Words to Reason and Argue about Drinking Water Management: Comparing Debates from Mexican, US and French Schools.

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HAL Id: halshs-01871646
https://shs.hal.science/halshs-01871646

Submitted on 11 Sep 2018

Comparing Words to Debate about Drinking Water: Textometrics for Argumentation Studies

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In ten videotaped socio-scientific debates related to water, students from Mexico, the USA and France tend to focus on few alternative positions. On the basis of Grize's definition of schematization, we followed their reasoning by studying how they put light on specific aspects of the discursive object 'water'. Through textometrical analysis of debate transcripts, we specified 6 characteristics of 'water' that are more or less emphasized depending on the prevailing national argumentative scenario.

KEYWORDS: argumentative scenario, comparative analysis, education, discourse object, framing, schematization, socio-scientific issues, textometrics.

1. INTRODUCTION

Argumentation is a great object of interest in education (e.g. Andriessen, Baker, Suthers, 2003, Driver et al., 2000; Erduran & Jiménez-Aleixandre, 2007, Von Aufschnaiter, et al., 2008, Muller Mirza, 2008). At the crossing of science, environmental and citizenship education, some topics challenge usual didactical perspective on argumentation: the socio-scientific issues (SSI). During a scientific *café* activity, students in Mexico, the USA and

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France proved capable of building complex arguments in response to SSI related to drinking water management, using knowledge, norms, values and emotions (Polo, 2014). In this paper, we follow how they elaborate their reasoning, by analyzing the *schematization processes* affecting the *discourse object* 'water'. We base our work on Grize's perspective of *schematization*, as a discursive construct giving clues about the underlying cognitive process (1997, p. 65). A comparison among the 3 national corpuses allows us to identify the prevailing orientation focuses of the *schematization* of 'water' and characterize a typical *argumentative framing* for each country. While intercultural work in argumentation generally emphasizes matters of rhetorical style (e. g. Disson, 2002, Oetzel et al., 2001, Taft, et al., 2011), our approach engages into a comparative study based on the substantial objects under discussion.

After detailing our theoretical orientations and research questions (2), we specify the context and data of our study (3). Then we detail our methodology (4), and present our main results (5), which significance is discussed in a final section (6).

2. THEORETICAL ORIENTATIONS AND CHALLENGES

2.1 'Schematization' (Grize, 1997)

Grize's 'natural logic' relies on the (re)construction of discourse objects through operations of *schematization* in dialogic communication. 'Schematization' refers both to the process and the result, a specific discursive representation of what the discussion is about (Grize, 1997, p. 29). Then, a *schematization* is inherently subjective and individual, even among argumentatively aligned participants. Nevertheless, people defending the same view tend to build similar schematization. This approach somehow extends the argumentative orientation of language described by Anscombre and Ducrot (1997). Grize study both explicit and explicit argumentative moves in discourse:

> As I understand it, argumentation considers the interlocutor not as an object to be manipulated, but rather as an alter ego who must be brought to share his vision. Acting on him, it's trying to modify the diverse representation which he can be thought to have, by emphasizing some aspects of things, hiding others, suggesting new ones, and all this thanks to an appropriate schematization.[1]

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[1] Own translation from the French "*Telle que je l'entends, l'argumentation considère l'interlocuteur, non comme un objet à manipuler, mais comme un alter ego auquel il s'agira de faire partager sa vision. Agir sur lui, c'est chercher à modifier les diverses représentations qu'on lui prête, en mettant en évidence certains aspects des choses, en en occultant d'autres, en en proposant de nouvelles et tout cela à l'aide d'une schématisation appropriée.*" (Grize, 1997, p. 40).

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An appropriate *schematization* cats *light* on specific aspects of a *discourse object* to serve an argumentative purpose, by creating axiological inferences (Grize, 1997, p. 48). Last but not least, a *schematization* does not consist of an isolated utterance but corresponds to a whole 'system' (*Id.*, p. 73).

Grize considers the *discourse objects* from an extensive perspective, including their 'faisceau' (object 'ray cluster'), which is to say all the usual things generally associated to the object (intrinsic characteristics, typical relations to other objects, action schemes). A participant's contribution to the 'ray cluster' (*faisceau*) of a *discourse object* is argumentatively orientated to the defense of a preferred conclusion. Tracking and comparing such *schematizations* is key to do substantial argumentation analysis[2].

2.2 Research questions: comparing schematizations

Still, how can such tracking be operated? Generally, comparing *schematization* is done through qualitative discourse analysis, at a microscopic level. For instance, we proposed a monography of two rival *schematizations* in a ten-minute debate, with a special focus on the diverging emotional framing (Polo, Plantin, Lund, Niccolai, 2013). But when it comes to comparing *schematizations* at a larger scale, especially for intercultural analysis, other tools are needed. The use of textometrics can give us interesting clues, with a first automatic quantitative analysis. In this perspective, we defined three precise research questions:
1. Is the specific *light* cast on a *discourse object* embodied in the words used to argue?
2. If so, can we describe *argumentative frames* using textometrics?
3. How do such *argumentative frames* vary in different cultural and linguistic contexts?

To better understand the corresponding methodology (4), we now specify the context and the empirical data characterizing this study (3).

3. EMPIRICAL STUDY: CONTEXT AND DATA

Our data consists of video-taped debates run during a scientific-*café*-type activity in three countries, in 2011 and 2012. The two-hour-long pedagogical activity is extracurricular but organized at school, in usual class groups of

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[2] This approach is similar to the Anglo-Saxon frame analysis. As a discursive construct, 'frames', as *schematizations*, "induce us to filter our perceptions of the world in particular ways, essentially making some aspects of our multidimensional reality more noticeable than other aspects." (Kuypers, 2009, p.181). As a process, both 'framing' and 'schematization' "encourages the facts of a given situation to be interpreted by others in a particular manner." (Kuypers, 2006, p. 8). Nevertheless, frame analysis related to the critical tradition in discourse analysis, which does not fit with our radically descriptive epistemological approach.

students aged 12-14. The sequence is led by a duo of trained elder students, aged 15-18. It is based on a multiple-choice questionnaire, alternating quiz questions giving basic information and 'opinion questions'. The activity is oriented toward a final debate, on the 'main question' (MQ, figure 1), which is also presented at the beginning to introduce the topic. After following, three thematic steps, the students discuss it in group, choose a common answer, and then debate it with the whole-class. Finally, each student expresses an individual answer through an anonymous vote. Our corpus consists of 10 final debates, at the class level, on the MQ, 2 from each of the two Mexican schools, 3 from the US school, and 3 from the French school.
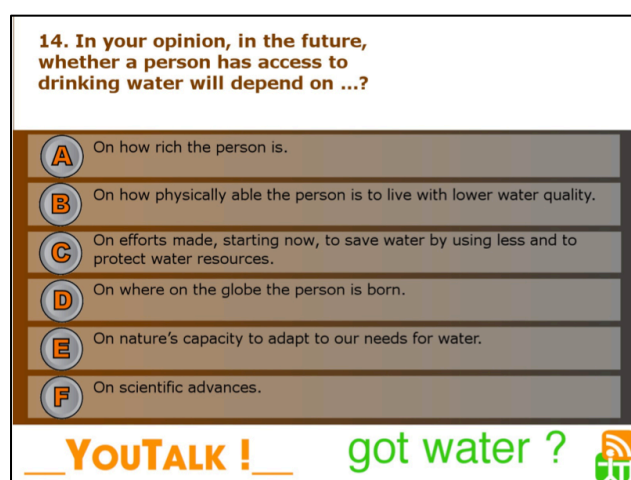

Figure 1 – Main question of the café, debated in our data, analyzed with TXM (English version).

It is essential to take into account the nature of the topic. In the literature, SSI are characterized upon 4 main properties (e.g Albe, 2009; Driver, Newton, Osborne, 2000, Gayford, 2002; Kolsto, 2001; Legardez & Simonneaux, 2006; Simonneaux & Simonneaux, 2009; Zeidler et al., 2005): interdisciplinarity, knowledge hybridizing, subjectivity (Oulton, Dillon, Grace, 2004) and controversy (Albe, 2009, Legardez, 2006, pp. 19-20). As a result, the debates studied here are very open compared to usual classroom discussions. This semi-formal activity lets the students use a great diversity of argumentative resources, and intend to make them feel comfortable with not all sharing the same view. The final debates on the MQ varied a lot among our data, with variations of the *schematization* of 'water'. Section 4 details our methodological to track these differences.

4. METHODOLOGY

Our research questions (see 2.2) can be operationalized into the three following problems:

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1. Which words is the *object* 'water' associated with, in students' argumentative discourse?
2. Do such co-occurrences group into characteristic orientation focus or 'lights' ('éclairages')?
3. Can we observe regularities among national subcorpora?

To answer these questions, we analyzed all the ten transcripts of the debates with TXM software[3], which automatically lists the co-occurrences between words. In order to get a complete picture of the use of the *discourse object* 'water', and not only the word itself, we proceeded into 3 analytical steps.

4.1 Researching contexts for the lemma 'agua', 'water', 'eau'

The first analytical step consists in researching co-occurrences for the lemmas corresponding to 'water', in each of the three subcorpora. We did not find any occurrence of 'water' using the plural. In the Mexican corpus, we found 117 occurrences of 'agua', which was the 5th more frequent word. In the US corpus, 'water' was only the 9th most frequent word, with a total of 91 occurrences. In the French transcripts, only 43 occurrences were found, 'eau' ranging as the 32th most frequent word. Such global differences can be partly explained by the fact that the debates were not of equal duration: they lasted between 4 minutes and 04 seconds for the shortest, to 9 minutes and 47 seconds for the longest. Moreover, French debates were characterized by many topical digressions.

LOC- time - café	Left context	Pivotal term
ROS - 1:29:23, 2	advances in order to: save er:	water
MAR - 1:26:24, 2	move somewhere else to have access to:	water
STA - 1:33:40, 2	x \ I thought one about D /	water
CAT - 1:26:39, 2	move from where they were to get a	water
ERI - 1:32:54, 4	only does it advance er water consumption and	water
CAT - 1:33:53, 2	would need the more purified water \ bad	water
CAT - 1:26:39, 2	to like move toward an area with better	water
ROS - 1:28:13, 2	and it would xx more: available **drinking**	water
ROS - 1:28:13, 2	you know who has access to water **drinking**	water
ERI - 1:32:54, 4	in science not only does it advance er	water
JIM - 1:30:36, 2	give them \ then they can interchange for	water
STE - 1:23:58, 3	the other parts of the world can **get**	water
MAR - 1:30:05, 2	up finding ways like you could probably **get**	water
SYD - 1:32:34, 4	so: it would be easier to **get**	water
THE - 1:27:09, 3	possibility that that it can happen to **get**	water
JAD - 1:35:33, 4	they would not really be willing to give	water
MIC - 1:32:00, 4	like Africa that they do not have **good**	water
ABI - 1:33:49, 2	was drinking like em: not very **good**	water
CAT - 1:31:32, 2	go to an area that does not have	water

Table 1 – First occurrences of 'water' in left-context order, US corpus.

These lemma-based requests in TXM gave us a the terms associated to each occurrence of the pivotal term 'water' (*agua*, *eau*), which can be alphabetically organized following the left context or the right context. Such visualization enables the analyst to start identifying, at a glance, repeated co-occurrences. Table 1 illustrates this type of data directly exported from the software, here twenty occurrences of 'water' in the US corpus, the first ones following the left context alphabetical order.

4.2 Researching pronouns referring to water

To get a more complete idea of the way the *object* 'water' is constructed in students' discourse, we also took into account the occurrences of pronouns standing for water. We identified only a few ones actually used: 'la', 'lo', 'se', 'esa', 'le', 'que', 'qué' in the Spanish data; 'it', 'that' and 'ours' in the US corpus; 'ça', 'la', 'l'', 'en', and 'elle' for the French transcripts. This second analytical step enabled us to catch other occurrences of the *discourse object* water. Below are examples taken from the three corpuses, with the locutor name, the time when it is uttered in the video, the number of the debate, and own translation into English when necessary:

> (1) LAU 1:48:09, 4   **elle** va devenir rare
>   (**it**'s gonna become scarce)
> (2) LIS 1:30:05, 1   a la vez **la** estamos contaminando
>   (at the same time we're polluting **it**)
> (3) ABI 1:25:52, 2   they might not be able to get **it** and
>   **ours** is very good\

4.3 Researching pronouns referring to water

In order to make sure that no occurrences of the *object* 'water' were missing, we followed a 3rd analytical step, in TXM, making requests based on the results of steps 1 and 2. We researched any contextual term that has been identified as co-occurring with the lemma 'water' (3.1), or a pronoun standing for it (3.2). These requests were generally made using a radical form, since the automatic grammatical tagging tool used by TXM was not equally developed for the three languages. This last step, of course, mostly repeated results previously found, but it also enabled us to find new contextual terms, such as:

> (4) OCE 1:49:28, 1   il y aura du **manque**
>   (there will be a **shortage**)
> (5) MON 1:32:09, 1   y va a **haber** muy poquita
>   (**there** will **be** very little)
> (6) ROS 1:29:23, 2   maybe for the future we will **have**
>   enough

This three-step methodology enabled us to get a quite complete picture of the discourse construction of the object 'water' among students' transcripts. The last stage of our methodology, interpretation, is based on two sets of results: a) identifying and specifying the different orientation focuses or *lights* ('éclairages') conferred to 'water' by grouping co-oriented terms, and b) comparing their relative weight in each subcorpus. It is presented together with our main results, in section 5.

5. MAIN RESULTS

Our first result was to characterize precisely the alternative discursive constructions of the object 'water' in relation to the argumentative *light* being emphasized (5.1). Then, comparing the relative weight of each of these perspectives, we could identify coherent systems of predominant *argumentative framing* in each linguistico-cultural field (5.2).

5.1 Specification of 6 orientation focuses or lights *('éclairages')*

On the basis of TXM results, we qualitatively grouped the contextual terms co-occurring with the *discourse object* 'water' into 6 main *lights* characterizing alternative schematizations. The full list of contextual terms associated to each group is reproduced in table 2.

1. A first group corresponds to rephrasing the general issue of **accessing water**.

2. A second group of associations made with water is characterized by a **focus on natural water resources**.

3. The third group of terms corresponds to apprehending water as related to the **satisfaction of human needs**, either from a qualitative or a qualitative perspective. In addition to the contextual terms listed in table 1, Two global expressions including left and right contexts are also part of this group: "as much water as we want, lower the water quality".

4. Another set of contextual terms cast light on the more or less environmentally friendly **human uses of water**. Two global expressions fall into group 4: "reduce the water that we search, leave the water on".

5. The fifth group of associated words considers water from the **viewpoint of the water producer**, concerned by technical processing problems or/and the matter of providing water to the consumers. This group, in addition to the terms listed in table 1, includes 3 global expressions: "change salt water into soft (*convertir el agua salina en dulce*), make water available, give water to other countries".

6. A sixth set of contextual words put emphasis on the monetary and **commercial exchange related to access to water**. It consists of the contextual terms listed in table 1, more the three global expressions: "use water as an economic thing (*ocupar el agua como algo económico*), see

water as an economic thing (*ver el agua como algo económico*), income of the water to pay (*ingreso del agua por pagar*)".

Focus	Left context	Right context
1. Accessing water	access to, get, how much, availability of, there is, there is less, half of the, about, have, have a little, accessibility of, get, get a lot more of, get that much, wrong with their	be, little, is out to bigger countries, issue, problem, depends on where we are born, become, 'stay available' (*rester accessible*), and the expression 'the issue of having water equally spread' (*le problème que l'eau soit repartie équitablement*)
2. Natural water resources	there is scarcity of (*haber escasez*), without, populated with, no, salt, ocean, lot of, ton of, available, vapor (*vapeur d'*)	end (*acabarse*), exhaust (*agotarse*), be a resource, be scarce, sources, supplies, supply, supplied, resources, scarce, has been taken, from the polar icecaps, goes, become scarce, from the air
3. Satisfaction of human water needs	have enough, need for, needs for, the right to, lack, the lack of, run low on, run out of, thin, purified, needed amount of, good, better, bad, drinking, the worst of the, need, adapt to the, drink	of lower quality, to drink, to live, potable, be a vital resource, of good quality, of bad quality
4. Human uses of water	preserve, save, saving(s) of (*economies d'*, *ahorro del*), waste, use, usage of, use less, pollute, protect, shampoo on, economize, consume, conserve, abuse, keep, take care of (*cuidar*), share, take advantage of (*aprovechar*)	to, to take care of (*de cuidar*), consumption
5. Viewpoint of the water producer or provider	distribute, make, cool down (*refroidir*), reuse, renew, provide, produce (and the French 'fabriquer'), out of, give, give them, desalinize, take the salt out of, desalinization of, doing, channel the, get from (*sacar*), stay with (*quedarse con*), gifts (*donaciones de*), offer, share	purification, plumbing, lines
6. Water trade	sell, give expensively (*dar caro*), steal, price of, money of, pay for, pay with, buy, interchange for, pay to get, the riches get, rich people have, bill of (*facture d'*)	become expensive, be as money, depends on the richness, expensive, cost, cheap, affordable, be valued (*valer*), rise, of a high price (*a un precio elevado*)

Table 2 – Grouping of contextual terms into 6 specific orientation focuses of 'lights' (*éclairages*).

Whether the students' discourse cast light on one or the other of these aspects has different consequences in terms of *argumentative framing* of the debate. At first sight, group 1 associations do not seem to provide strong argumentative orientation toward a specific answer or argumentative conclusion. Still, the way the general issue is called gives a first insight

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about which orientation the speaker is trying to bring the debate toward. In combination with the analysis of the relative place of the 5 other groups of contextual terms, the analyst can specify the alternative argumentative *framing* being displayed. Since *schematization* doesn't rely on isolated utterances, but works as a meaning and orientating discursive network, a global picture is needed to actually describe this construct. We developed a synthetic word-cloud type visualization, for each subcorpus, of the textometrical analysis of co-occurrences, which makes it easier to combine these parameters and draw conclusions about the typical *argumentative framing* that emerges from the data (5.2).

5.2 Alternative schematizations *of 'water': results for each country*

Figures 2, 3 and 4 synthesize our results, respectively for the Mexican, the US and the French corpora. We designed this word-cloud visualization in order to present a global picture that articulates the analysis of co-occurrences made in TXM with the first step analysis consisting of qualitative grouping of occurrences into the 6 specific focuses described in 5.1. In the center of the visualization appears the pivotal lemma 'agua', 'water' or 'eau'. Then, left-context occurrences of the *discourse object* 'water' are reproduced on the left part of the figure, and the right-context occurrences in the right section of the plan, both in alphabetical order. When a contextual term co-occurred several times with the *discourse object* 'water', we reproduce the lemma (infinitive of verbs, adjectives and nouns in singular masculine), except if there was no variation. For instance, 3 occurrences of 'les riches' are reproduced as 'les riches', but the thirteen occurrences of the verb 'to get' used at different persons appear with the lemma 'get'. In order to get a meaningful representation of our results, contextual terms are bigger when they are more frequent, proportionally to the total number of co-occurrences. More frequent terms are also slightly more centered, appearing closer to the pivotal lemma. For the French corpus, it corresponds to terms used at least five times to characterize the discourse object 'water', while the threshold is three for the US corpus and four for the Mexican corpus. A number is associated to each contextual term, corresponding to its frequency in the corpus. Terms that share the same radical (ex: 'access', 'accessibility') or are semantically synonymous (ex: 'desalinize' and 'take the salt out') are reproduced close to each other, and in the police and place corresponding to the sum of their frequencies. Some occurrences cannot be classified as specifically left or right context terms but rather consist of global expression including left and right contexts for 'water'. These expressions were placed directly next to the central pivotal word. Last but not least, a color code was used to identify the different orientation focus (*éclairages*) characterizing the *schematization*s of the *discourse object* 'water':

1) in black appears the terms corresponding to the general problem of access to water;

2) blue is used for terms referring to water as a natural resource;

3) red is used for terms characterizing water in reference to human qualitative and quantitative needs;

4) in green are reproduced the terms dealing with human more or less environmentally friendly uses of water;

5) brown is the color corresponding to words describing water from the viewpoint of the water producer or provider;

6) purple is used for terms referring to water trade and the commercial transaction determining someone's access to water.

These visualizations reveal a specific *argumentative framing* of the issue in each subcorpus.

Five key features characterize the Mexican corpus in terms of prevailing orientation focuses of *schematization* of 'water' (see figure 1). First, when water is considered as a natural resource (in blue), what is emphasize is how scarce (4 occurrences of 'escasez' or 'escasa' – *scarcity* or *scarce*), absent (2 occurrences of 'sin agua' -*without water*), or endangered (18 occurrences of 'acabarse' or 'agotarse' –*extinguish* or *dry up*) it is.

Secondly, among human use of water (green), the idea that water must be saved (37 occurrences of 'ahorrar', 'guardar' or 'usar/utilizar menos' – *save*, *keep*, or *use less*) is very frequent. This focus is characterized by the extensive use of the verb 'cuidar' (*take care*), with 21 occurrences. Even if the light cast on human use of water here mostly consists of prescribing good practices, some behaviors that waste water are also mentioned (9 occurrences of 'desperdiciar', 'gastar' or 'desgastar').

Third characteristic of the Mexican corpus: when water is considered for its capacity to satisfy human needs (in red), two aspects are emphasized, the fact that water is vital (two occurrences of 'necesitar' –*need*- and one of 'recurso vital' – *vital resource*), and the capacity of people to adapt to the evolution of water resources (3 occurences of 'adaptar'). The expression 'recurso vital' is surrounded by a blue frame because the substantive also refers to water as a natural resource. The emotional tonality associated to the mentioned human needs is quite high, as they correspond to matters of life or death: 3 occurrences of 'tomar' or 'beber' (*drink*), and one occurrence of 'vivir' (*live*).

On the contrary, this corpus presents very few contextual terms corresponding to the viewpoint of the water producer (in brown). A unique occurrence among the three national corpuses appears in Mexican data: the use of the verb 'compartir' (*share*), which is reproduced in green and surrounded by a brown line: here water provider is also presented as a co-user.

Fifth characteristic of the Mexican data: a large number of occurrences referring to water trade (in purple). Both selling and buying water are mentioned, but the students mostly present themselves from the viewpoint of

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the consumer (30 occurrences of 'comprar', 'pagar' or 'costar' –*buy*, *pay*, or *cost*, versus 6 occurrences of 'vender' or 'dar caro' -*sell* or *give at a high price*). Moreover, 13 terms deal with water price, 5 of them emphasizing how expensive it is, or mentioning that it is going up. Water is even considered as a potential currency twice ('pagar con' - *pay with*). Last but not least, the verb 'robar' (*steal*) appears twice. Drinking water, thought as a commodity, can be monopolized, traded, or stolen.
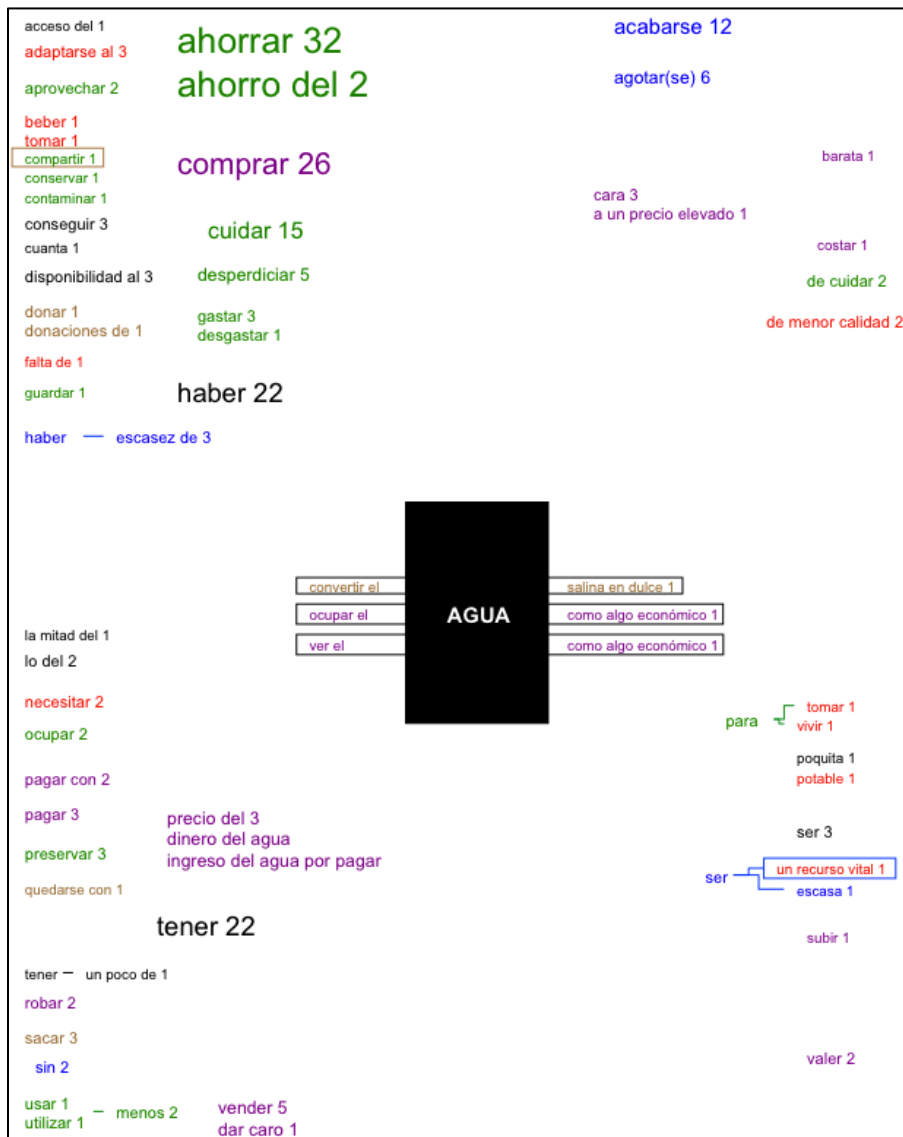

Figure 2 – *Schematization* of 'water' in the Mexican data: visualization of co-occurring terms, their focus and frequency.

Figure 3 synthesizes the results obtained for the US corpus. Here, the focus on water as a natural resource (in blue) is much more frequent than it is in the two other subcorpora. This perspective is embodied both in a general lexicon (10 occurrences of 'sources', 'resources' or 'supplies') and by reference to specific water sources: polar icecaps (1 occurrence), seawater (5 occurrences). If 3 occurrences mention that water is scarce or absent (2 occurrences of 'no water'; one of 'scarce'), there is also 2 expressions emphasizing its abundance ('a lot of', 'a ton of'). Two contextual expressions are ambivalent in this aspect: 'has been taken' and 'out to bigger countries', because they establish scarcity in a place corresponding to more water in other places, the USA falling into the second category (the 'bigger countries').

Such dichotomy is consistent with what appears in red, corresponding to water characteristics for the satisfaction of human needs. At a quantitative level, 5 occurrences mention the lack of water ('lack of' or 'run out of/low on'), 2 rather refer to an appropriate amount of water ('enough'; 'the needed amount'), and one occurrence describes a situation of abundance ("as much water as we want"). At the qualitative level, water is also framed as more or less good (6 occurrences of 'good', 'better', 'purified' or 'thin' versus 4 occurrences of 'bad', 'worst', or 'lower water quality').

When it comes to the uses of water (in green), 7 occurrences are quite neutral ('consume', 'consumption', 'usage' or 'use'), while 20 describe good practices to follow and 5 bad practices to be avoided. For good practices, the most frequent verb is 'save', referring to both preserving water and economizing it.

The US corpus is also characterized by a very frequent *schematization* of the discourse object 'water' from the viewpoint of the water producer or provider (in brown). Water production is extensively discussed, with 4 general occurrences ('produce'; 'make water available'; 'make'; 'do'), and the mention of a large number of production techniques: the desalinization of seawater (4), the recycling of water ('reuse'; 'renew'), water purification (1), and even channeling a river (1). A lexicon referring to water distribution also embodies this orientation focus: 'lines'; 'plumbing'; 'give' (4); 'provide' (1).

Water trade appears in the US corpus, as much from the viewpoint of the seller (2 occurrences of 'sell') as from the viewpoint of the buyer ('pay to get', 'pay for'). One occurrence of the neutral term 'interchange for' was also inventoried. About the water price, the emphasis is more on how cheap it is or might be (3 occurrences of 'cheap', one of 'affordable') than on how expensive it is or might be (only one occurrence of 'expensive').

Besides, in the US corpus, two words employed for the general problem of access to water deserve a specific attention. The first one is the massive use of the verb 'get', which embeds an idea of voluntary action that is absent in the verb 'have', for instance. Rather than considering access to water as determined by fatality, this framing is emotionally less intense than the

French or Mexican ones. This tendency is confirmed by another specificity of the way the global problem is referred to, in the US corpus: the use of abstract words and a bigger emotional distance to the issue ('water problem', 'water issue', "it is wrong with their water").
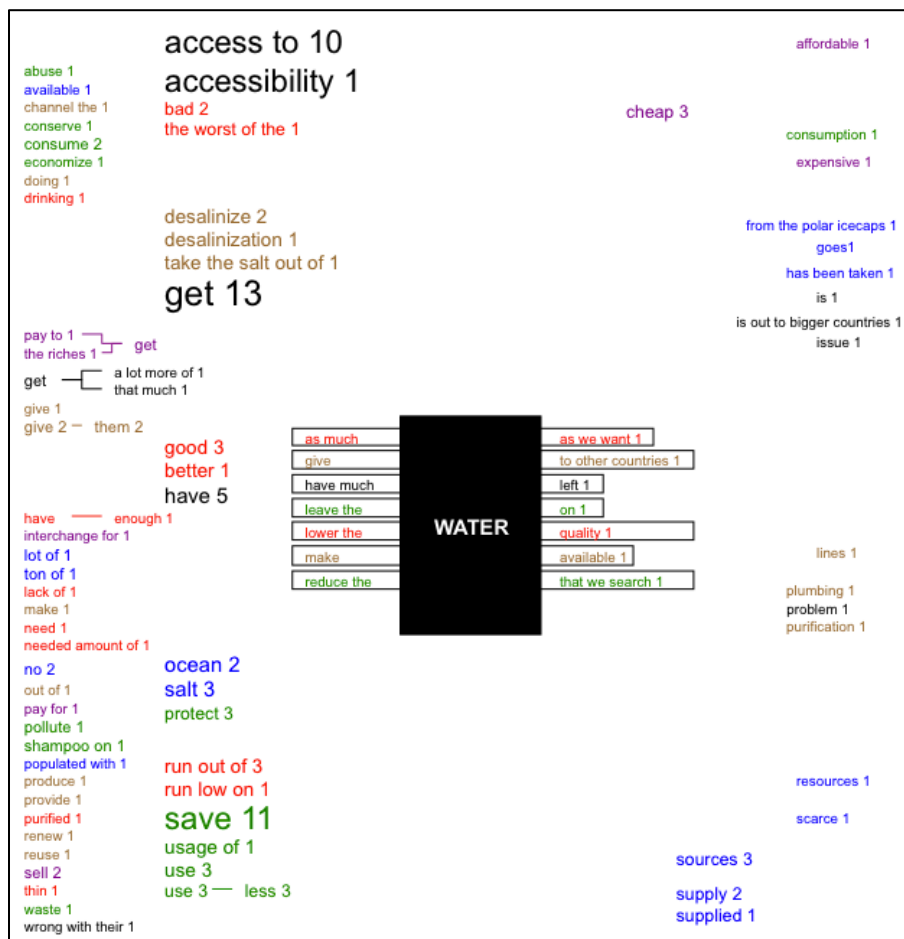

Figure 3 – *Schematization* of 'water' in the US data: visualization of co-occurring terms, their focus and frequency.

In figure 4 are visualized the main results for the French corpus. Here, water is hardly considered as a natural resource (only 3 occurrences in blue). When such framing occurs, it is mainly to put emphasis on the fact that water is getting more and more rare.

'Economiser l'eau' is THE motto that stands out of the French data, when it comes to water uses (in green). In total, 16 occurrences refer to good practices to use less water (11 occurrences) or preserve it (5 occurrences). But, contrary to the other corpora, here no concrete situation is presented.

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In terms of *schematization* of water for its capacity to meet human needs (in red), both qualitative and quantitative aspects are mentioned in the French corpus. A unique interesting occurrence frames the need for access to water as a right to water.

This is consistent with the fact that, among the 12 occurrences corresponding to the viewpoint of the water producer or provider (in brown), one specifically focuses on water distribution considered as a matter of public service. Some contextual terms also refer to the general action of producing water ('faire', 'fabriquer' - *make*), while the specific word 'refroidir' (*cool down*) refers to getting water from the air.
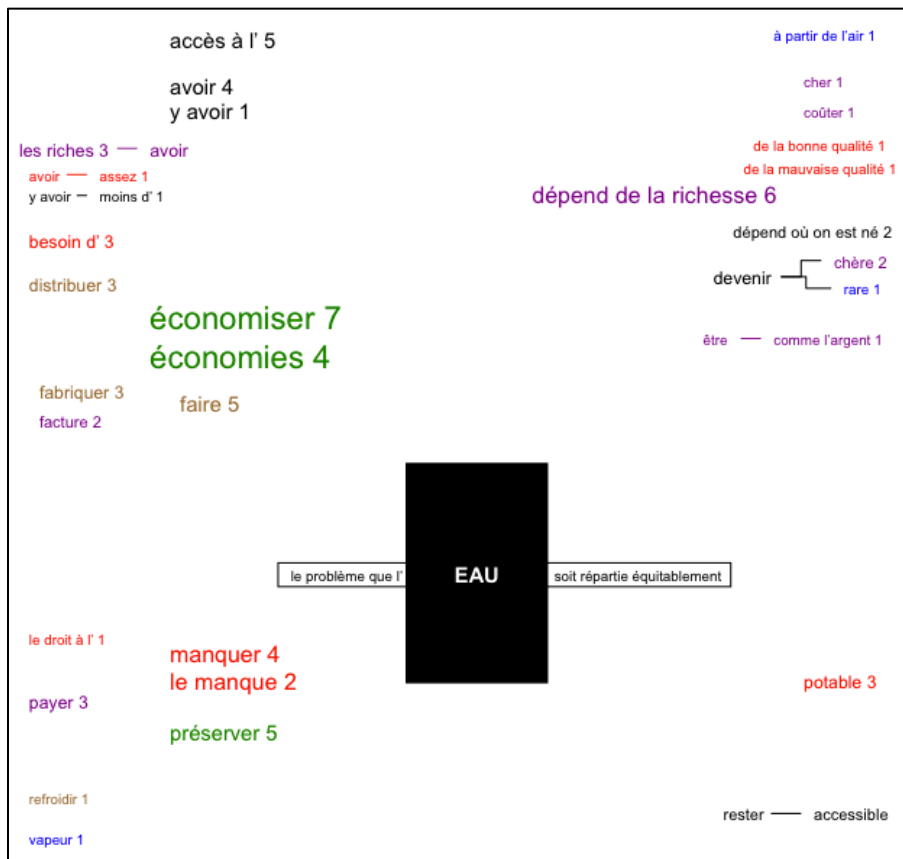

Figure 4 – *Schematization* of 'water' in the French data: visualization of co-occurring terms, their focus and frequency.

The orientation focus on water trade (in purple) is quite well represented among the French data, with 9 occurrences referring to the price to be paid by the consumer to access water. Moreover, 10 occurrences embody a concern for the socioeconomic inequalities among people for access to water.

At the end of the day, the French corpus is strongly characterized by addressing the problem of access to water at a macro-social level, with a global motto ('économiser l'eau') rather than concrete, micro-level examples of good practices, the definition of a universal right to water, and the subsequent concerns of dealing with social inequalities and the matter of providing water to everyone.

6. CONCLUSION

The analysis of co-occurrences in TXM proved useful to specify and compare students' *schematization* of 'water' as a *discourse object*, between our three national corpora (Mexico, USA and France). Beyond effects of cultural rhetorical styles, substantial differences in terms of orientation focus (*éclairages*) distinguish the debates hold in the three countries. In the Mexican debates, water is mostly apprehended from the viewpoint of the consumer, worrying about daily practices for getting water at an affordable price and saving the vital endangered resource. On the contrary, in the US corpus, the viewpoint of the water producer prevails. Here what counts is finding technical solutions to provide water at a low price to the consumers, making the best out of the natural water resources of each territory. In France, social inequalities are mentioned from a macro-social viewpoint, and the addressed solutions mostly rely on a better global organization of the distribution of water, considered as a universal right and public service. These results about the specific *argumentative framing* converge with results obtained by two other methods, about the cognitive models of 'water' used by the students, the prevailing knowledge area in the debates in the three countries, and the analysis of students' votes during the activity (Polo, 2014, pp. 359-424). They contribute to the comparative characterization of the prevailing *'argumentative scenario'* (Plantin, in press) in each setting. Innovative word-cloud visualization gives a global picture of the automatic textometrical results and the complementary qualitative analysis that was very helpful for the comparative dimension of our analysis.

More generally, we believe that the operationalization of the Grize's concept of *schematization* (1997), as a descriptive framing approach, can be applied in other argumentative situations and enrich the methodological toolbox of the community of argumentation studies. The textometrics provide promising ways of doing comparative analysis in argumentation that really focus on the *objects* under discussion. Moreover, the word-cloud-type visualization of mixt-method results that we developed in this study can be useful even in monographies, out of any comparative aim. It might be especially relevant to study the role of emotions in a specific argumentative corpus, enabling the analyst to see at a glance the prevailing orientations given to the debate, and the co-substantial emotional framing (Polo et al., 2013).

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