

Original communication

Epistemic and relational conflicts in sharing identical vs. complementary information during cooperative learning

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When interacting on a learning task, which is typical of several academic situations, individuals may experience two different motives: Understanding the problem, or showing their competences. When a conflict (confrontation of divergent propositions) emerges from this interaction, it can be solved either in an epistemic way (focused on the task) or in a relational way (focused on the social comparison of competences). The latter is believed to be detrimental for learning. Moreover, research on cooperative learning shows that when they share identical information, partners are led to compare to each other, and are less encouraged to cooperate than when they share complementary information. An epistemic vs. relational conflict vs. no conflict was provoked in dyads composed by a participant and a confederate, working either on identical or on complementary information ($N=122$). Results showed that, if relational and epistemic conflicts both entailed more perceived interactions and divergence than the control group, only relational conflict entailed more perceived comparison activities and a less positive relationship than the control group. Epistemic conflict resulted in a more positive perceived relationship than the control group. As far as performance is concerned, relational conflict led to a worse learning than epistemic conflict, and – after a delay – than the control group. An interaction between the two variables on delayed performance showed that epistemic and relational conflicts were different only when working with complementary information. This study shows the importance of the quality of relationship when sharing information during cooperative learning, a crucial factor to be taken into account when planning educational settings at the university.

Key words: Conflict, interdependence, cooperative learning, university learning

A great deal of research underlines the beneficial consequences of social interactions on learning (Gettinger, 1992; Johnson, 1981). Social developmental psychologists conceive social interactions as a privileged opportunity for cognitive development. By making children interact in piagetian tasks (e.g. conservation tasks), and

assessing their developmental stage as regards this task before, immediately after, and few weeks later, researchers noticed that initially non-conservant children can give a conservant answer after the interaction, and that this progress is stable (Doise, Mugny & Perret-Clermont, 1975). They noted nevertheless that not all interactions

lead to progress (Mugny & Doise, 1978); this is only the case when, during these interactions, divergent points of view are actually confronted (Mugny, Doise & Perret-Clermont, 1975–76; Mugny, Giroud & Doise, 1978–79).

Conflicts and learning

In his theory of equilibration, Piaget (1975) suggested that the key for development is a breakdown in cognitive equilibrium, created by a conflict, a disturbance. This disturbance releases a “re-equilibration” process, through which children can reach a new and higher level of equilibrium. According to Piaget, this process is the result of an internal conflict between the children’s own responses. However, social psychologists have argued that this conflict, which is at the basis of development, can also have a social origin. Thus, it has been called a “socio-cognitive conflict” (Mugny et al., 1975–76). In fact, in social interaction situations, confrontation with a partner creates a double imbalance. This imbalance is both social (inter-individual) because it is a discrepancy between two persons, and cognitive (intra-individual) because it makes each individual doubt about his/her own answer. By solving the inter-individual conflict, children can solve the intra-individual one. In fact, in order to coordinate the different points of view, a cognitive work emerges from this socio-cognitive conflict, leading to a more elaborate level of reasoning. Many studies show effectively that it was when individuals could confront their points of view through a socio-cognitive conflict that they progressed after social interactions (Ames & Murray, 1982; Gilly & Roux, 1984; Mugny et al., 1975–76; Mugny et al., 1978–79). This is true for socio-cognitive development in children, but also for the quality of reasoning and learning in adults (Doise, Mugny & Pérez, 1998).

Two issues in aptitude tasks

From a similar point of view, conflict elaboration theory (Pérez & Mugny, 1993, 1996) specifies the mechanisms that occur in such learning situations, which are most of the time problem solving situations. Namely, it is specified that in this kind of tasks aptitude is at stake, since in problem solving participants are required to use a certain number of skills that are (or not) appropriate to solve the problem. In tasks where aptitude is at stake, such as learning tasks, two factors are particularly important: a) there is a correct answer but individuals do not know a priori which one it is; b) this type of task has a high level of social anchoring, since giving a correct or an incorrect answer ordines individuals in terms of ability (Butera & Mugny, 2001; Mugny, Butera, Sanchez-Mazas & Pérez, 1995; Quiamzade & Mugny, 2001).

Therefore, the occurrence of a conflict during an interaction in this type of task creates a double dynamic: Firstly, the conflict introduces an uncertainty concerning the validity of a solution, which is questioned by the existence of another possible solution. Secondly, the conflict is an opposition between individuals, which implies that one is right, and the other is wrong (or one is righter than the other). In other words, the uncertainty related to the solution to the task is enhanced by an uncertainty related to one’s own competences. Then, a conflict in these tasks implies two issues: one is to find the correct answer (“epistemic” issue, related to knowledge) and the other one is to show one’s own competence (“relational” issue, related to status) (Mugny & Butera, 2001).

The focus on one or the other of these two issues, in order to solve the conflict, depends on the threat that can be generated by the interaction (Falomir, Mugny, Quiamzade & Butera, 2001; Mugny, Butera & Falomir, 2001; Quiamzade & Mugny, 2001). In a non-threatening situation, e.g. when partners are evaluated on independent dimensions (Butera & Mugny, 1995), the epistemic issue prevails. To solve the conflict, individuals try to assess the validity of each proposition and to understand the problem by focusing their attention on the task. The conflict resolution is then called “epistemic” (Mugny & Butera, 2001). In a situation where individuals’ competences are threatened, e.g. when partners are in a competitive relationship, the relational issue prevails. Facing a conflict, individuals try to show that they are competent. When they feel competent, they try to assert their point of view and invalidate the other’s one, through a “conflict of competences” (Butera & Mugny, 2001). This conflict resolution is competitive because it is focused on the aim to prove his own competences (Johnson & Johnson, 1994). When they perceive the source as more competent than themselves, adopting its point of view through “compliance” allows them to protect their own competences (Quiamzade & Mugny, 2001). In both cases, conflict resolution is based on social comparison of the competences between self and the partner, which is a “relational” regulation of the conflict (Doise & Mugny, 1984; Mugny & Butera, 2001).

Epistemic vs. relational regulation of the conflict and cognitive activities

As for the effect of epistemic vs. relational conflict, it appeared that epistemic conflict is more likely to entail accuracy in problem solving and to produce long-term progress. For instance, when they observed interactions between children confronted to piagetian tasks, Carugati, De Paolis and Mugny (1980) and Mugny et al. (1978–79) noticed that only the participants who had solved the conflict in an epistemic way (namely, through confrontation

of points of view) progressed durably. The benefit of the conflict was lost as soon as children showed compliance (relational regulation of the conflict). Indeed, these two forms of conflict regulation correspond to different levels of cognitive activities and therefore to different outcomes in learning.

Many studies have already explored the cognitive activities resulting from those two forms of conflict regulation, by creating situations requesting individuals to focus their attention either on the task or on social comparison. A line of research (Butera & Mugny, 2001) has studied a situation in which the threat associated to social comparison is directly manipulated, in order to study the hypothesis that a non-threatening social comparison allows focusing on the task, thereby favouring accuracy, whereas a threatening social comparison induces focusing on the relationship, thereby deteriorating performance. In a study, participants who had to test a hypothesis in an inductive reasoning task, were confronted to the alternative solution proposed by another person (Butera & Mugny, 1995). Moreover, they were asked to allocate points of competence to themselves and to their partner. In a non-threatening condition, they had 100 points for themselves and 100 points for their partner. In a threatening condition, they had 100 points to distribute to themselves and to the partner; in this condition, allocating points to one participant withdraws them from the other, which corresponds to a situation of competition. Results showed that in the non-threatening condition participants allocated a moderate but equal number of points to themselves and to the partner, allocations that are positively correlated, showing that one's own competence can go along with somebody else's. This in turn produced an enhanced use of the most diagnostic strategy, confirming that participants were focused on the task. Conversely, in the threatening condition, a condition that prompts competition, allocations of points were largely asymmetrical and self serving, in a sort of protection of one's own competence. This focus on the relational conflict had detrimental effects on the resolution of the task, resulting in a lower use of the most diagnostic strategy.

The detrimental effect of competence threat has also been studied in cooperative learning interactions. Tjosvold and Johnson (1977) and Tjosvold, Johnson and Fabrey (1980) observed that participants who interacted with a confederate who defended an opposite position were better in perspective taking than those with whom the confederate agreed. During this opposition nevertheless, as soon as the confederate made a negative evaluation of the participant's competence, the participant tended to derogate the confederate more and was less open-minded, less interested in hearing more arguments than when the confederates gave a positive evaluation (Tjosvold, Johnson &

Fabrey, 1980). Moreover, they were less interested in learning and worst in identifying the confederate's type of reasoning (Tjosvold, Johnson & Lerner, 1981).

Moreover, Monteil and Chambres (1990) reported that the learning resulting from an interaction is better when the partner associated contradiction with amenity (expression of affability toward the partner) than when this amenity was not associated to contradiction. These two conditions nevertheless led to better learning than a condition where contradiction was associated with contrariety (expression of pique or dissatisfaction towards the partner). It can be supposed that being confronted by this type of feedback invited participants to focalize their attention on the relation, and not on the task, in order to solve the divergence. Indeed, the contrariety was introduced in their experiment through phrases such as: "This is obvious!" "You are wrong", phrases that can be seen as threatening for competences. Their results show that association between conflict and contrariety is the least favorable condition for learning.

Other work compared a cooperative learning method based on "controversy" (participants were invited to exchange on contradictory information and to change of perspective) to another one where the concurrence seeking was favored (Smith, Johnson & Johnson, 1981, 1984), as well as to a third method of "debate", where participants had to defend opposite positions but where a winner was declared (Johnson & Johnson, 1985). In general, these authors observed that, compared to the two other methods, controversy was beneficial for learning, relationship between partners, and psychological health (Johnson & Johnson, 1994; Johnson, Johnson & Tjosvold, 2000). In other words, a conflict is beneficial only if it is not associated with social comparison (in the debate condition, the aim is to be better than the others).

To sum up, the above work shows that a conflict, when it leads individuals to focus on the task and on problem solving – namely in its epistemic form – favours a thorough treatment of the task (diagnosticity, perspective taking, learning). The literature is less unanimous on the consequences of a conflict which focuses attention on social comparison of competences, namely a relational conflict¹. It seems agreed upon that relational conflict will lead to a more superficial treatment of the task than epistemic conflict. But does this effect merely corresponds to the cancellation of the benefits of epistemic conflict, or is it detrimental for learning? Johnson and Johnson (1993) and

1 Competition is not the only possible form of relational conflict (compliance is another one); however, we will refer to a relational-competitive conflict each time we mention relational conflict since in this study competition is what was induced through the "relational" manipulation.

Johnson et al. (2000) propose that acquisitions are “good” in the controversy condition, “moderate” in debate, and “low” in concurrence seeking. According to them, the relational feature would only reduce the benefit of the conflict. Other scholars argue that the effect is a cancellation of this benefit (Carugati et al., 1980; Mugny et al., 1978–79). However, Monteil and Chambres (1990) observe that the condition in which contradiction is associated with contrariety leads to a worse learning than the condition without contradiction. Moreover, a study by Butera, Mugny and Tomei (2000, Study 1) revealed that compliance in front of an expert source (relational regulation of the conflict) led to a lesser use of the diagnostic strategy than in the control group (without influence).

Thus, two mechanisms may be involved in relational conflict: First, the processes at the origin of the cognitive consequences of a conflict are not activated, which cancels its benefits. Second, relational conflict threatens the individuals’ competences, which leads them to move their attention from the task to social comparison. A general hypothesis could then be that the relational form of the conflict not only cancels its benefits but is also detrimental for learning.

Conflict and interdependence

In the above work, the relational resolution of conflict seems to be determined by the threat that the other’s competence represents for one’s own. This threat can be prompted by a representation of the task as having one single answer. Indeed, when there is a conflict in such a task, the fact that one person is right implies that the other one is wrong. In order to reduce this threat, individuals should perceive a certain degree of complementarity between each other, in such a way that both can be right. For instance, it has been shown that the introduction of task representation in terms of complementarity, through the idea that different points of view can be compatible (Butera, Huguet, Mugny & Pérez, 1994), allows the reduction of competence threat (Butera & Mugny, 2001; Butera et al., 2000; Quiamzade & Mugny, 2001).

A way to introduce, through the task, this representation of complementarity between partners is to share the resources between partners. Johnson, Johnson and Stanne (1989) and Ortiz, Johnson and Johnson (1996) have described “no resource interdependence” as the situation in which participants receive identical information, and “resource interdependence” as the situation in which each participant receives only one part of the information (complementary information). Two benefits of the sharing of complementary information (resource interdependence) can be underlined. The first is that it incites students to consider others as sources of information. The second ben-

efit is that it reduces competition issues and social comparison between students.

Gruber (2000) and Butera et al. (1994) noticed that, thanks to the perception of complementarity between self and partner, it appears as legitimate to rely upon the partner for information. Complementarity of information between partners (resource interdependence) means giving incomplete information to each one. The only way to have access to all the information and to understand the problem wholly is then to interact with the partner. Hence, the first benefit of sharing complementary information is that it makes interaction relevant; behaviours oriented towards information exchange can result from this representation of the interaction. Moreover, Lambiotte et al. (1987) suggested that sharing complementary information could favour the partners involvement in the task, interactions, and efforts towards explanation. In the same line, Buchs and Butera (2001) pointed out that interaction processes were more crucial when students shared complementary information than when they discussed identical information. Indeed, perceived quality of relationship modulated performance under resource interdependence condition, but did not affect performance under resource independence.

The second benefit of sharing complementary information between partners is that it reduces social comparison issues. Indeed, some studies on coaction underlined that participants compare to each other more when they work on identical (vs. different) tasks (Pepitone, 1972; Sanders, Baron & Moore, 1978). Indeed, participants who have access to the same information have the possibility to compare their performances, which is not the case when participants work on different tasks. This is also suggested by studies by Marshall and Weinstein (1984) and by Rosenholtz and Wilson (1980) in classrooms. Finally, Lambiotte et al. (1987) suggested that working on identical information involves, in addition to the motivation to understand the problem, a motivation to show one’s own competences. The latter can disturb the learner from task processing. Working on complementary information relieves individuals from these issues.

These two potential benefits of working on complementary information have been tested by Buchs, Butera and Mugny (2002). Analysis from videotaped students’ interactions (Study 1) revealed that working on complementary information favored participants’ involvement (more time allocated to give explanations, more questions, and more responses given). Moreover, positive reactions were more important, and negative reactions (e.g. expressed difficulties) were less frequent when students worked on complementary information than when they worked on identical information. On the other hand, discussing identical information enhanced disagreements,

and stressed stakes of competence, preventing participants from a constructive resolution of this confrontation. Self-report regarding perceived students' interactions (Study 2) showed that discussing complementary information decreased the perceived level of divergence, whereas stake of competence appeared to be a mediating variable in the detrimental effect of discussing identical information. To summarize, resource independence enhances relational issues, and seems to give to conflict a relational form.

Overview and general hypotheses

In previous studies, the relational or epistemic form of conflict has been invoked to give an explanation to the results. However, it has never been directly provoked. The first aim of this research is to provoke an epistemic vs. relational conflict in interactions, and to compare the consequences of these two types of conflict to each other, and to a condition where no conflict is introduced; this will be studied for learning, as well as for the perception of the interaction. Moreover, it will be explored how the way to distribute information (resource interdependence vs. independence) affects the perception of the interaction and the effect of the type of conflict on learning.

A conflict, in its epistemic form, may favour the relationship, and focus participants on the task, thereby leading them to better learning than when they are not confronted to a conflict. Conversely, a relational conflict may be detrimental for the relationship, and stress the relational activities of evaluation and comparison, and thus lead to a worse learning than the absence of conflict.

Moreover, the effects of the type of conflict may be modulated by the situation in which they take place. Resource interdependence should render the interaction more relevant, and therefore favour interactions and relationship. It should also reduce social comparison activities. In this situation, learning would depend on the form of the conflict. An epistemic conflict should lead to a strong and durable learning. A relational conflict should on the contrary deteriorate the performance. When participants have identical information (resource independence), two options may appear. Firstly, the relationship with the partner may be perceived as less relevant (independence), which may lead the participants to pay less attention to what their partner says and to the form in which this is said. Secondly, this situation may make social comparison salient. If the latter occurs, resource independence may give a relational form to all interactions. No differences should then be found between conditions.

Method

Relational vs. epistemic conflict has been introduced in interactions thanks to a confederate; an interaction without conflict (control group) was also performed. Dyads, composed by a participant and the confederate were asked to work cooperatively on two texts. In the resource independence condition (identical information), the participant and the confederate read the two texts. In the resource interdependence condition (complementary information), one participant read a text, the other participant read the other text.

Participants

One hundred and twenty-four first-year psychology students volunteered in the experiment, and were randomly assigned to one of the six conditions (from 19 to 22 participants per condition). In order to avoid man-woman dyads and thereby to prevent the interference of gender-related dynamics, and since the confederate was a woman, only women were recruited.

Procedure

The experimenter welcomed the participant and the confederate. She informed them that they would have to work cooperatively on two texts. The aim was to share their ideas about these texts in order to master the texts' content as much as possible. They were told that they would be asked to answer some questions about both texts after the interactions. Two roles were defined (Dansereau, 1988; Buchs & Butera, 2001): The "summarizer" had to explain the text to her partner as clearly as possible. The "listener" had to try to understand and, in order to facilitate her partner's explanation, ask questions and provide her own contribution. Each one (the confederate and the participant) was summarizer for a text and listener for the other.

The first 10 minutes were devoted to the reading of the first text. In resource independence conditions both partners read it; in resource interdependence conditions only the summarizer read it, while the listener read a text unrelated to the experiment. Then, during eight minutes of discussion, the partners had to interact according to the roles. The same procedure was carried out for the second text, but the roles were exchanged. Roles for each text, as well as texts order, were alternated. The participant and the confederate were then asked to answer, individually, a questionnaire aiming to evaluate the way they perceived the interaction, and to fill in a multiple choice questionnaire regarding the information contained in both texts. Four weeks later, participants had to fill in, again individ-

ually, the same multiple choice questionnaire, and were then debriefed in the presence of the confederate.

Materials

The texts the participants had to study were extracted from an unassigned social psychology textbook and rewritten in order to be easier and understandable by first-year psychology students. One text was about discrimination and prejudice, and the other about the categorization process and its consequences. Each of these texts presented three social psychology experiments.

Independent variables

Type of conflict

“Type of conflict” was manipulated in order to induce epistemic conflict vs. relational conflict vs. no conflict (control group). In each text, three key ideas were selected in order to introduce conflicts. For each idea, an argument had been elaborated. The confederate’s role consisted in introducing these arguments (both as listener and as summarizer) during the two phases of interaction. The argument’s content was similar in all the experimental conditions, but the way it was introduced differed according to the conditions. In the epistemic conflict condition, the confederate’s interventions stressed a search for accurate understanding. For example, she said “I am not sure I have understood the difference between those two conditions... Isn’t it the same thing?” or “It’s quite strange, I thought about it in another way, indeed [counter-argument], what do you think about that?”. In a relational conflict condition, the confederate’s interventions stressed competence issues. In this condition, the confederate suggested doubts about the participant’s competence, and tried to check the participant’s comprehension or to underline a lack of reflection and elaboration. For example, she said “You haven’t told me the difference between those two things... Presented like that, it is the same...”; or “For me it is quite clear, but I don’t know if you have understood it...”; or “And that doesn’t surprise you? Because there are some theories that postulate the opposite [counter-argument]. Have you never heard about it?”. In the control condition, the confederate reformulated what she had said or what the participant had said, in a non-conflictual form.

This script was followed very strictly, although taking into account the participant’s reactions. The time allocated to each argument (controlled by the experimenter), and the quantity of information given by the confederate were the same in the three conditions. To insure that participants evoked each pre-defined idea and therefore that the confederate could introduce the arguments, some points were underlined in the text, and the experimenter reminded

them the need to explain all the information in the text. When one of the pre-defined idea failed to be mentioned, or when conflict could not take place, the experiment ended and this participant was dropped from the sample.

Resource in(ter)dependence

The second independent variable was the in(ter)dependence of resources. In resource interdependence conditions, the participant and the confederate received complementary information: The participant read a text, the confederate the other one. In resource independence condition, the participant and the confederate received identical information (they read both texts).

Dependent variables

Learning (performance at the MCQ)

The main dependent variable is learning, measured by the mark obtained at a multiple choice questionnaire containing six questions per text, that is to say, 12 questions overall. The questions asked were related to the text. For example, a question was: “What is typical of stereotypes?”. One of the four proposed answers was correct (“knowing group belonging enhances perception of similarity among members”). The performance at this questionnaire was measured a first time just after the interaction (immediate performance) and a second time four weeks later (delayed performance). The marks ranged from -3 to $+12$.

Perception of the interaction with the partner

The perception of the interaction with the partner (i.e. with the confederate) was assessed by a questionnaire containing 23 items. For each of them, participants were asked to answer on a scale ranging from 1 (*very few*) to 7 (*a lot*) (the questions were for example: “regarding the relationship with your partner, in your opinion, what was the extent of...”; or “In your opinion, during the discussion with your partner, how much time has been allocated to the following activities within the dyad?”). Factorial analysis revealed the existence of four factors. The first one concerns the perceived amount of exchange between partners (ask for specifications, give clarifications, insure that the two partners have understood, try to explain as clearly as possible; $\alpha = .78$). The second factor contains four items measuring the perceived amount of divergences (expressing different points of view, defending and arguing one’s ideas, discussing a discrepancy, exchanging on a more difficult point; $\alpha = .79$). The third factor concerns relational activities expressed by participants (trying to impose one’s own point of view, challenging the partner’s answers, evaluating the partner’s competence, trying to appear as more competent than the partner; $\alpha = .78$). The last factor

concerns the perceived quality of relationship with the partner ($\alpha = .79$). It is composed by five positive items (cooperation, spontaneous agreement, agreement after discussing, quality of relationship, collaboration) and two negative items which have been reversed, so that a high score refers to a positive relationship.

Predictions

An effect of type of conflict is expected on the four scores of perception of interaction. More specifically, participants of the epistemic and relational conflict condition should perceive more exchanges, and more divergences between them and their partner than participants of the control group. Participants confronted to an epistemic conflict should perceive the relationship as more positive than the control group. Conversely, those confronted to a relational conflict should perceive the relationship as less positive than the control group. They should also perceive more relational activities than the two other groups. Moreover, participants who received complementary information (resource interdependence) should perceive more exchanges between themselves and their partner, but also perceive the relationship as more positive, and as containing less relational activities, than participants who received identical information (resource independence).

Regarding performance, participants in the epistemic conflict conditions should have a better performance than those of the two other conditions. Moreover, participants in the relational conflict conditions should have a worse performance than those in the control group. This should be the case for immediate performance as well as for the delayed one. Finally, an interaction between the two independent variables should show that the effect of the type of conflict (superiority of the epistemic conflict and infe-

riority of the relational one compared to the control group) is observed only when participants receive complementary information (resource interdependence). When they receive identical resource, the three types of conflicts should be equivalent as far as performance is concerned. These predictions are the same for immediate as well as for delayed performance.

Results

Perception of the interaction

A 3 (type of conflict: epistemic, relational, no conflict) \times 2 (resource: interdependence, independence) ANOVA was performed on each score of the interaction questionnaire. Means and standard deviations are presented in Table 1.

Perceived exchanges

A significant effect of type of conflict appeared on the perceived amount of exchanges with the partner, $F(2,118) = 12.05$, $p < .001$, $\eta^2 = .17$. Analysis of contrasts showed that participants in the relational ($M = 4.51$) and epistemic ($M = 4.86$) conflict conditions perceived more exchanges between them and their partner than participants in the control condition ($M = 3.76$), $F(1,118) = 10.29$, $p < .001$, one-tailed, $\eta^2 = .08$, for the relational conflict condition; $F(1,118) = 23.08$, $p < .001$, one-tailed, $\eta^2 = .16$, for the epistemic conflict condition. No differences appear between the two conflict conditions, $F(1,118) = 2.39$, $p = .12$, $\eta^2 = .02$. Moreover, an effect of resource distribution on the perceived amount of exchanges was expected, since exchanges should be more important in resource interdependence conditions. Indeed, participants who received

Table 1: Perception of the interaction (scores range from 1 to 7)

	Resource interdependence			Resource independence		
	No conflict <i>N</i> = 21	Epistemic conflict <i>N</i> = 21	Relational conflict <i>N</i> = 21	No conflict <i>N</i> = 22	Epistemic conflict <i>N</i> = 20	Relational conflict <i>N</i> = 19
Perceived exchanges	3.85 (1.19)	5.04 (0.99)	4.75 (0.99)	3.67 (1.09)	4.69 (0.99)	4.25 (1.03)
Perceived divergences	1.96 (0.91)	3.29 (1.01)	3.87 (0.94)	2.15 (0.76)	3.24 (1.13)	3.29 (0.97)
Perceived relational activities	1.65 (0.85)	1.61 (0.64)	2.32 (1.06)	2 (0.99)	1.91 (0.94)	2.53 (1.08)
Perceived quality of relationship	5.66 (0.63)	5.98 (0.64)	5.06 (0.88)	4.95 (0.87)	5.65 (0.63)	4.55 (0.67)

Note. Standard deviations in brackets

complementary information ($M = 4.54$) perceived more interactions between them and their partner than participants who received identical information ($M = 4.18$), $F(1,118) = 3.25$, $p < .04$, one-tailed, $\eta^2 = .03$. The interaction between the two variables was not significant ($F < 1$).

Perceived divergence

A significant effect of the type of conflict was also observed on the perceived amount of divergence, $F(2,118) = 29.41$, $p < .001$, $\eta^2 = .33$. Indeed, participants of the epistemic ($M = 3.26$) and relational ($M = 3.58$) conflict conditions perceived more divergences with their partner than those of the control group ($M = 2.06$), $F(1,118) = 33.14$, $p < .001$, one-tailed, $\eta^2 = .22$, for the epistemic conflict; $F(1,118) = 52.18$, $p < .001$, one-tailed, $\eta^2 = .31$ for the relational conflict. No differences appeared between the two conflict conditions, $F(1,118) = 2.22$, $p = .14$; $\eta^2 = .02$. Neither the effect of resource distribution ($F < 1$), nor the interaction effect, $F(2,118) = 1.71$, $p = .19$ reached significance.

Perceived relational activities

An effect of type of conflict was observed on the perceived amount of relational activities $F(2,118) = 6.14$, $p < .003$, $\eta^2 = .09$. As for these activities, the participants of the relational conflict condition are those who differed from the two other groups. Indeed, participants of this condition ($M = 2.42$) perceived more relational activities than those of the epistemic conflict condition ($M = 1.76$), $F(1,118) = 10.11$, $p < .001$, one-tailed, $\eta^2 = .08$, and more than the control group ($M = 1.82$), $F(1,118) = 8.39$, $p < .003$ one-tailed, $\eta^2 = .07$. These last two conditions do not differ from one another ($F < 1$). An effect of resource distribution was also expected. Indeed, relational activities should be more important in resource independence than in resource interdependence conditions. This effect was significant $F(1,118) = 2.84$, $p < .05$ one-tailed, $\eta^2 = .02$ and pointed out that participants who worked on complementary resource ($M = 1.86$) perceived less relational activities than those who worked on identical resource ($M = 2.14$).

Perceived quality of relationship

A significant effect of type of conflict on the perceived quality of relationship was observed $F(2,118) = 19.09$, $p < .001$; $\eta^2 = .02$. Participants in the epistemic conflict condition ($M = 5.82$) perceived a more positive relationship than those of the control group ($M = 5.30$), $F(1,118) = 9.91$, $p < .002$, one-tailed, $\eta^2 = .08$ and than those of the relational conflict condition ($M = 4.82$), $F(1,118) = 38.17$, $p < .001$, one-tailed, $\eta^2 = .24$. The latter participants perceived a less positive relationship than the control group, $F(1,118) = 9.76$, $p < .002$, one-tailed, $\eta^2 = .08$. Finally, an effect of resource distribution pointed out that participants who had complementary information judged the relationship as more positive ($M = 5.57$) than those who had identical information ($M = 5.05$), $F(1,118) = 15.36$, $p < .001$, one-tailed, $\eta^2 = .12$. No interaction between the two variables was observed ($F < 1$).

Learning (performance at the MCQ)

A 3 (type of conflict: epistemic, relational, no conflict) \times 2 (resource: interdependence, independence) ANOVA was performed on immediate and delayed performance². Means and standard deviations are presented in Table 2.

The type of conflict had a marginal effect on immediate performance, $F(2, 118) = 2.52$, $p < .09$, $\eta^2 = .04$. Contrasts showed that participants of the epistemic conflict condition ($M = 8.18$) performed better than those of the relational conflict condition ($M = 7.17$), $F(1,118) = 4.97$,

- 2 The 3 (type of conflict: epistemic, relational, no conflict) \times 2 (resource: interdependence, independence) \times 2 (roles: summarizer, listener) ANOVA on performance (immediate and delayed) showed neither a main effect of role, $F < 1$ for immediate performance, $F(1,118) = 1.68$, $p = .20$ for delayed, nor an interaction of role with type of conflict, $F < 1$ for immediate performance, $F(2, 118) = 1.07$, $p = .35$ for delayed, nor an interaction with resource distribution $F < 1$, for immediate and delayed performances, nor a three-way interaction $F < 1$, immediate and delayed performances. Therefore, role will not be taken into account in the analyses.

Table 2: Immediate and delayed performance (marks range from -3 to 12)

	Resource interdependence			Resource independence		
	No conflict $N = 21$	Epistemic conflict $N = 21$	Relational conflict $N = 21$	No conflict $N = 22$	Epistemic conflict $N = 20$	Relational conflict $N = 19$
Immediate performance	7.40 (2.47)	8.44 (2.40)	6.99 (2.05)	7.75 (1.74)	7.91 (1.67)	7.36 (1.61)
Delayed performance	7.12 (1.92)	7.79 (2.55)	5.75 (1.87)	6.74 (1.76)	6.19 (1.50)	6.42 (1.78)

Note. Standard deviations in brackets

$p < .02$, one tailed, $\eta^2 = .04$ and marginally than the control group ($M = 7.58$), $F(1,118) = 1.83$, $p < .09$, one tailed, $\eta^2 = .02$. The control group did not differ from the relational conflict $F(1,118) = .83$, $p = .18$, one tailed, $\eta^2 = .01$. The main effect of the type of conflict remained marginal on delayed performance $F(2, 118) = 2.77$, $p < .07$, $\eta^2 = .04$. The contrasts showed that the epistemic conflict condition ($M = 7.01$) led to a better performance than the relational conflict condition ($M = 6.07$), $F(1,118) = 4.42$, $p < .02$, one tailed, $\eta^2 = .04$. Moreover, this last condition led to a worse performance than the control group ($M = 6.93$), $F(1,118) = 3.96$, $p < .03$ one tailed, $\eta^2 = .03$. The epistemic conflict condition did not differ from the control group ($F < 1$).

No main effect of resource distribution appear, neither on immediate performance ($F < 1$), nor on delayed, $F(1,118) = 1.58$, $p = .21$. An interaction between type of conflict and resource was expected, since the effect of the type of conflict was to be observed only when participants received complementary information. This interaction is non significant on immediate performance ($F < 1$; $\eta^2 = .01$), but it is significant on delayed performance $F(2,118) = 3.51$, $p < .04$, $\eta^2 = .06$. Contrasts partially confirm our hypotheses, as shown in Figure 1. Indeed, a conflict led to a better performance in its epistemic form ($M = 7.79$) than in its relational one ($M = 5.75$) when participants received complementary information only, $F(1, 118) = 11.71$, $p < .001$, one tailed, $\eta^2 = .09$; when they received identical information, these two conditions did not differ ($F < 1$). Although the means seem to show that participants with complementary information who have been confronted to an epistemic conflict perform better ($M = 7.79$) than those who have not been confronted to a conflict ($M = 7.12$), this difference is short of significance, $F(1,118) = 1.26$,

$p = .13$, one-tailed, $\eta^2 = .01$. When participants had identical information, this difference is – as expected – not at all significant ($F < 1$). Moreover, the epistemic conflict, resulted in a better performance under resource interdependence ($M = 7.79$) than under resource independence ($M = 6.19$), $F(1, 118) = 7.04$, $p < .005$, one tailed, $\eta^2 = .06$.

As for relational conflict, it led to a worse performance than the control group when resources were interdependent ($M = 7.12$), $F(1,118) = 5.29$, $p < .02$ one tailed, $\eta^2 = .04$, whereas this was not the case under resource independence ($F < 1$).

Finally, it is worth noting that overall immediate performance ($M = 7.65$) is better than the delayed one ($M = 6.68$), $F(1,118) = 29.69$, $p < .001$, $\eta^2 = .25$.

Discussion

As expected, the type of conflict affected the perception of the interaction with the partner. The amount of exchanges and of divergences perceived is higher in the conflictual conditions (epistemic and relational) than in the control group. Conversely, only the relational conflict led to more perceived relational activities (evaluating the partner's competences, trying to impose one's own point of view, etc). Therefore, the difference between epistemic and relational conflict do not consist either in the quantity of interactions, or in the degree of conflictuality that each conflict involves, but in its form, with the relational conflict focusing more the participants' attention on the evaluation of the competences.

As far as the quality of relationship with the partner (the confederate) is concerned, participants who were con-

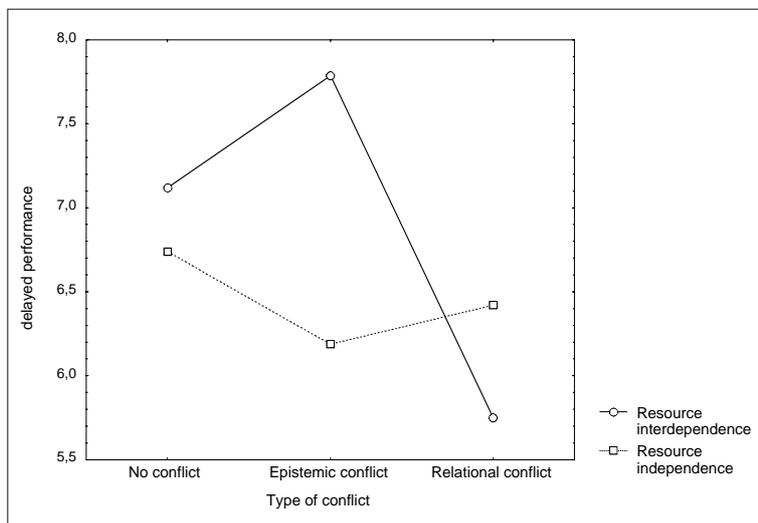


Figure 1: Delayed performance according to type of conflict and resource.

fronted to a relational conflict perceived the relationship as less positive than those in the control group, whereas participants confronted to an epistemic conflict perceived the relationship as more positive than those in the control group. It had already been shown, on longer periods, that learning methods based on controversy favoured interpersonal attraction and relationship, comparatively to methods based on concurrence seeking or debate (Johnson & Johnson, 1994; Johnson, Johnson & Tjosvold, 2000). The present results showed that merely one interaction based on epistemic conflict is enough to enhance a positive representation of the relationship, whereas an interaction based on a relational conflict leads to a negative representation of the relationship.

Moreover, as predicted by the literature on conflict resolution, conflict did not lead to the same level of learning whether in its epistemic or relational form. On the one hand, research has shown that an epistemic regulation of the conflict can lead to a deeper information processing than a relational regulation; this was observed through different methods such as post-hoc observation, (Carugati et al., 1980; Mugny et al., 1978–79), and focusing (or not) on social comparison or competition (Johnson & Johnson, 1994; Monteil & Chambres, 1990; Quiamzade & Mugny, 2001; Tjosvold, Johnson & Fabrey, 1980; Tjosvold et al., 1981). The present results, obtained by directly provoking relational or epistemic conflict, supported the same idea and extended it; it was shown that a conflict in its epistemic form is more favourable for learning than in its relational form. On the other hand, there was no consensus in the literature about the consequences of a relational conflict compared to no conflict situations. Indeed, existing studies did not allow to conclude that a relational conflict would lead to more (Johnson & Johnson, 1993), equal (Carugati et al., 1980; Mugny et al., 1978–79) or less (Butera et al., 2000; Monteil & Chambres, 1990) learning than the absence of conflict. Results of the present study support the third option. Indeed, after the delay of four weeks, the relational conflict led to a worse learning than the control group. This sort of conflict was not only unfavourable for learning, but also detrimental. This points out an important difference between studies carried out in the tradition of social developmental psychology (Carugati et al., 1980; Mugny et al., 1978–79) and the present study, regarding the relational regulation of the conflict. In this experiment, relational conflict deteriorates delayed performance, whereas in above mentioned studies, relational regulation cancels the benefit of conflict (making it equivalent to the absence of conflict). In these studies, the relational regulation of the conflict corresponds to compliance, a way to avoid the conflict in order to maintain a positive relationship with the partner (Doise & Mugny, 1984). What was provoked in the present study, in the re-

lational conflict condition, is quite different, since it is an attack to the participant's competences, inviting them to solve the conflict in a defensive way. We can suppose that those two types of relational regulation of the conflict do not lead to the same cognitive activities. Avoiding the conflict through compliance means to avoid the cognitive activities of coordination of points of view (epistemic resolution). This avoidance may then cancel the benefits of interaction. Solving the conflict in a defensive way means on the contrary to charge the cognitive system with additional work in order to prove one's own competence. This cognitive load may therefore interfere with the task processing, and be harmful for learning. The comparison between compliance and defensive behaviour in relational conflict, here rather speculative, seems very promising for understanding the lack of progress in cooperative interactions; future research is on the way to directly address this issue.

Regarding the comparison between epistemic conflict and control group, it was expected to replicate the beneficial consequences of the epistemic conflict on learning (Ames & Murray, 1982; Doise et al., 1975; Gilly & Roux, 1984; Mugny et al., 1975–76; Mugny et al., 1978–79; Smith et al., 1981, 1984; Tjosvold & Johnson, 1977, 1980). However, in this experiment, the difference between participants who have been confronted to an epistemic conflict and those who have not been confronted to a conflict is only marginal on immediate performance, and not significant after the delay. It seems that participants of the epistemic conflict condition have not learned as much as expected. A possible explanation is suggested by an experiment by Mugny et al. (1978–1979), in which the strength of the conflict was manipulated. The conflict, provoked by a confederate, was either "strong" (the confederate and the experimenter insisted on the divergence), or "weak" (the confederate simply evoked the divergent solution). In a control group, there was no conflict. The results showed that only the strong conflict condition led children to progress. The mere presentation of the divergence (weak conflict) was not enough to induce progress. On the basis of these results, it is possible to argue that in the present experiment the epistemic conflict provoked was not strong enough to improve learning significantly. This hypothesis as well will be put to test in further research.

Results also showed that – as expected – resource distribution modulated the outcome of the interaction, and the effect of the conflict. Two benefits were expected in the resource interdependence condition: Firstly, that interdependence would render the interaction relevant from the participant's point of view (Butera et al., 1994), which would favour exchange activities and cooperation (Buchs et al., 2002; Lambiotte et al., 1987); secondly, that inter-

dependence would reduce social comparison issues, which may be threatening when partners receive identical resources (Buchs et al., 2002; Pepitone, 1972; Sanders et al., 1978). A higher amount of perceived exchanges between oneself and the partner when participants receive complementary resource supported the existence of the first of these benefits. A less positively perceived relationship, and a higher amount of perceived relational activities, when participants receive identical resources give support to the existence of the second benefit.

As for performance, it should be noted that no main effect of resource distribution was observed. Despite the fact that participants, when they received complementary information, did not have access to the whole information (they only read one text), they performed as well as those who had read the whole information, that is both texts (in the independence condition). Moreover, the absence of an effect of role (listener vs. summarizer), and of an interaction between resource distribution and role, allows to consider that participants have not been penalized by not reading the text for which they were listeners in the resource interdependence condition. This can be explained by the fact that the confederate's explanation was very clear and allowed the listeners to understand the text to the same extent as they would have understood it if they had read it. This may also explain why participants who were in the epistemic conflict condition did not really progress, comparatively to the control group: The quality of the confederate's summary was maybe such that it produced a sort of ceiling effect.

Performance underwent a deterioration effect in the delay that separated the first from the second measure. Four weeks later, only the information that had really been integrated had remained. This allows to understand why the expected interaction between type of conflict and resource distribution appears only on delayed performance. In this experiment, participants all performed well at the immediate test (in average, three or four wrong answers out of 12), certainly because the time that separates the explanation (during interaction) from the measure was very short. Therefore it is not on immediate learning that participants differentiate from each other, but on durable learning, the one that remained after the delay. On this latter measure, the resource distribution mode affected the effect of the type of conflict.

In Johnson and Johnson's (1994) opinion, conflict have an effect on learning only if they take place in a context of real cooperation. Results support this idea, since the expected impairing effect of relational conflict appeared in the interdependence condition and not in the independence condition. It seems that an independent mode of distribution of resources prevented participants from perceiving complementarity between them and their partner (this is

why participants of this condition perceived less interactions), and at the same time it enhanced social comparison activities (this is why participants perceived more relational activities). Participants in this condition were therefore insensitive to what the confederate told and to the way she told it. All interactions, whatever their initial form (conflictual or not, relational or epistemic) focus attention on the relational aspects more than on the task, which makes all interactions equivalent for learning.

Although this study has not reproduced the beneficial consequences of an epistemic conflict on learning, it has underlined two important issues. Firstly, it showed that a conflict can deteriorate learning if it is a relational conflict, based on the threat of individual competences. Secondly, this study has underlined the importance of the context of occurrence of conflict. Indeed, it showed that as soon as participants work on identical information (in resource independence conditions), relational activities are enhanced, there are less interactions, the relationship is perceived as less positive, and all sorts of interactions are equivalent for learning. These results are relevant to the understanding of learning processes at the university, particularly those involving teamwork. Indeed, all situations that require students to work together – e.g. exercises, lab classes, group assignments, etc. – challenge the teacher to set the conditions that will favour a durable learning, and to avoid those that will impair it. The results presented above suggest that the type of resource distribution – that the teacher controls by assigning the pedagogical materials – has an important impact on the effect of the various conflict that may arise during students' interactions. In fact, it appears that there might be a problem whenever, for lack of resources or limited access to them, the teacher has to distribute the pedagogical materials in such a way that students hold complementary information. Our results suggest that, in this case, students will be particularly sensitive to the quality of relationship with their fellow students, and that their work will be impaired by a relational conflict. Unfortunately, competition among students is still sometimes a class setting implemented by teachers, at least in the French system. Applied research will tell if these results can be of any help.

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