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COHERING WITHOUT CONVERGING: STUDENTS' USE OF *DOXA*, NORMS AND VALUES WHILE DEBATING ABOUT SSI (MEXICO, USA, FRANCE)

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Abstract: Socio-Scientific Issues have become legitimate objects for science education research (e.g. Aikenhead, 1992; Gayford, 2002; Kolsto, 2001; Simonneaux & Simonneaux, 2009; Zeidler et al., 2005). They require that students elaborate their opinions, both by mobilizing their knowledge and by making political and/or ethical choices. However, implementing such pedagogical situations at school raises questions for teachers and some fear that such debates could end up becoming a relativistic empty fight of opinions (Albe, 2009). Our study of a corpus of 10 debates about drinking water management in Mexico, the US and France shows that students do not necessarily fall into this trap. They use principles (*doxal laws*, *procedural norms* and values or *fundamental norms*) that are strongly established within their respective communities to argue and evaluate each other's arguments.

We first show an inventory of the principles observed in our corpus, distinguishing 1) "doxal laws", knowledge or beliefs based on *doxa* and presented as facts; 2) "procedural norms", rules about how one should argue and 3) "fundamental norms", ethical/moral values. A striking result is that most of those principles are common among the three countries.

We then discuss a communicative hypothesis that can explain why such principles seem so widely shared. The interactional structure of the argumentative use of general principles in conversations leads to typical co-occurrences of strongly linked principles. Having to collectively cohere even though they may not be converging, the students need to position themselves toward the *doxal laws*, *procedural norms* or *values* they use to argue with each other. Therefore, regularity and variations can be analyzed in terms of typical *argumentative scenarii of opposing principles*.

Keywords: argumentation, interaction, values, norms, socio-scientific issues

INTRODUCTION

Theoretical background

In the research literature on science education, Socio-Scientific Issues (SSI) have become legitimate objects for research and teaching (e.g. Aikenhead, 1992; Gayford, 2002; Kolsto, 2001; Simonneaux & Simonneaux, 2009; Zeidler et al., 2005, Zohar & Nemet, 2002). They have two main characteristics. The first is that such issues must be open-ended and affect society. Second, elaborating an opinion on such issues requires a person both to mobilize knowledge and to make political and/or ethical choices. Even if there has been a call for developing children's ability to deal with SSI, their implementation at school is still very difficult and faces opposition from some teachers who fear that they will give rise to a relativistic empty fight of opinions (Albe, 2009).

From a research standpoint, little is known about how to assess students' argumentation

concerning SSI. The literature raises the role of four factors affecting the quality of student's debates on SSI: 1) basic knowledge is necessary but not sufficient (e. g. Lewis & Leach, 2006); 2) the quality of student-student interactions is essential (e.g. Mercer, 1996; Albe, 2006); 3) students' understanding of the socio-scientific nature of the issue leads to deeper conclusions (e.g. Driver et al., 1996); students' epistemological values affect their way of arguing and the kind of solutions they might consider (e.g. Désautels & Larochelle, 1998; Sandoval, 2005).

Pedagogical situation

This study has been done in a “semi-formal” educational environment: the pedagogical situation is an extra-curricular activity held in the classroom, and not led by the teacher. Debate leaders are specially trained 15-17 year-old students and participants are 12-14 year-old students. Our corpus is based on 10 occurrences of a 90-to-110-minute-“scientific café” activity videotaped between November 2011 and May 2012, in Mexico, the USA and France. The “scientific café” is about drinking water management and is organized around a QCM-type diaporama.

The activity goes through 3 thematic parts, each one consisting of several “knowledge questions” (KQ) including correct answers and explanations, and one “opinion question” (OQ) to be debated. For each OQ, the students 1) debate in small group and chose one common answer; 2) debate at the class-level defending their group answer and/or expressing personal views; 3) vote individually and anonymously. At the beginning of the activity, the students individually and anonymously vote about a main question (MQ), which is an OQ-type question. They return to this question at the very end of the café, then pass through the three phases composed of group debate, class debate and individual vote.

The corpus analyzed comprehends students' discussions in small-group and class-group about the MQ for the 10 *cafés*, and, for 6 of them (2 in each country), also small-group and class-group debates about the 3 other OQ.

CONCEPTUAL FRAMEWORK

Students' discursive work: knowledge, norms and emotions as argumentative resources

When they argue, the students work to produce a discourse defending their conclusion. Such work is based on both logical reasoning and the “argumentativity” of language itself (Anscombe et Ducrot, 1997 [1984]). Content and rhetorical style are inextricably linked. Figure 1 gives a global model of the argumentative work of the students, defined as the use of 3 types of resources: elements of knowledge-belief, norms (behavioral rules and values) and emotions. At the discursive level, students build their arguments and argumentatively orient their discourse using more or less explicit logico-linguistic deductions or inferences. At the meta-discursive level, the students criticize and evaluate the arguments, referring to their conception of what is a good argument or a right way to argue and debate.

In their conversation, the students use these three types of resources jointly, sometimes even in the same sentence. For instance, some knowledge elements can be supporting («backing» in Toulmin's words) or illustrating some norms. Moreover, *fundamental norms* often consist of moral judgments of some regularities the students present as facts (knowledge elements). Emotional framing or “schematisation” (Grize, 1997) of the issue is also supported by knowledge elements, described in more or less pleasing ways depending

on the argumentative conclusion which is being defended (Polo et al., 2013). Such emotional framing is also based on the norms that are used as criteria to distinguish between what is more or less desirable.

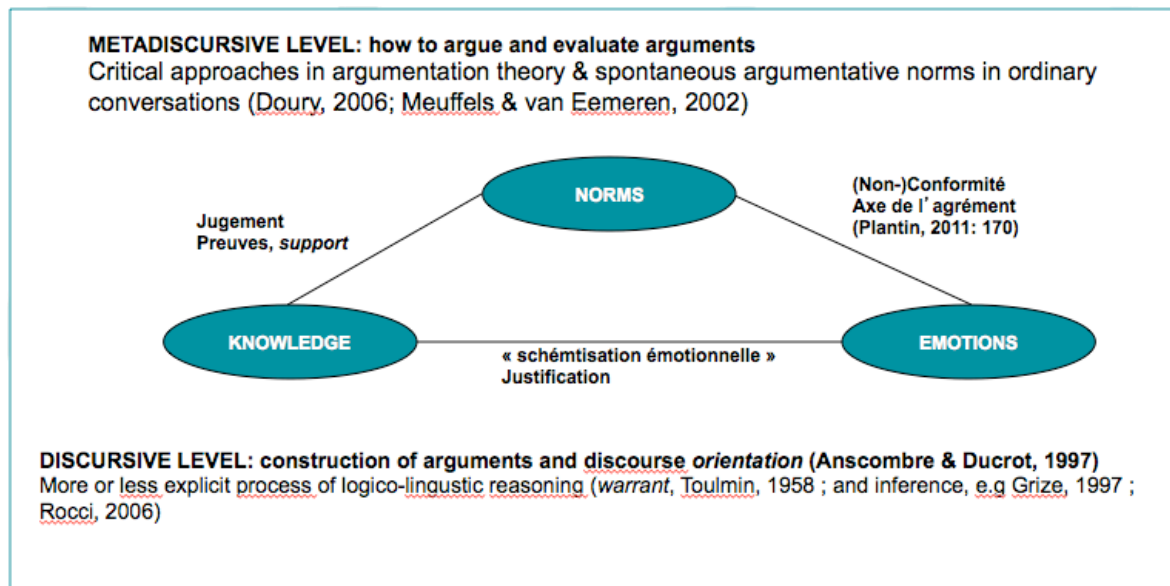


Figure 1. Argumentative resources: typology and interactions. To argue about a socio-scientific issue, students use all together knowledge, emotions and norms.

Doxal laws and norms: a typology

During the "scientific café", the students commonly use general principles to justify their ideas and strengthen their arguments. A global inventory of those general statements led to a typology into three categories, defined both by the interactive treatment of the principle (a) and the kind of objects its content refers to (b).

Doxal laws (L) are introduced in students' discourse as non-controversial and obvious facts (a). They are based on the *doxa* or *endoxa* (Rocci, 2006), which means elements of knowledge coming from daily experience and/or culturally shared (b). *Doxal laws* may correspond to school knowledge or scientific knowledge (*episteme*) but it is not obligatory that they do so.

Fundamental norms (F) are not always presented as obvious shared ideas, and sometimes need to be justified using knowledge elements about which a moral judgment is made (a). Their content does not refer, by itself, to knowledge, but rather to moral or ethical values (b). Such fundamental norms are used to evaluate arguments and alternative options (a).

Last but not least, *procedural norms* (P), in opposition to the two first kinds of principles, do not work at the discursive level but at the metadiscursive level. Their interactive treatment is similar to the one of *doxal laws*, since they are often presented as obvious rules, but they have the power to shift the conversation from the discursive to the metadiscursive level (a). They correspond to particular elements of the *doxa*, dealing with behavioral rules applying to the communication situation (b). Procedural norms include considerations about 1) politeness in ordinary or argumentative interactions (Brown & Levinson, 1980; Plantin, in press, p. 369); 2) the interactional context; 3) and, more specifically, the long-term framework ruling classroom's activities (Brousseau, 1998); 4) students' beliefs about what is a good argument (*ordinary argumentative norms*, Doury, 2006), and, specifically, what a "scientific" argument is (*epistemic values*, Désautels & Larochelle, 1998; Sandoval, 2005).

METHODOLOGY

This study combines quantitative and qualitative methods. First, a global inventory was made to identify the general principles used by the students and to quantify their frequency among the different countries. Then, qualitative case studies were done with a microscopic perspective to explore a hypothesis about why most of the principles were common to the three countries. Each methodological step is described below.

1. Transcripts

For MQ, all debates were completely transcribed using *Transana* software and ICAR transcription conventions (detailed at <http://icar.univ-lyon2.fr/projets/corinte>). For the 3 other OQ, only relevant parts of students' discussion were transcribed.

2. Identification of principles

Transcripts and videos were then analyzed in order to identify general principles and group them into categories. This step resulted in recognition of different occurrences of a same principle, and of distinguishing between *doxal laws*, *procedural norms* and *fundamental norms*. In order to take into account the complexity of authentic conversations, and the polyfunctionality of discourse elements, a single sentence was sometimes considered as containing a reference to several principles.

3. Quantification of principles' occurrences

After identification of the principles and their occurrences, the frequency of each principle was calculated for each country. This step marks the differences and similarities in the nature and quantity of principles used by the students in each school. Evaluating the principles' frequency also revealed that some principles could be considered to be less significant than others.

4. Exclusion of non-significant principles

We decided to exclude low-frequency principles (under 2 occurrences) and principles strongly linked to local contingencies from the inventory. Principles that only appeared in one café and that corresponded to topical digressions were excluded from the analysis. This was also the case for principles referring to local contexts that could not be compared to other countries (national socio-economical situation, previous school activities, etc).

5. Isolation of common principles and local specificities

Within the corpus of principles created from step 1 to 4, those occurring at least once in each country were considered "common principles". Still, some of those *common principles* were more frequent in some countries than in others. Some principles also proved to be specific to one country, or specifically absent in one country.

6. Testing an hypothesis through micro-case studies

The global inventory results drove the analysis to explain the large quantity of common principles. The regularities observed among the corpus' data enabled to argue that the co-occurrence of some principles could be explained by modeling the use of the conversational structure of general principles. We then developed a micro-case study that led to interpreting such co-occurrences in terms of typical *argumentative scenarii* opposing strongly connected principles.

RESULTS

1. Global inventory results: a focus on *common principles*

During the global inventory, 96 *doxal laws*, 51 *fundamental norms* and 37 *procedural norms* were identified. After excluding the non-significant principles, we obtain the striking result that most of the principles are used by students in all three countries.

1.1 *Common doxal laws*

Among all the *doxal laws*, 41 were considered significant, 21 of which are common to the three countries. These common *doxal laws* are reported in Table 1. Each law was given a number, corresponding to when it was first identified in the corpus.

1.2 *Common fundamental norms (values)*

There were 22 *fundamental norms* shared among the three countries, out of the total amount of 35 significant *fundamental norms* (Table 2). Obviously, the fact that some students used each one of these norms in each country does not mean that all French, Mexican and American students agreed on them. Actually, some *fundamental norms* listed here are strongly opposed to each other. For instance F11, the survival of the fittest, is pretty much contrary to F2, the idea that having access to water is an unconditional right.

1.3 *Common procedural norms*

Out of the 37 *procedural norms* identified, 26 were considered significant. Nineteen of them were used by students from all three countries (Table 3). Similarly to what happens for *fundamental norms*, some opposed *procedural norms* are reported. As an example, rule P16 that frames the exercise as a technical problem-solving process is contrary to rule P27 that establishes the conversation as a debate about an open-ended, controversial issue.

It is interesting to notice that several of the procedural norms used by students in the three countries correspond to classical principles of argumentation theory. Such rules are used in critical argumentation studies to distinguish between *good* arguments and fallacies (Meuffels & van Eemeren, 2002). Some are used in a similar way by the students, for example the accusation of the *ignoratio quaestionis* fallacy (not sticking to the issue being discussed, P7). Others are used in an opposing way, such as the *ad hominem* strategy: the students focus on the fact that you must not contradict yourself in a debate, P4 (producing neither contradictory discourse nor acting in a manner that is contradictory to what you say). In doing so, they produce typical *ad hominem* arguments without considering them to be fallacies.

How can the predominance of common principles in this global inventory be explained? In the next section, a communicative hypothesis is suggested, based on an analysis of the interactional structure of the argumentative use of general principles in dialogues.

Table 1

Doxal Laws used by students in the three countries (21/41)

Nber	Doxal Law
L1	la gente rica va a tener más disponibilidad al agua\ (rich people are going to have better access to water\)
L7	l'eau elle va dev'nir d'plus en plus chère\ (water's gonna be more and more expensive\)
L8	des pays qui (...) arriveront pas à suivre et des: des personnes qui n'arriveront pas à suivre (countries that (...) won't be able follow up and some : people who won't be able to follow up)
L13	quand t'es habituée à faire un truc tu vas pas changer (when you're used to doing something you won't change)
L18	en algún tiempo va a haber menos agua (some day there gonna be less water)
L20	y'a des pays où y'a beaucoup moins d'eau que: dans d'autres (there are some countries where there's much less water than: in others)
L22	on peut s'déplacer\ (one may move\)
L27	souvent les avancées scientifiques (...) bah: elles ont été euh: bonnes pour euh: des pays riches\ (scientific advance has often been (...) been em: good for em: rich countries\)
L28	pour les avancées scientifiques faut d'la tunne (for scientific advance there must be money)
L29	parce que: à l'heure qu'il est c'est pas rapport à A (because: nowadays it's it corresponds to A) – <i>what is true today will be true tomorrow</i>
L30	la: naturaleza no se puede cambiar\ (nature can't be changed\)
L38	we pretty much created our water problem with our usage of water how much we've consumed it and how we polluted it – <i>mankind is destroying the planet</i>
L41	plus t'économises l'eau et c'est clair qu't'en auras plus longtemps (the more you save water the longer you'll have water obviously)
L42	we found a way to de:salitize the water\
L43	<i>el agua es indispensable para la vida humana\ (water is indispensable for human life\)</i>
L45	we're definitely wasting <i>water</i>
L47	moins y'en a plus plus ça d'vient rare plus ça d'vient cher c'est logique\ (the less there is the scarcest it becomes the more expensive it becomes that's logical\)
L48	generally (...) a lot of policies have to go through – <i>a long time is needed before you can see the impact of scientific advance</i>
L54	nature is already degrading
L72	y'a des avancées scientifiques en c'moment (scientific advance is happening now)
L77	if if it was free there'd be someone who'd misuse it\

Note. The table does not present a generic statement, but one emblematic occurrence for each law (translated into English). When the students' quote was not clear enough, a general statement was added (in italics). The same conventions are used for Tables 2 and 3.

Table 2

Fundamental Norms *used by students in the three countries (22/35)*

Nber	Fundamental Norm
F1	so that it's cost-effective
F2	l'droit à l'eau potable (the right to have drinking water)
F3	what we do now will break the em you know who has access to water drinking water in the future
F4	c'est pas nous qui changerions l'monde\ (it's not us who'd change the world\) - <i>we cannot avoid fatality</i>
F6	science is always the answer\
F8	se está acabando el agua y pues] qué compras después con el dinero\ (water is disappearing and then what will you buy after with money\) – <i>money is less important than water</i>
F10	si podría ser triste (...) terminar (...) que los ricos tendrán el agua que quieren y los pobres no (yes that could be sad (...) ending up (...) that rich people have as much water as they want and poor people haven't)
F11	ce s'ra la loi du plus fort (it's gonna be the survival of the fittest)
F12	hay que ahorrar el agua (water must be saved)
F13	j'partage moi\ (I do share\) – <i>we should share things, help each other - altruism</i>
F14	on la distribue à des personnes qui en ont besoin\ (we give it away to the people who need it\) – <i>fundamental needs must be satisfied</i>
F15	tenemos que guardar a futuro para nuestros hijos\ (we must keep for the future for our sons\) – <i>we must think of next generation's welfare</i>
F16	bah oui l'argent ça r'vient à tous les coups c'est sûr (of course money is always in that's for sure) – <i>people are only interested in money</i>
F19	the people are not aware like the water like issue
F21	pour euh: la terre\ (for em: the Earth\) – <i>we must take care of the planet</i>
F25	we messed it up so we have to fix it ourselves – <i>responsibility principle</i>
F27	ayudando a casi toda (...) la poblacion de los paises hasta del mundo\ (helping almost all the population of the countries even of the world\) – <i>people (countries) are altruist</i>
F32	no funcionaría porque habría personas que no tendrían agua y se morirían\ (it wouldn't work because there'd be some people who wouldn't have water and who'd die\)
F39	je sais pas pourquoi on sacrifierait notre hygiène de vie pour l'eau/ (i don't see why would sacrifice our lifestyle for the water/)
F40	that's racist\
F42	el agua nada más va a servir para ti/ (the water would only be available to you/) – <i>you must be altruist</i>
F43	j'ai pas envie d'faire chier mes parents (I don't wanna be bothering my parents) – <i>you should take care of your family</i>

Table 3

Procedural Norms used by students in the three countries (19/26)

Nber	Fundamental Norm
P2	est-ce que tous les pays pourront faire ça/ (could all the countries do that/) – <i>Think globally</i>
P3	<i>Counter-examples are good refutations</i>
P4	<i>You should not contradict yourself (ad hominem)</i>
P6	el realismo (...) lo que yo tomé en cuenta es la situación (realism (...) what i took into account was the situation)
P7	on parle d'eau là on parle pas des voitures\ (we're talking about water not cars\) - <i>ignoratio quaestionis fallacy</i>
P10	<i>if you're hesitating between two options, you must chose the one that implies the other (arguments based on causality)</i>
P11	il suffit pas d'être riche\ (being rich isn't enough\) – <i>you must consider a cause which is necessary and sufficient</i>
P15	ça marche pour maintenant mais pour euh à un moment ça marchera plus\ (it's working now but after a while it won't work any more\) – <i>we must find a long-term solution</i>
P16	it's about water it's not about politics\ - <i>it's a technical, non-controversial issue</i>
P17	lo que dirá la mayoría\ (what majority will say\)
P18	entonces entonces qué/ (and then then what/) – <i>if you reject a proposal, you must make an alternative one</i>
P20	why is it and how is it A/ - <i>you must justify your claims</i>
P21	you can't conserve water if you don't have water\ - <i>your reasoning must be universal, possibly applied to anyone</i>
P22	t si podría ser triste (...) terminar (...) que los ricos tendrán el agua que quieran y los pobres no\ (...) si tiene razón - <i>you can argue about what is desirable</i>
P23	cómo le vas a explicar/ (how are you gonna explain it/) – <i>we must chose an option that we can easily justify</i>
P26	elle écoute pas\ elle parle elle écoute pas\ (she doesn't listen\ she talks she doesn't listen\) – <i>we must listen to each other</i>
P27	il y a plusieurs réponses\ (there are several answers) – <i>it's not a right-or-wrong question but a controversial issue</i>
P28	madame c'est quoi la réponse/ (what's the answer miss/)
P30	y quién ganó/ (and who won/) – <i>debating is a competitive activity</i>

2. Communicative hypothesis

This corpus shows regularity in the argumentative use of general principles, in terms of interactional dynamics. These regularities — presented in the form of a communicative hypothesis — could explain why so many common principles were found across the three countries. In what follows, we first present a model of the conversational structure of the argumentative use of principles (2.1). Then, we give a few examples from the American part of the corpus to show how this model enables the analyst to describe such data (2.2). Finally, we use a case study to specify the communicative hypothesis we make.

2.1 Conversational structure of the argumentative use of general principles

The model of the conversational structure of the argumentative use of principles presented in this section echoes the study of Muntigl and Turnbull (1998) about the conversational structure of ordinary argumentation. They showed that *face-work* strongly constrains argumentation, a phenomenon studied through typical sequences of 3 conversational turns:

T1. A	Proposition
T2. B	More or less « face-damaging » disagreement with T1
T3. A	Support to T1 or direct refutation of T2

At turn 1, speaker A makes a proposition. At turn 2, speaker B expresses a disagreement with this proposition. The authors showed that the more face-damaging T2 is, the more likely A, at T3, will support the initial claim he made (T1). On the contrary, the less face-damaging that T2 is, the more likely A will directly react to it at T3.

Similarly, the argumentative use of principles can be modeled, as shown in Figure 2.

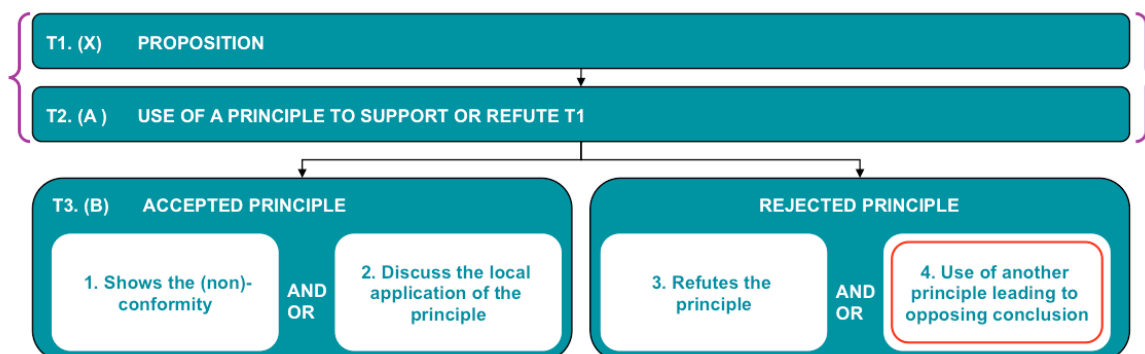


Figure 2. Model of the conversational structure of the argumentative use of principles. Students may use 4 strategies (and possibly combine them) to react to the argumentative use of principles. X can be speaker A, speaker B, or another speaker.

At T1, a speaker X makes a proposition. Secondly, speaker A uses a general principle (g) to support or refute the proposition made at T1. In some cases, the same speaker may make a proposition and immediately use a principle to support it ($X=A$). At T3, another speaker B ($A \neq B$) expresses a disagreement with A. Here, B can either accept or reject the principle g used by A at T2. If the principle g is accepted, B may have two strategies: 1) show that the proposition made at T1 conforms to g (when g was used to refute it; if it was used to support it, strategy 1 consists, on the contrary, in showing that it does not conform to g) and/or 2) showing that g cannot apply in this context. If B rejects the principle g , he can elaborate two other strategies: 3) directly refute g itself and/or 4) use an alternative principle g' leading to an opposing conclusion. In strategy 4, the newly mentioned principle, g' , is generally presented as superior to g ($g' > g$).

2.2 Examples from the American sub-corpus

Each one of the 4 strategies described above was observed in all three countries. Here we only have space to show a few examples from the American part of the corpus.

During the 4th scientific café held in Kenosha, the debate taking place at table 1, about how the price of water should be determined (OQ3), offers a typical example of strategy 1. Gabriel is using the procedural norm P2 (*we must think globally*) to refute Erick's statement that free drinking water is a « horrible idea ». Erick then actively tries to show that his statement conforms to P2. His turns corresponding to T3 in the model are in bold:

1.	CAT	[yeah\
2.	ERI	[free drinking water sounds like a horrible idea\
3.	GAB	yeah\
4.	ERI	'cause we [we'll be out of drinking water in like days\
5.	GAB	[that's th-
6.	ERI	((laughs))
7.	GAB	that would be: [absolutely
8.	CAT	[yeah\
(.)		
9.	CAT	we [could all like (inaud.)
10.	GAB	[well we're thinking usa again\ we're thinking US again\
(.)		
11.	ERI	[well even from a worldwide standpoint\
12.	GAB	[like free drinking water is terrible yeah\ but the reason you gave me was strictly US and so was my government\
13.	ERI	even from a worldwide standpoint though

In the same *scientific café*, discussing the same issue, the students at table 2 provide us with a clear example of strategy 2. Sean is the only one defending option a (water should be free), and he supports his position using the procedural norm P17 (the majority is right). He does so in mentioning that another small group of students, at the next table, is going to vote for option a. But Rick, without rejecting P17, denies the fact that it could apply here, arguing that table 6 is not actually going to vote a but only pretending to do so:

1.	SEA	okay <((pointing at T6)) they're voting A>
2.	RIC	no they're not\ they're lying to you\

The third strategy can also be illustrated by another extract of their discussion. Rick claims that people currently have enough water to live. Sean disagrees using two different principles: the *procedural norm* saying that we must think globally (P2) and the *fundamental norm* of altruism (F27). After a long pause, at turn 3, Rick directly rejects those norms, instead focusing on his own personal situation:

1.	RIC	people do have water to live\
2.	SEA	and the people in the world that don't have water/ (1.6)
3.	RIC	i have water\

The example chosen for strategy 4 is also taken from a discussion on how the price of water should be determined, this time coming from the 3rd *café* held in Kenosha. At T2, Pamela uses the *fundamental norm* of social equity (F10) to support Sabrina's proposition to choose option D (the price of water should depend on family income). Sabrina, at turn 4, strengthens this argumentation by referring to the fundamental norm of responsibility (F25) supporting F10. Louise first uses a type-1 strategy showing that option D could benefit people who are misusing the water (turn 5). At turn 9, she continues along this strategic line, elaborating on individual responsibility in belonging to a certain social group. But Louise does not directly oppose the fundamental norm of social equity (F10). She rather promotes the alternative *fundamental norm*, adopting a type-4 strategy, and refers to absolute equity instead of relative equity as a framework for judging what is fair

(turns 7 and 11).

1.	SAB	[and what about (.) family income/ [you need water\
2.	PAM	[yeah i also think D too 'cause like i don't think like less fortunate people should be (.) punished like you know what i mean like because they don't have money they pay for water they shouldn't (.) [not get
3.	LOU	[yeah:
4.	SAB	[xx time it's not their (fault)=
5.	LOU	=they could like they could overu:se like they could (.) not pay as much and [<((turning hands)) get more water>&
6.	PAM	[and take advantage of that yeah: it's true
7.	LOU	&take advantage of it\ (.) when like it should be [<((swinging hands)) equal for all people>&
8.	KEL	[((nodding head in the affirmative))
9.	LOU	&you know what i mean/ 'cause like in like it's their fault that they are (.) poor\ in a way because they could go find a job but they didn't like you know what i mean/
10.	PAM	yeah
11.	LOU	like i think it should be equal among everyone\
(3.8)		

3. Can we change the world? Opposing Principles: a Case Study

Type-4 strategies explain that some opposing principles are likely to co-occur in dialogal situations. Using a general principle *g* potentially orientates the conversation towards the use of an opposing principle *g'*. We argue that this phenomenon explains why a large number of common principles were found in the global inventory. Moreover, this communicative hypothesis is not contradictory to the observation of local differences among the three countries. Actually, some scenarii of opposing principles can be « preferred », have a higher frequency, in some local contexts. A brief description of a case study is useful to clarify what an argumentative scenario of opposition is like. The opposition between the *fundamental norms* F3 (we can influence the evolution of the world) and F4 (we cannot avoid fatality) is presented in Figure 3.

si (...) on change l'économie (if we change the economy) (1Fr)	une autre personne tu as d'influence (you can influence someone else) (3Fr)	L41 - F12 si empezamos a cuidar el agua (if we start taking care of the water) (4US ; 5Fr ; 22Mx)	F6 - with scientific advances you could come up with more cost-effective and just efficient ways (3Mx ; 4Fr ; 34US)
<div style="background-color: #00FFFF; padding: 5px; border: 1px solid black; margin: 10px auto; width: 80%;"> <p>F3 - what we do now will break the em you know who has access to water drinking water in the future</p> </div> <p style="text-align: center;">nothing really happens from like pure serendipity (4Mx ; 6US)</p>			
<p>quand l'humanité (...) VA manquer d'eau on peut retarder le moment on peut pas on peut pas l'éviter (when humanity (...) WILL face a shortage of water we can postpone it we cannot avoid it) (1FR ; 4Mx)</p>			
<div style="background-color: #D8BFD8; padding: 5px; border: 1px solid black; margin: 10px auto; width: 80%;"> <p>F4 – c'est pas nous qui changerions l'monde\ (it's not us who'd change the world\)</p> </div>			
F33 la economía va va a superar (...) nuestro ahorro de agua (economy will overcome our savings of water) (3Mx)	P29 but we can't control the whole world (1US)	L13 no estamos haciendo nada (but we're not doing anything) to preserve the water (8Fr, 8US, 13Mx)	L28 - pour les avancées scientifiques faut d'la tunne (for scientific advance money is necessary) (3FR, 5Mx, 6US)

Figure 1. Can we change the world? A scenario of opposition and its local variations. When they argue, the students may use competing principles that structure the debate.

Figure 3 shows that F3 and F4 can potentially be supported by other general principles about the type of actions that can (or cannot) be undertaken to influence the evolution of the world. In this typical scenario of opposition, each principle supporting F3 has its counterpart among the principles supporting F4: changing the economy or suffering from independent economical variations; influencing others or not being able to control mass behaviour; starting to save water or persisting in one's usual lifestyle; favoring scientific progress or failing to provide funding to do so. At this level of argumentation, clear tendencies appear among the countries. American students mention technological solutions much more often than the others (34 times, whereas there are only respectively 3 and 4 occurrences in the Mexican and French parts of the corpora). On the contrary, economic policies are not mentioned in the American part of the corpus, and only appear once in the French *cafés*. In the Mexican debates, only the negative counterpart of this idea is discussed, insisting on the fact that nothing can be done to escape the effects of the economic system. The action to influence the evolution of the access to water the most considered in Mexico consists of saving it. This action is also discussed to some extent in France and the US, but it is more often as inefficient. Only in Mexico are the affirmative occurrences of this idea more frequent than the negative occurrences.

DISCUSSION AND CONCLUSION

In these scientific-café-type debates, the students use general principles to argue. They can be classified into *doxal laws* (regularities presented as facts), *fundamental norms* (ethical or moral values) and *procedural norms* (rules on how to debate), depending on the type of content they refer to and on the interactive treatment they receive. The use of such argumentative resources may be a characteristic of the activity of debating on a SSI itself. When someone uses a general principle *g* to support a proposition, an opponent may use 4 types of strategies: 1) accepting *g* and showing that his counter-proposition conforms to *g*; 2) accepting *g* but claiming it is irrelevant in this context; 3) rejecting *g* by direct refutation; 4) rejecting *g* by using another principle leading to the opposite conclusion. Such a conversational structure of the argumentative use of general principles, especially when strategy 4 is chosen, favours a co-occurrence of opposing principles. This phenomenon can explain why many principles are used in all three countries. Nevertheless, a scenario of opposition can be locally expressed with variations. If we analyze the frequency of the use of each principle, preferred tendencies in each country appear.

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