about what their role is, and thus about how to behave in this type of situation. This perspective on implementing a collaborative learning task means that when students are placed in a collaborative situation, they do not by definition engage in collaborative learning.

Very divergent situations appear to be labeled as collaborative learning. Some are closely related to the traditional situation by for instance attributing a central role to the teacher (for instance Stahl, 2004) while others diverge so much that collaboration in their true sense is rarely achieved (knowledge building community (Bereiter 2003),

negotiation scenario (Andriessen, Baker & Suthers, 2003; Andriessen & Sandberg, 1999). What generally binds these perspectives is that learning is in one way or another perceived of as a shared active construction of knowledge that depends on the interaction between participants. Collaborative learning is used in this paper as a qualification of a peer relation, rather than that the term is attributed to a situation or to an electronic environment. The purpose of collaborative learning, in a long-term perspective, is the development of a professional culture of collaboration, that is, collaboration embedded in practices fostering negotiation of knowledge (see Allwood, Traum, & Jokinen, 2000; Allwood, 2000, for related ideas) The extent to which collaboration is successful in the shorter perspective is contingent on the particular demands of the situation.

Argumentation and regulation of collaboration

Argumentation in interaction, whilst it can enable knowledge co-construction (Baker, 1999) can be seen as a process that primarily favours knowledge "tuning" or restructuring, such as in the case of conceptual differentiation (Baker, 2002). Our working hypothesis in the current paper is that in addition to this cognitive tuning, we suppose, at the socio-cognitive level, a related process of relationship tuning. A study reported by van der Puil, Andriessen & Kanselaar (2004) reports data that show that after an argumentative exchange in a collaborative learning task, social repair was necessary, possibly to reinstate the collaborative working relationship. Hence, tuning at the cognitive level (conceptual differentiation) may be related to tuning at the socio-cognitive level (maintaining the working relationship).

To explain the complex processes happening during collaboration, a framework was developed that identified four regulatory forces that are acting upon the interaction: a) self-regulation, or participants reflecting and acting upon achieving personal goals; b) task regulation, where participants are conforming to task and contextual constraints; c) mutual regulation, where participants are pressed to share and explain in a social context (Bunt, 1995; Baker,1998) auto-regulation, or the regulatory force determining contributions coming forth from relational and interactional conventions and collaborative history. The manner in which these regulatory forces operate on collaboration depends on the educational context in a larger sense, setting the

objectives, norms and sanctions for the collaborative work, and providing the possibilities (scaffolds, rewards) for collaboration and building up relationships.

Van der Puil et al. (2004) distinguished progressive and conservative directions that regulation may take. The progressive force aims at working towards achieving the task goal, while the conservative regulatory forces primarily pay attention to what has happened before, especially (small) conflicts and misunderstandings. In a learning context in which collaboration still has to mature, at the relational level, the regulatory forces mutual regulation and auto-regulation could be described as conservative, self-regulation and task regulation as progressive. The last two relational forces can be manipulated by instruction, to achieve certain pedagogical goals, thereby changing the development of the interaction.

> *.... interaction driven by auto-regulation adheres to the established conventions coming forth from relational and interactional conventions. It thereby represents accepted interactional behavior, that is: grounded behavior. As [the collaboration] continues it can be expected to evolve by mutual regulation: new behavior becomes grounded because of the perceived need to explain deviant behavior. Consequently the mechanism of mutual regulation expands the behavioral repertoire within the relation in an evolutionary sense. [..] Auto-regulation and mutual regulation come forth from within the existing relation (van der Puil et al, p. 183).*

Within such an approach, argumentation can have a deregulating effect on the collaboration, which needs to be regulated in order for collaboration to proceed. Regulation can be conceived as a multifaceted process during which several objectives are at stake at the same time: learning, communication, interaction, efficient time-management, etc. It can be assumed that regulatory forces achieve equilibrium in mature collaboration, or that several levels of equilibrium may exist during the development of collaboration.

A proposal for a tension/relaxation analysis

In order to get a different understanding about the relation between argumentation and learning, from a socio-cognitive point of view we propose to take up the issue of the collaborative working relation. Two students, brought together into a new learning situation, have to establish a working relationship in order to be able to effectively collaborate and communicate by interaction. In the initial stages, such a relationship is

characterised by understanding of the situation, knowledge of the subject matter, and, most importantly their image of the other's estimation and respect. We suppose that the more the difference in knowledge, intentions, ways of communication, etc., the more tension is created in the working relationship, but also, the more mutual potential gain is present in the situation. On the other hand, too much tension is supposed to predominate the collaboration, at the cost of attention to the domain of reference. Tension should be released during collaboration, in order to focus attention on learning and problem solving. Although there are personality characteristics involved in tension/relaxation management, our focus is on the interaction itself, and how potential tension is dealt with by the participants.

We suppose that in a dialogue, utterances have potential tension raising or relaxing qualities, depending on various contextual characteristics (see also: Bales, 1950). In addition, such qualities may have an effect on the context itself, it can become more tensed or more relaxed. Supposedly, participants in a collaborative learning situation create a working relationship which functions under some desired level of tension. At the level of interaction, one may suppose that each participant contributes to this process by its utterances. In the context of computer-mediated communication, there are no other means for conveying intentions or communicating meaning than through written chat. Van der Puil, Andriessen & Kanselaar (2005) report some evidence that shows that the social dimension of communication gets lost when students communicate through chat. We do not suppose that negotiation at the social plane gets lost, but it may take place at a level that has not yet been captured in descriptive analyses (cf. Stahl, this volume).

As a first step, also inspired by previously discussed readings, we can look at the potential tension/relaxing of utterances likely to occur in argumentative interactions. First, the argumentative utterances, as described by Muntigl & Turnbull (1998), fall into the aggravation category, with different degrees of intensity: irrelevancy claims (so what?), challenges (why?), contradictions (no, I don't), and counterclaims (yes, but..). One may propose counterparts that reduce tension, but not necessarily as pairs that come together. Concessions, constructive contributions that build on what the other has said, or arriving at a compromise may count as tension reducing contributions. Explicit tension can be raised by personal attacks and sarcasm, while humour and polite consideration might serve as tension reducers. At the level of reactions, one may suppose that interrupting (if the CMC system allows that)_,

ignoring what the other said raise tension, while give the floor or explicitly reacting to the other may relax tension. On the other hand, persisting with a topic that is tense amounts to aggravating tension. Table 2 provides a overview, of these tentative, probably highly content and context sensitive tension/relaxation potentials of utterances in a learning dialogue.

Table 2

A proposal for tension/relaxation analysis criteria

Tension	Relaxation	Confirmation of CWR
Irrelevancy claims	Concession	Self/other disclosure
Challenges	Building	Dyadic pronouns
Counterclaims	Compromise	Motivating the other
Claim against doxa (contentious)		Joint purpose
Taking stance		
Questions		
Requests (for justification or clarification)		
Personal attacks	Humour	Conversational equality
Sarcasm	Consideration	
Interrupting	Giving a turn/time	Future orientation
Ignoring	Focusing	
Persisting	Change of focus	

In order to test the feasibility of these ideas, we examine an example of a collaboration interaction on these terms.

An analysis of the socio-cognitive dimension in electronic argumentative interactions

Our initial question was to examine the relationship between the face threatening quality of argumentative contributions and the depth of argumentation. To that goal, we examined a case of a collaborative learning dialogue between 2 students, which is part of an existing set of dialogues, a corpus assembled in the SCALE project by the French partner in Lyon (Baker, Quignard, Lund, & Séjourné, 2003). This project was about using collaborative graphs to support computer mediated argumentation (see, for example, van Amelsvoort, Andriessen & Kanselaar, in press). We take this

specific dyad, because it has been extensively analysed as an interesting case of broadening and deepening by collaborative argumentation (Baker & Séjourné, in press), but we felt the social dimension was at least as interesting.

Task sequence

The task sequence that the students followed has 4 phases:
Instruction: students are introduced to the notions used in argumentation (opinion, claim, argument, argumentative relation…) and experiment with the computer environment (a simple chat tool in this case).
Preparation for debate: the students are requested to read a number of texts about genetically modified organisms (GMO), which include the opinions of various participants in the debate. They are asked to fill in a table in order to represent (the space of debate) these opinions in terms of their argumentative characteristics. Then, they individually produce a ttext answering the question: "Should we allow production of GMO?"
Debate phase: the teacher pairs students which each other and they have to chat (by synchronous computer interface) in order to deepen their understanding of the domain for improving their texts. At the end of the session they are asked to summarize the main points of agreement and difference.
Consolidation phase: the students are asked to improve their texts written during phase 2, in the light of what was discussed.

The interaction case revisited

We will present the complete debate between Carla and Betty. Baker & Sejourne (in press) conclude that globally, Betty won the debate in the sense that she was able to counter the different arguments in favour of GMO raised by her partner. Carla mainly reacted to what Betty proposed, instead of defending her position. Only Betty raised counter arguments. Nevertheless, Carla changed the opinion expressed in her text afterwards to "in favour". This seems in opposition to her conceding to Betty's argumentation during the debate, and also against her including a number of those counterarguments in her own revised text. This leaves us with a question: why does Carla change her opinion in the opposite direction of her concessions during the

debate? To what extent was she really expressing her own opinions? Or to what extent did she do that in the revised text? The answer is to be found in our subsequent analysis of the socio-cognitive dimension. In our analysis, followed through sequentially from the beginning to the end of the interaction, we shall attempt to be predictive, i.e. to state whether tension needs to be released or increased, given the state of T/R so far. These predictions can then be validated in the ensuing analysis.

Sequence 1

The collaboration starts with a focus on interaction and social relation, showing that these participants know each other quite well, as we see personal, playful jokes. When Carla hesitates to clarify her opinion (which is that she is unclear), Betty teases her (31).

	Speaker	Utterance	Argumentation	CWR
10	Betty	Hi		
11	Carla	Hiya		
12	Betty	how's it goin?		R: conventional/ politeness
13	Carla	good and you?		
14	Betty	ok, so what about GMOs?		T: question
Q	Carla	and you?		R: giving a turn
16	Betty	no, you first		
17	Carla	you little rascal		R: humour
18	Betty	why?		
19	Carla	you'rre vicious		R: humour
20	Betty	oh don't get excited		
21	Carla	i'm just kidding		R: consideration
22	Betty	of course i know		R: self disclosure
23	Betty	ouououou		
24	Carla	no but seriously i'm half fig half grape	opinion	R: focusing
25	Carla	no but seriously i'm half fig half grape		
26	Betty	what?		
27	Betty	,,,,,		
28	Betty	????????		
29	Carla	i'm not for and i'm not against	opinion	
30	Carla	i have a shared opinion		

31	Betty	that's a good argument	T: mild sarcasm
32	Carla	what i really think is..;	
33	Betty	it's.....	
34	Carla	just a second i'm thinking	
35	Betty	take your time	R: giving time
36	Carla	thanks	R: politeness
37	Betty	no problem	
38	Carla	i'm sick of this	Self disclosure
39	Carla	there	
40	Betty	of what to think?	T: question

From the point of view of the cognitive dimension of argumentation, there is no tension increase, there is no opposition of opinion: only Carla has stated her opinion, and it is an open "neither for nor against" one.

In terms of relaxation, this is playful humour. The only small cloud on the horizon is Betty's slight sarcasm (31, 40). Now it is time to get down to the task, which is a debate, so we expect tension to rise …

Sequence 2

	Speaker	Utterance	Argumentation	T/R
41	Carla	there'll be a better production thus less famine	Argument	T: taking stance
42	Betty	yeah but if it's bad for the organism, then it comes down to the same thing	Counterargument	T: challenge
43	Carla	it will maybe permit us to create vaccinations against mucovicidose and i think that that is maybe a good thing	Argument	
44	Carla	there'll be - pollution and this is essential if we don't want to die	Argument	
45	Betty	yeah but they can create it without making all food and the rest genetically modified	Counterargument	T: challenge

After some hesitation, Carla comes with an argument (41: GMO → better production → less hunger). Betty immediately replies with a counterclaim (42: yes, but…), but it is a very forceful counterclaim, suggesting that Carla did not produce a serious

argument. This is supposed to raise the tension of the relationship: Betty suggests Carla has produced an irrelevant argument. Muntigl and Turnbull suggest now that Carla is supposed to react with aggressive support for her own claim when she feels threatened, while she could counter Betty's argument when she feels less aggravated. In this case she comes up with another argument for her own claim (43: maybe, maybe we can develop new vaccinations), which may support the face losing character of Betty's counterclaim which suggests irrelevancy.

Note that we interpret arguments from the point of view of the social dimension. That is, we do not infer from explicit acknowledgements of lost face, or increased tension, but we infer from the type of contribution, and most significantly, from its content as a possible irrelevancy claim. Our storyline reads that Carla tries another argument, in order to avoid further embarrassment. Betty wipes it off like the first time. It is the style that counts. She does not seem to require much effort, but, then again, it also is not very constructive what she says.

Carla has lost; Betty demolished her arguments without much further ado; we predict that Carla must 'get her own back'. Tension has built up, it must be released; but before it can be, Carla must re-establish equilibrium in terms of her self-image as competent and intelligent, and present herself as such. She needs to 'score some points' now.

Sequence 3

	Speaker	Utterance	Argumentation	T/R
46	Carla	but tell me i think you're against so explain why to me will you?	Request for challenge (changing burden of proof)	T: Request (for clarification/justification)
47	Betty	because it's bad for the human organisms	Counterargument	T: challenge
48	Carla	answer me		T: time constraint
49	Betty	and if we start with plants in 10 years at least it will be human beings' turn	Counterargument	T: challenge
50	Carla	to be modified?	Request (clarification)	T: Request (clarification)
51	Betty	yeah sure maybe we'll even be	Counterargument	T: challenge

		cloned		
52	Carla	yes it's true but ya know i am totally against cloning any individual	Concession	R: Concession
53	Betty	so am i of course	Concession	R: Concession

Then, in 46, Carla tries a different approach: reversing the burden of proof. Most positively, she asks Betty to explain herself and her position against GMOs. We may suppose that she asks this because Betty needs to explain to her why she considers her arguments as irrelevant, and by explaining she would have reduced the tension, because Carla would have been granted some attention by Betty reacting to her topic. Betty expresses her fear that one day humans will be cloned, but she does not really support that idea. Carla nevertheless concedes.

The previous prediction, that Carla must 'get her own back' is not validated (at least not yet). Here again, she has had to concede, and this is the second consecutive sequence that she has lost! So in terms of facework, things have got worse for Carla; but in terms of tension-relaxation, this is a sequence that lowers tension, since Carla concedes everything.

We therefore need to make a clear distinction between face loss/preservation and tension-relaxation: it is possible to lose (more) face and yet for tension — as it is manifested in the interaction itself — to remain on a reasonable level: here, tension seems to be balanced by relaxation (concession). This seems to be an early indication for a CWR that appears to be adequate. Despite the fact that Carla lost the last sequence, she is nevertheless able (and forced) to concede this sequence 'gracefully' and reasonably.

We predict that since two sequences have been lost by Carla, yet tension is at a reasonable degree, she must and will get even, but not by a very violent outburst.

Sequence 4

	Speaker	Utterance	Argumentation	T/R
54	Carla	why are you against GMOs? Isn't there a single positive argument in your opinion?	Request (clarification/ justification)	T: request

55	Betty	phhh maybe but nothing has been proved	Counter-argument	T: challenge
56	Betty	for the vaccinations nothing has been proved	Counter-argument	T: persisting
57	Carla	it's obvious that these are nothing but hypotheses at the moment but imagine just one instant if it worked don't you think that it would be a great step for mankind?	Request (clarification/justification)	T: request
58	Betty	yeah but they can succeed otherwise until now how have we done	Counter-argument	T: counterclaim
59	Carla	if gmos can help in many different domains i can totally for but	Argument	R: focusing
60	Betty	but?	Request	T: challenge
61	Carla	just a sec		
62	Betty	and then the flavour and the savour of food could be lost!	Counter-argument	T: challenge
63	Carla	you can't be sure of that!!!!!!!!!	Counter-argument	T: challenge
64	Betty	you can't be either for the vaccins!!!!!!!!!!!!!!!!!!!	Counter-argument	T: challenge
65	Carla	ok even score	Concession	R: concession

Carla now changes strategy (54): she asks Betty if she is so completely against that she cannot produce a single argument in favour. This is a clever strategy, it would give Carla ammunition to support her own point of view, which then becomes stronger. Betty bluntly refuses: cloning has not been proved. Carla insists, up to the point where she risks tension rising too high on Betty's side as well. Which happens, with as signals of tension the exclamation marks in 63 and 64. Carla concedes after this, without a similar sign from Betty, but it may be the start of a new strategy.

Betty would only concede when Carla shows some actual proof, of some achievement that would require GMOs. In order to come up with this, Carla has to be knowledgeable in the area, maybe she needs to consult her data sources. This extra effort (because that's what it is) may need some positive motivation on Carla's part, probably the possibility that it may get Betty out of her trench. But is may also be the case that the tension that is building up prevents some clear strategic thinking.

Carla's strategy to get some arguments in favour if GMO from her partner has failed. Tension has risen, but still seems under control. For the next sequence we predict that

Carla will try again, or else has to concede again, thereby confirming Betty's domination.

Sequence 5

	Speaker	Utterance	Argumentation	T/R
66	Betty	and after the genes in the human organisms could also be modified	Argument	T: counterclaim
67	Carla	that's not for sure.....	Counter-argument	T: challenge
68	Betty	if they eat genetically modified food	Counter -argument	
69	Betty	So		T: challenge
70	Carla	it's true that nothing has been proved but if it turned out to be true, and that no problems came of it then the utility would be multiplied by 100000000.....	Argumentation	T: counterclaim
71	Betty	and then what about the farmers what's going to happen to them???	Question	T: challenge
72	Betty	and nature what do you with her nothing is stronger than nature herself	Argumentation	T: challenge
73	Carla	every solution begins from hypotheses so why are you closing yourself up in this opinion??????	Counter-argumentation	T: challenge
74	Betty	Which opinion?	Question	T: request
75	Carla	it's true that nature is the work of Madam super nature	Concession	R: concession T: sarcasm
76	Betty	oh oh that's so beautiful		T: sarcasm
77	Carla	that you are against but it would be good if you would still admit that if it worked then it would be beneficial for everybody	Argumentation	T: counterclaim
78	Betty	if it worked on what*	Question	T: challenge
79	Betty	i'm telling you that if man starts with the plants, after they going to want to do more and it's going to degenerate and soon we ourselves are going to be	Counterargumentation	T: contradiction

		genetically modified and after it'll get worse as time goes on		
80	Carla	in the medical domain, in the environment, public health, food, economy	Argumentation	
81	Carla	but I completely agree with you	Concession	R: concession
82	Betty	as far as medicine goes i agree with you but	Concession	R: concession

Some argumentation takes place during this process, which we claim is triggered by Carla's attempts to get recognition for her point of view, without necessarily trying to prove that she is right. Carla is tense, as is shown by the question marks in 73: Why are you closing yourself up in this opinion????? Betty will not move from her stance, and Carla has somewhat saved face by telling her that.

Most arguments are produced by Betty, but she repeats herself a lot. There are some slight concessions in 79 and 80, but the most important contribution to tension/relaxation is in 86, where Carla changes the subject and Betty immediately goes along. In this case, no one's face is threatened, and the neutral state is immediately taken.

Carla is challenging Betty's reasonableness; she is implicitly accusing her of having a rigid point of view: she can say nothing in favour of GMOs, she concedes nothing to Carla, whereas Carla has conceded much, and presented her opinion initially as 'open'.

Sequence 6

	Speaker	Utterance	Argumentation	T/R
83	Carla	c'mon now we have to resume our discussion		R: focusing
84	Betty	for the environment and for food, i would really be surprised	Counter-argumentation	T: persisting
85	Betty	the synthesis is that you are for and i'm against	Conclusion	
86	Carla	(my throat hurts)		R: change of focus
87	Betty	are you sick?		
88	Betty	i wanna sleep!!		
89	Carla	you'll see you day that this system is	Argumentation	T: taking a stance

		put into work all the benefits that it will bring		
90	Carla	did you know that the prof is going to read our discussion the researcher just told me		R: change of focus
91	Betty	no i'm not as sure as you and for the moment most everybody is against so it's not going to happen right away	Argumentation	T: challenge
92	Betty	no that's not true	Counter-argumentation	T: contradiction
93	Betty	so are you for or against??????	Question	
94	Carla	look it's like piercing in the beginning everybody was against it but then people changed their minds	Argumentation	T: challenge
95	Betty	yes that's a fashion it's not the same this is nature that's on the line and the human organism	Counter-argumentation	T: challenge
96	Carla	i am for j300% in the only case that it doesn't cause any problems but they have to be sure 600%	Conclusion	R: concession
97	Betty	no i'm against 1000	Counter-argumentation	T: contradiction
98	Betty	%		
99	Carla	you put make-up on though so that's not natural it's more or less the same	Counter-argumentation	T: challenge
100	Betty	i am for		
101	Betty	no it doesn't go into the organism*	Counter-argumentation	T: contradiction
102	Carla	we gotta stop so see ya big kisses bye		R: change focus
103	Betty	ok bye kisses		
104	Carla	Garden~doa~		
105		Carla is no longer with us		
106	Betty	you're gone?		

The previous sequence ended with Carla's concessions, it is Carla all the time who concedes, and by this in fact she is regulating the relationship. Although she is fair to developing her own point of view, she is not able to make Betty change her role as an opposing every argument in favor of GMO. When tension gets too high because of that, Carla concedes. Nevertheless, we see that she develops her point of view, maybe

because she is not impressed by the repetitive nature of the opposition. Both contestants are able to adequately grasp their own point of view in a summary statement.

Note the change of strategy of relaxing the tension in 86, a complete change of focus, and Betty immediately follows that lead. After that, although the contenders firmly state their opinions, tension remains released and the debate end cheerfully, although there is no compromise, and many issues remain unresolved.

Discussion

The girls had a good starting point: a fun friendly interpersonal relationship. This enabled them to quite frequently disagree (it is known that students commonly avoid this) and to be able to 'live with' a relatively high degree of social tension.

At the beginning of the interaction, they rehearsed standard school arguments, but that were quickly refuted. It was only when the interaction 'got off the ground', and some degree of social tension arose, that they touched on, but did not manage to deepen, two crucial issues for conceptual learning: the nature of scientific proof and the concept of Nature.

Why were they not able to deepen their understanding, despite the good general relationship? There are at least 2 possibilities: these children do not commonly collaborate in school; they are friends, but have not developed a CWR. Secondly, a reason may lie in the educational setting; they did not have enough prior knowledge of the GMO topic to be able to collaboratively refine that knowledge. Plus there is the notion of the efforts invested: why bother if no one is going to rate this?

In this paper, a related possibility is put forward: they do not deepen because their working relationship does not allow it. That is, they go as deep as the participant with the least motivation decides, because their individual regulation is stronger than their mutual regulation. From an institutional viewpoint, his conception fits within a transmission of knowledge scenario, where individual cognition is preferred over collaborative elaboration. We return to this idea in the concluding section.

Summary of the analysis

When we look at the tension/relaxation pattern, quantified4 as the number of tension- minus the number of relaxation- statements and argumentation (in the same way quantified as the number of argumentative contributions) over time (figure 1) we seem to observe a complicated pattern.

Table 3

An overview of the main characteristics of the 6 sequences

Sequence 1	Carla expresses open opinion	Low tension, playful fun,
Sequence 2	Betty demolishes all of Carla's arguments	High tension
Sequence 3	Betty argues against, and Carla concedes	Lowered tension
Sequence 4	Carla asks Betty to clarify her ideas, but Betty refuses	High tension
Sequence 5	Carla challenges Betty's reasonableness but has to concede again	High tension
Sequence 6	Change of focus, summary statements	Low tension

One can picture this relationship as interweaved, tension increase sometimes seems to follow deepening in argumentation, and on other occasions, since tension takes time to 'die out', it can 'linger on' to the next argumentative deepening and interfere with it. Alternatively, we could say that the argumentation is deepened precisely because of such a high degree of socio-relational tension. Social tension sometimes precedes cognitive conflict: Carla is driven by the desire not to loose face, and therefore generates challenges in argumentation.

There can be a great distance between cognitive conflict and social tension. In a proper collaborative working relationship there should be a harmony between the two dimensions, which seem separate, but actually depend on each other. Instability is the default situation, and it can go in any direction. In a way we are talking about two separate dimensions: you have to relate (learning to collaborate) and do a proper task. In a CWR, people know how to deal with both.

[4] This means of quantifying is of course purely notional and illustrative of our analysis approach, at its present state of development. A more satisfying approach would involve estimating the degree of tension increase or decrease of specific types of moves.

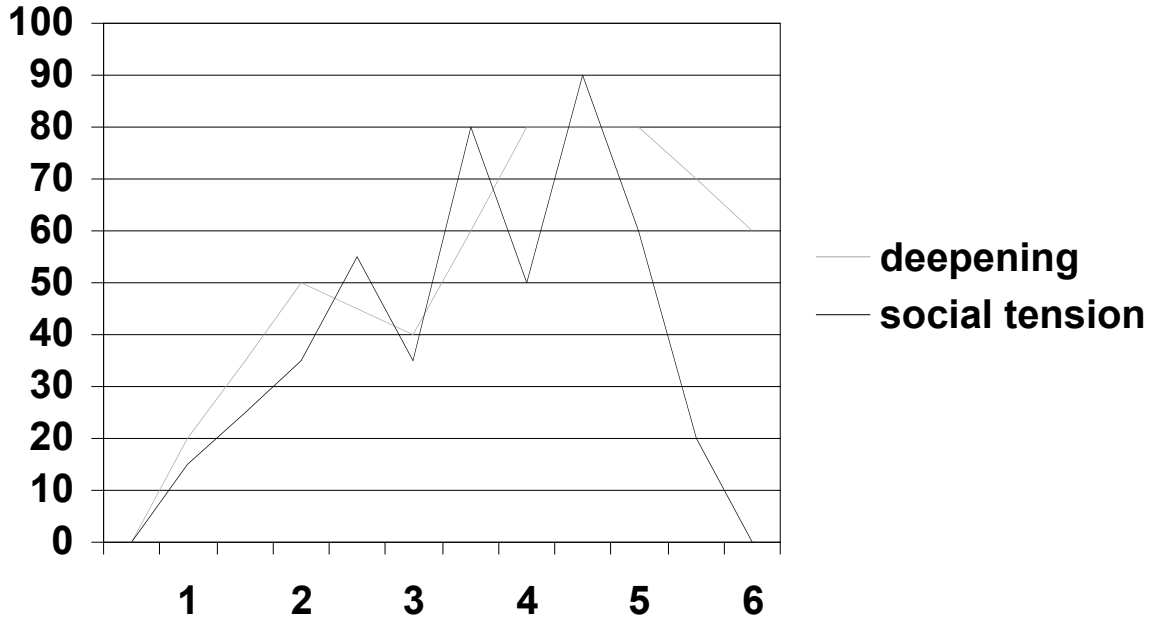

Figure 1: Depicting social tension and deepening by argumentation in the 6 sequences

Some conjectures

Within current institutional contexts, often characterised by knowledge transmission, collaborative learning can be seen as two individuals trying to solve a problem, leading to (sometimes unresolved) tensions. We propose to develop (in further work) a more systematic approach to the tension/relaxation analysis in order to investigate the following claims:

- In some problem solving interactions the production of arguments is not driven by participants actively looking for elaboration and better understanding of a domain, but it is driven by the tensions at the socio-cognitive level.
- Some tensions are the result of participants failing to arrive at a common understanding of the assignment and its procedures, or from other major differences between participants that manifest itself via a different understanding of collaboration and the working relationship.
- The negotiations of the working relationship as they unfold during electronic interaction can be described as a narrative, whereby the end is characterised either by tension/relaxation or by explosion.

- Argumentation in most traditional learning situation is interpreted by participants at the socio-cognitive level, and not at the rational cognitive level
- Most emotion in these dialogues is manifested in the arguments themselves: in their capacity as tension aggravation objects.

Conclusion

What about learning in collaboration? We conceived it here as learning in interaction, under the form of broadening and deepening understanding of a space of debate. This involves increasing cognitive conflict, and thus associated socio-relational conflict, and the other way round. We argued that inappropriate ways of dealing with or managing socio-relational tension will prevent this type of collaborative learning, and perhaps others. Also, we assume that the occurrence and inappropriate dealing with socio-relational tension is characteristic of educational systems focusing on individuals rather than on groups.

In a good CWR participants have learnt to manage the interplay between social and cognitive tensions; such knowledge can have a general aspect (there are some people who are 'good at working in teams'), and it may have an aspect that is specific to the collaborative partner(s) (how can tension be dealt with that person?)

What constitutes the appropriate level of tension is in part the result of the history of the specific CWR, as part of the educational context and shared personal experience of the participants. Developing a good CWR takes time.

You cannot have collaborative learning without having developed a collaborative relationship. Much collaboration requires establishing a CWR with (un)known partners, trying to understand each other, having to negotiate appropriate roles in specific learning contexts, requiring effort in establishing a shared history.

Our albeit programmatic considerations presented above can be seen as concrete illustrations of the inseparability of socio-relational and cognitive dimensions of interactions between persons. After all, a person can not be reduced to a pure cognitive processor, whether in interaction with others or not: we all require, and so must provide, consideration as and to persons, within a collaborative working relation, blossoming within an appropriate educational scenario.

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