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ARGUMENTATION AND MULTIMODALITY: AN ANALYSIS OF SUSTAINABILITY AND BREAKING OF IRON ORE WASTE DAMS

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ABSTRACT

Iron ore tailings dams were built to contain mining waste. After the rupture of the ore tailings dam in Brumadinho-MG, many multimodal discourses about the sustainability and use of tailings dams were supported by social criticism. The aim of this study is to analyze the role of multimodality in textual argumentation, from a socio-cognitive and interactional perspective, in order to understand the argumentation from a cognitive bias. For this, it is adopted from an expo-facto research, the theoretical bias of discursive intentionality in the line of Searle (1995); the character of mental models, social representations and sociocultural knowledge as predicted by Van Dijk (2012), Geeraerts's (2016) socio-semiotic vision to understand how argumentation through the imagery field of cartoons is constructed and socially supported and dialogism in Meyer's perspective (2008) from the argument. In this perspective, the text is thought of as a linguistic-discursive construction in which intentionality is related to mental models resulting from representations built from the subject's experience in society and from interactional practices. In this context, the text contemplates a range of interconnected cognitive operations as directed by Marscuschi (2007). A corpus of cartoons published in the Brazilian media is constituted, oriented to the theme of sustainability and the rupture of tailings dams of iron ore for the analysis of the multimodal and discursive aspects. The conclusion highlights the use of multimodal resources in the argumentative orientation of the fear policy and social criticism.

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INTRODUCTION

Of all the existing metals, steel is the most used, with iron ore as its main ingredient (Pinto Jr. *et al.*, 2018 and, Anglo American, 2019). The ore is considered to be a rock made up of a mineral or set of minerals that contains the economically exploited iron. Iron ore is used in rails and infrastructure, in addition to cosmetics, engineering, construction, painting and other products. Iron ore originates from nature and is extracted through mining. Mining comprises a set of activities aimed at researching, discovering, measuring, extracting, treating or benefiting and transforming mineral resources in order to make them economic and social benefits (Ibram, 2016, p. 11).The so-called iron ore beneficiation or treatment consists of a series of processes ranging from the extraction of the ore to the final product ready for sale.

According to Vision (2019), the processes can be physical or chemical and their use depends on the fins and the quality of use of the processed ore. These processes consist of: reducing the ore granulometry; grinding (reduction of granulometry by means of mills); delamination (removing the ultrafine harmful to the later stages of processing); sieving (separation of the ore and tailings by granulometry); jigging (ore separation and tailings by density); magnetic separation (selection of ore and tailings for magnetic properties) and fluctuation (selection of ore and tailings for chemical properties). The final product of all these processes is called concentrate and its price depends on the iron content that is presented. What is not used is called rejected by iron ore and contains gangue, some ore and other impurities. As the ore undergoes crushing and grinding processes, the tailings are made up of fine catches ranging from sand to clay. The latter being in the presence of water, or characterized as mud.With the Industrial Revolution, there was

a sharp increase in mineral inputs, according to Ibram (2016), and as a result, there was a need to remove them to places close to watercourses for deposit and containment from containment bars or dikes. Rafael conceptualizes tailings dams as being:

[...] an earth structure built to store mining waste, which is defined as the sterile fraction produced by the processing of ores, in a mechanical and / or chemical process that divides the crude mineral into concentrate and tailings (Rafael, 2012, p.22).

The tailings are usually deposited on the land surface, in disposal basins formed by dams or dikes. In this way, ore tailings dams are formed in large spaces and consist of structures that close the narrowest stretch of a valley, while dikes are structures built in flat areas or with little slope. These tailings disposal basins formed by dikes and dams are called tailings dams. The composition of the tailings is fine grains or fine tailings, called mud, and those with a thicker texture, called granular tailings. The heavier particles settle while the rest remain in suspension, thickening over time.Rafael (2012) considers that the tailings storage has been a very important concern in mining companies worldwide, whose motivation is the protection of the environment. It presents three methods of raising tailings dams, which is how to prepare the dam to receive tailings: upstream, downstream and the centerline method. This author focuses and discusses the upstream method, which begins with the construction of a starting dyke. This is the most simple and low-cost construction, but it has the disadvantage that when there are excessive lifting speeds, they can induce the static liquefaction that is the main cause of the collapse of several tailings dams built in the world.The tailings are unused materials that are generated in the cleaning of the ore and in this process the mud is formed that has to be stored in a confined way in some place and structure, as mentioned by Rafael, in order not to be thrown into the environment, which could cause more damage. The dams will store the waste that would otherwise be dumped into nature causing more environmental impacts. Rafael (2012) considers that the tailings storage has been a very important concern in mining companies worldwide, whose motivation is the protection of the environment. Basically, there are two methods of raising tailings dams, which is how to prepare the dam to receive tailings: downstream and upstream.Figure 1 shows a tailings dam built by the downstream method. Downstream is the lowest direction of a river.
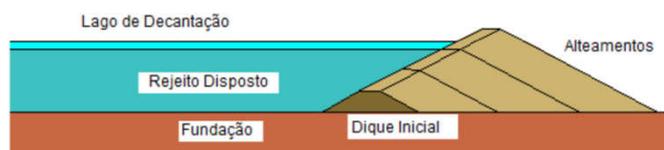
Source: Rafael (2012, p. 32)

Figure 1. Tailings dam built by the downstream method

It can be seen through the image that the dikes are built on the right side of the reader, from the initial dike and that, therefore, have good sustainability and this is not the least costly construction method. Already upstream has the meaning of a place above or the beginning of the river. Figure 2 illustrates the upstream construction method, which is the least costly.
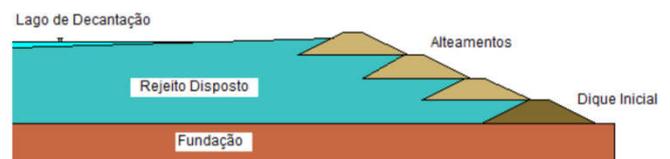
Source: Rafael (2012, p. 31)

Figure 2. Dam built by the upstream method

The figure verifies the existence of the initial dike on the right side of the reader and is highlighted in dark color and is also usually the first place to break when a catastrophe occurs. The elevations correspond to new dikes that will contain the mud. In the figure, three more elevations or dikes are observed in addition to the initial one. This type of dam construction is the most used, least cost and simplest construction, which starts with the construction of a starting dyke and which however has the disadvantage that when there are excessive elevation speeds, they can induce static liquefaction which is the main cause of the collapse of several tailings dams built in the world.According to Globo.com (2019), the cost of the upstream dam is half the cost of other methods and conserves a lot of moisture, while the drier process is more expensive. This was the model of the Brumadinho dam that ended up collapsing and due to the losses, it becomes interesting to make more investments in safer storage methods.

METHODOLOGY

The methodological framework of this study focuses on a qualitative research, of an expo-facto nature and of an exploratory nature. Due to the fact that the investigation is based on cognitive theories that lend themselves to discussing the correlation between cognition and argumentation, cartoons published in the Brazilian media were selected, oriented to the theme of sustainability and the breaking of iron ore tailings dams in Brumadinho -MG, in order to carry out a content analysis regarding the multimodal and discursive aspects that guide to an explanation of how the argument works in cognitive terms in the light of the socio-semiotic of Geeraerts (2016). The cartoons were selected by the theme involved to analyze the speeches around the fact that the dam burst in Brumadinho-MG.

Cognition and multimodality: From the Latin Cognition and as a translation from Greek, gnosis, the term cognition has as its principle and meaning the act of knowing, knowledge and perception. Although some authors consider that the term originated in ancient Greece (Chaney, 2013), it is in Psychology that it has gained space in an attempt to understand how the human being works in terms of mental mechanism (Neisser, 2014). In the view of Bechtel (2008), the cognitive process corresponds to parts and operations that operate with each other, leading to thinking about a dynamic activity in which there is interdependence between the parts. In Psychology, the term is inspired by the computer metaphor, in the sense that information has an entry and is subsequently processed and transmitted, as highlighted by Bender and Beller (2013).In this sense, cognition has an internal character because it is about mental states, but also an external character, since culture can affect or influence cognitive processes. Cognition is fundamentally cultural and excluding this dimension necessarily prevents its understanding (Bender&Beller, 2013). After all, the condition of the environment allows the perception of the world itself to

change. However, it is not just about perception. The authors reinforce that cognition can be understood in several aspects such as: perception, attention, categorization, learning and memory, thoughts, decision making, problem solving and use of language.For Neisser (2014), cognition concerns everything that human beings are capable of doing. Houwer; Barnes-Holmes and Barnes-Holmes (2016) point out that there are disagreements, however, regarding the use of the term Cognition among cognitive researchers themselves due to the fact that: some consider cognition as a set of non-emotional states; others exclude the experience of awareness of cognitive states (Moors, 2007 apud Houwer; Barnes-Holmes&Barnes-Holmes, 2016); or even that the information process uses symbolic representations (Mcclelland&Rumelhart, 1985 apud Houwer; Barnes-Holmes&Barnes-Holmes, 2016) and others are linked to the biological nature of the human body (Barsalou, 2008 apud Houwer; Barnes-Holmes&Barnes-Holmes, 2016).It can be said that cognition is linked to the way information is processed, and can also be accompanied by emotion and awareness. For Brandimonte, Bruno &Collina (2006), cognition is not merely a process, but a mental process by which information is processed from its entry to its use.However, it must also be considered that cognition has not only an internalist character, but also an externalist one, as stated by Bender &Beller (2013), or even, cognition as behavior by Overskeid (2008), that is, it reveals a way of processing information that mediates external phenomena. In this sense, it can be said that certain external stimuli shape the way of thinking. One of the main discoveries in this field of research is that the properties of external representation can affect the way it is processed (Bender&Beller, 2013). In this regard, the objective of this study is to understand, from cognition, how the external phenomenon can bring and build mental representations and ways of thinking. As these are speeches about cases of iron ore dam rupture, it is necessary to understand how these speeches act in an interactionist and cognitive view.

Paveau (2013) advises that interactionism and cognitive psychology work in a symmetrical way, that is, they lead to a convergence with regard to the external environment. According to the author, interactionists had already proposed in the 1980s to integrate the elements of the environment in a linguistic analysis. In other words, take into account how the medium influences the interpretation of linguistic models, in an interactional process. Likewise, Berrendonner, as Paveau (2013) recalls, proposes to take into account the significant aspects of all elements of reality and includes objects.In Bronckart'ssociodiscursive interactionism, for example, as the author emphasizes this linguistics from abroad, as well as a conversational analysis from multimodal approaches such as Mondada's. In this context, the speeches are not limited to the enunciative parameters, but take into account the socio-historical conditions. In social cognition, as Paveau (2011) argues, the relationships between social beliefs, discursive practices, as well as the context are called environment in the cognitive perspective. It can be said that it concerns the way in which the external environment or environment interferes in discursive practices. In the words of Geeraerts &Cuyckens (2012, p.10) "[...] social interaction, the exchange of ideas and the change in world views are mediated mainly by the meaning of linguistic expressions", which it implies that the meanings of the aspects of language depend on social relations.In the case of the object of research of this study, since it is, mainly, the speeches present in the genre cartoon

and journalistic matter, it can be said that they are usually produced from impressions, beliefs and social representations.One form of socio-cognitive proposition is pre-built, that is, the effect of one speech on the other. Pecheux (1993) refers to pre-built elements already formed that circulate in society, that is, to what is already known, shared, perceived as what is given or known, or even, already said. Usually, they appear in interdiscourses. The interdiscourse refers to the evidence by which the subject organizes his speech and links objects (Courtine, 2007).Pêcheux (1993, p. 79) points out that "it is impossible to analyze a discourse as a text, that is, as a linguistic sequence closed on itself". In principle, it is necessary to make references to other possible speeches, often to understand the intentions of the speeches. For this, the author states that it is necessary to take into account the conditions of production of the speeches.

According to Geeraerts (2016), Cognitive Linguistics in the new millennium has turned to the study of the sociocultural aspects of language at three levels: i) variation within languages, linked to the research traditions of sociolinguistics, dialectology and stylistic analysis, using the same methodical empirical methods as those traditions; ii) variation between languages and cultures, studying the form of cultural and anthropological comparisons or historical investigations in changing concepts over time periods; iii) intralinguistic and interlinguistic variation. For this study, what stands out is the third level, which consists of the analysis of the way in which the emergence of a language and the presence of certain characteristics of that language can be better understood if taken into account the socially interactive nature of communication linguistics.As Geeraerts &Cuyckens (2012) confirm, Cognitive Linguistics is the study of language in its cognitive function and correlation with the world. For the authors, interaction with the world is mediated through informational structures in the mind. In this sense, Geeraerts &Cuyckens (2012) see the language as a repository of world knowledge, a structured collection of significant categories that help us to deal with new experiences and to store information about old ones. It can be said that Cognitive Linguistics is concerned with understanding how knowledge occurs through language.Current studies point to a social perspective as a notion of a cultural model. Geeraerts (2016) still advocates the idea of social semiotics, that is, how language can be understood as a multimodal aspect and formed by the social sieve. Thus, the term semiotics, known as the study of signs and their use and interpretation, highlighted by the author, refers to the way in which social representations are manifested at multimodal levels. In this regard, taking into account all this look at the social influence on cognitive conditions, it can be observed that in the speeches published by the media about the tragic events related to the rupture of the iron ore dam in Mariana and Brumadinho brought indications that, in the cognitive perspective, the pre-built elements refer to social beliefs, as well as the vision of the social, such as the thought about Vale's posture in face of events in both cities where the mining company has iron ore exploration . It is known that the genre cartoon portrays not only the opinion of the cartoonist / cartoonist, but also a sharing of beliefs, sometimes extracted from the social, sometimes turned to the social, as a way of reflecting on the event, as pointed out by Paveau (2013).The medium can influence the interpretation in an interactional process. It is not necessarily a matter of media manipulation, after all, the subject may have the beliefs consistent or not with those of the cartoonist / cartoonist and not necessarily let himself be

influenced by them, but to make think from the beliefs themselves the way the speeches are produced. The role of linguistics, in this case, is not to express your opinion about the speeches, but to analyze them in a neutral way capable of understanding the way in which the speeches are presented in society.As Geeraerts &Cuyckens (2012, p.4) point out, "Cognitive Linguistics is interested in our knowledge of the world and studies the question of how natural language contributes to this". The opinion expressed in the cartoons is a form of imagistic and linguistic representation of how society is directing intentions and what social representations are present in them. Thus, it is not necessarily an opinion of the chargista / cartoonist subject about the facts explicit in the cartoons, but of provoking discussions, often from the beliefs of the society itself or of a group of it. Paveau (2012) highlights that contexts have a certain influence on discursive production. In the case of cartoons, because they are typically dated, the context actually influences the way the speech will be presented.

Thus, in the cartoon below, for example, it can be seen as pre-built: the image of the mining company as guilty of the iron ore dam ruptures that occurred, especially in the city of Brumadinho-MG; the image of the mud as a devastating factor of houses, trees and everything that lies ahead, referring to the fact that the rupture of the dam implies the spilling of the mud, devastating the environment and the social, expressly represented by the flag containing a skull symbolizing the death.The representation of death by the skull symbol is known and socially constructed. The dead fish in the river where the direction for understanding the gaping fish are dying because of this., Or that explain the directionality that there is an environmental disaster. It is worth remembering that it is not about discussing the culpability or not of the mining company, there is a possibility of accidents at any dam, but it is a way of qualifying opinion and generating criticism.It is known that language is an entirely arbitrary system and is investigated as speech and text, that is, studies have focused on the property of language without considering its multimodal character. In principle, speakers use iconicity when speaking, so they develop a symbolic system. This context contributes to the meaning of the sentence. Thus, as described by Vigliocco, Perniss& Vinson (2014), the linguistic and conceptual level is a process of transducing the linguistic symbol to cognitive representation.

For the authors, the literature considers that the property of language and communication take different paths. The first meets the writing conditions and the second is more concerned with the interaction, that is, how language is used in the interaction, which includes gestures and prosody. Or even, the use of imagery representation can be included. The authors also point out that iconicity affects semantic processing, that is, the understanding of language. In fact, it cannot be denied that language is multimodal, as it manifests itself in different media, especially through the image, in its symbolic or representational character.Vigliocco, Perniss& Vinson (2014, p.5) complement in the sense of iconicity stating that "If the multimodal nature of language is recognized, then iconicity becomes visible through all languages as expressed in different channels". In fact, there is a relationship between language and iconicity.To understand the role of iconicity, especially in the processing and development of language, a cognitive structure that explains how iconicity works is necessary. Emmorey (2014) defends the theory of map

structure, in the sense that iconicity corresponds to a map structure between two mental representations. In other words, for Emmorey (2014), a mapping between the meaning and a visual or auditory linguistic form"In this regard, it can be said that in the case of cartoons, for example, there is the mental representation of the cartoonist / cartoonist's opinion manifested by the layout of the images of the line and the mental representation of the fact manifested by the speech provided with representational beliefs facts of the event expressed in the cartoon. In Figure 1, it is possible to observe the image of the paper boat, with the top of the boat the Vale company logo upside down, represented by the green color, the real color of the company logo.

Source: Charge-de-Edra-on-rupture-of-dam-of-Vale-in-Brumadinho.

Figure 3. Rupture of Brumadinho dam – MG

The figure presents a form of representation in the sense that the company is metaphorically characterized as a participant in a fragile boat, because, as is known, the paper boat is quite fragile in the water due to its type of material. Thus, the cartoon leads the reader to reflect on the delicate situation in which the company finds itself due to the tragedies that occurred in Minas Gerais. In this way, just like a paper boat sailing in a "sea of mud" becomes a fragile object, as it can dissolve, the company is seen metaphorically belonging to this "fragile boat", because at any moment the dams can break and new accidents happen due to the mud flow. In this regard, multimodality manifests itself in the mapping of the meaning of the cartoon and of the image representation by the arrangement of the images that appear in it.As stated by Geeraerts &Cuyckens (2012), there is no knowledge without a mental representation, as it is part of the cognitive apparatus. In this respect, there is a correlation between language and mind, because both to understand it and to produce it, everything goes through cognition. In the view of Perlovsky& Sakai (2014), there is a cyclical process from mind to language and from language to mind, in which it creates language and then receives it back in the interpretation processing. In this respect, multimodality is linked to the way cognition works with language.

Weiskopf (2010) argues that language is a multimodal device. For the author, the human being is able to combine and transmit information linguistically about things detected by any of the senses. Following the principle of embodiment of

linguistic understanding or embodiment of meaning, understanding sentences or phrases involves mapping them into conceptual representations. In fact, concepts start from perception. In this scenario, cognitive abilities such as language and conceptualization of thought are intrinsic to the system of embodiment and sensorimotor abilities. Language is then seen as a cognitive tool (Geeraerts, 2016, p.531). Although, the tradition of cognitive studies is to point out that the ability to understand a sentenceis a matter of calculating its semantic representation, as described by Weiskopf (2010), more current studies suggest that people tendtogenerate perceptual images of scenarios described in understanding of sentences (Weiskopf, 2010, p. 296). For Geeraerts (2016), Cognitive Linguistics has adhered not only to the idea of cognitive commitment in the sense of Lakoff (1990), of mind and brain studies, but also of establishing relationships between other cognitive disciplines in order to study non-language. only as an autonomous process but as a reflection of conceptual organization, principles of categorization, processing mechanism and influences of experience and the external environment. In addition, to be committed to considering human language as a social semiotic in which meaning is constructed socially. It is worth remembering that social practices show that communication is not just about words, but also signs, gestures and images, which configures communication as multimodal. Van Leeuwen (2011, p.668) highlights that multimodality is about "the integrated use of different communicative resources, such as language [text-verbal], image, sounds and music in multimodal texts and communicative events". In this sense, what stands out in this study is how the multimodal resources are presented in the form of arguments to support a thesis in the cartoons, especially those focused on the theme of iron ore dam ruptures.

Argumentation and Cognition: As Perelman (1987) well defines, argumentation consists of a process in which to argue is to provide arguments, that is, reasons for or against a given thesis. In other words, arguments are nothing more than concrete justifications based on opinions about a certain subject, on which it is intended to defend a position and a vision. In a modern theory of argumentation, a new form of rhetoric is understood. In contrast to classic rhetoric, in which argumentation was conceived as the art of speaking well, in the sense of persuading and convincing an audience, argumentation in the current mold is essentially communication, dialogue, discussion (Perelman, 1987, p. 234). As every argument is intended to meet the audience's adherence, in the cartoons, which are a purely argumentative genre, using both written and imagery, the arguments are arranged considering an intention to influence. It is also necessary to know the auditorium well to know how to act, what to put in the speech. In this regard, it can be considered that in the case of cartoons, being a genre of journalistic nature, the cartoonist / cartoonist is informed first of the fact that occurred and also, often, of the repercussion of that fact in society. After all, as advocated by Perelman (1987), having knowledge about the theses and values admitted by the auditorium, in the case of cartoons, the public that is the society, which addresses the speech is fundamental because it will be the starting point of your speech. The intentionality of the speech is the directionality to which the speech producer points out the meaning. Be it persuasion or manipulation, the discourse of cartoons points out reflections that can influence judgments, decisions and actions, as argued by Van Dik

(2006). In a sociocognitive view, as the author considers, the argument is above all a question of the relationship between speaker and receivers. There is no knowledge in isolation in the subject's mind. He needs to use his senses, perceive and observe the world around him and reflect on him. Cognition comes to be seen as a social construction, as Marcuschi (2007) already maintained.

After all, as language is interactional, both with regard to its use, as well as its production in the sense of being used to interact, it constitutes a cognitive stamp generated in the mind with the purpose of directing intentionalities to the interlocutor. As Searle (2002, p.4) points out "intentionality is directionality". In this sense, it is up to the reader to perceive the path of this directionality to then interpret the discourse. The beliefs and desires, defended by Searle (2002), as principles of intentionality are constituted in intentional states, but have no intention of anything. First of all, they make up the intentional internalist, that is, mental picture. Thus, for Ibid (2002, p.6), it is possible to "experience the intentional state without the object or state of affairs to which it is directed even exists". When it comes to the materiality of the text, intentionality is best perceived through this direction that the author leads, in the disposition of arguments and in linguistic or even imagery clues. In this sense, the text is thought of as an interactional form that is always produced for someone as a certain purpose.

> The text is thought of as a construction that involves knowledge of the language; the things of the world and how they work; the subjects, their intentions and the society in which they live; of mental models resulting from experiences, experiences and interactional practices (Elias, 2016, p. 191).

The act of arguing involves a game of intentionality, in which there is both the one who guides his text to inform, influence and expose, many times, a criticism, and the one who is the interlocutor, to whom the text is directed. This "[...] has the freedom to consider or not the validity of the arguments, to accept or not the thesis defended" (Elias, 2016, p. 192). In this respect, it is not necessary to talk about manipulation, necessarily, because it is up to the reader to judge the information. In this regard, Meyer (2008) argues that all argumentation is dialogue. As much as the producer desires a membership, there is a whole freedom of thought. In this case, the possibility of contrary theses must be considered. In the case of cartoons about the tragedies that occurred with the Vale company, it is possible to observe, in fact, a dialogue, through a certain repudiation and revolt by the population about the events. However, all the repudiation pointed out in the speeches around this theme is not necessarily equivalent to manipulation speeches, since they use argumentation as a manifestation and representation of other speeches that underlie the events of the dam breaks.

> Indeed, to speak of manipulation is to put oneself in the perspective of an accusatory discourse and then to be caught in the game of argumentative contradiction. In this context, to say that a discourse is manipulative is to invalidate that discourse through the manipulation argument (Plantin, 2002, p. 238).

For Hoffmann (2016), in cognitive terms, arguments can be used to stimulate reflection on one's reasoning and not just to

win debates and fights, resolve differences of opinion, reach some consensus, understanding, or even, justify knowledge in open questions and demos. The arguments also have the function of promoting, stimulating reflection. In the field of Psychology, the term reflection can be confused with metacognition, in the sense of self-monitoring. However, in cognitive terms it assumes the character of understanding the nature of the arguments and knowing how they affect the way of thinking. In addition, the reflective judgment that is made about the arguments involves the individual's ability to recognize his own views and that these can be challenged by new evidence. In other words, they serve not only to reflect on the world but also on the conditions themselves. Such a reflection process can be intentional or unintentional, according to the author. It is intentional, in this context, when the explicit objective is self-reflection and unintentional when it has other purposes, such as persuading, which is to change someone's mind. "It's like reading a book for entertainment while, without wanting to learn about the world" (Hoffman, 2016, p.368). There is a semantic difference between persuading and manipulating. The first is to present arguments that lead to reflection. Adherence is the focus, although it does not always happen. Manipulation, on the other hand, refers to making decisions for the other in order to make certain choices against their will in favor of the manipulator's own interests. In this regard, it can be said that observing the regularities of the cartoons, the objective of the discourse present in them is always turned to criticism. Through sarcasm, they promote reflection on society, as well as self-reflection of their own position in society.

> The cartoons can be recognized as organized and standardized forms that are established in the circulation and use of them, since, in general, they have certain regularities regarding the production organization process, especially with regard to the interrelation between imaginary speech and verbal speeches or to them in isolation, basing a criticism between the lines (Silva, 2008, p.86).

It can be said that there is more persuasion than manipulation of the media. In principle, persuasion occurs when the subjects find some reasonableness in what is being exposed in the speeches based on their own reflections on the arguments. Hofmann (2016) argues that a precondition for reflective argument is based on the representation of arguments. For him, the arguments can be represented in speech or in writing, in thoughts, images and reflection will only be possible if somehow these arguments follow a mental model. Reflection is only possible when there is perception, when one "looks", according to the author, at something.

In Figure 4, it can be seen that the terms present in the paratext: "accident, negligence, incompetence, greed, fatality, inconsequence, tragedy, inevitable, predictable, unpreparedness" comprise speeches by the population and the media about the event of the rupture of the tailings dam in the city of Brumadinho-MG. The terms represent the way of thinking of the individuals involved or not in the event, being: i) accident, due to the belief that an event was unexpected; ii) negligence, due to the belief that the company could have prevented the disruption; iii) incompetence due to the belief that the company made mistakes and did not know how to avoid or correct them; iv) greed, due to the belief that the company is not concerned with the citizen, only with its own

profit, seeking to maintain a type of dangerous dam; v) fatality, due to the belief that it could not be avoided because it was a misfortune; vi) inconsequence, due to the belief that it was irresponsible and lack of awareness with the population; vii) tragedy, due to the belief that what happened was a catastrophe; viii) inevitable, due to the belief that the tragic event was about to happen, due to the high risk of the type of dam involved; ix) predictable, due to the belief that it is a dangerous type of dam; x) unpreparedness, due to the belief that both the company and the population were not prepared to contain or prevent the event.

Source: Cartoon about-breaking-of-dam-of-Vale-in-Brumadinho.

Figure 4. Edra's cartoon about rupture of Brumadinho-MG dam

In this regard, in cognitive terms, it is noted that the cartoonist / cartoonist works with activated beliefs that circulated in the media, both with regard to the claims, as to the company's explanations or comments from journalists and experts on the subject.The paratext as opposed to the image of people with their hands raised, as if they were crying out for help, in a situation of "drowning" or flooding of mud (recognized by the color of the water in the cartoon), refers to the reader's reflection on the fact that occurred and it allows him to recognize, according to his convictions, the real reason for the event. Another possibility of interpretation is to take into account that there are many people involved in the dam process and that no one has taken the blame. Therefore, the raised hands can also suggest the interpretation that everyone involved "washed their hands", exempting themselves from any possible deception. The image of the open faucet with liquid flow is a metaphorical model of mental representation of the dam rupture, which, once broken, flows. Although the open tap refers to water and not mud, the cartoonist uses this representation to reflect on the event that the tap represents the dam and the liquid the mud that was drained due to the rupture. The expression "I wash my hands" was taken from the biblical passage, in which PoncioPilatos, in order not to commit himself to Jesus' accusation and condemnation, spoke to the people saying "I wash my hands", to say that it would not be his fault, but of the people who so chose to condemn Jesus. It is observed that the use of the expression reveals an interdiscourse between media discourse of the cartoon and religious discourse, used as an argument to support the thesis that the company is using the discourse that it was not to blame for the fact that occurred, compared to the biblical passage. The expression "I wash my hands" announces a way of saying that the "hands are clean", that is, free from dirt. In this case, one can observe a metaphor of dirt equivalent to

something wrong, illicit or guilt, unfolded from the original expression. In this process, the cognitive device performs an interpretation of the interpretation of the terms, considering not only the context, but also the interdiscourse.

Source: Cartoonist Ferrugem'sCartoom on the Brumadinho-MG Dam Break

Figure 5. Charge by cartoonist "Ferrugem" about the rupture of the Brumadinho-MG dam

In Figure 5, it can be seen that the criticism is even more explicit around a culpability towards Vale. The paratext "it is not an accident, it is a crime" refers to the reader's comparative reflection on the two events of Vale's dam ruptures, the first in Mariana-MG, which occurred in 2015, with 19 deaths and 296 people missing, and the second in Brumadinho-MG, in 2019, 229 dead and 48 missing. The charge's argument focuses on comparing the accident size of both cities, for the same reason. The arguments are traced by the imagery and metaphorically representing "waves" of mud, used as multimodal resources, leading to the interpretation that the first occurred in 2015 was less than the second in 2019.The size of the wave, in this case, represents the number of deaths. In this regard, the reader needs to activate his discursive memory to remember the fact, as well as the dimension of the tragedy. By associating the paratext "it is not an accident, it is a crime" with the image in the cartoon, one can recognize the belief that they believe in guilt with regard to environmental and social crime, leading the reader to reflect on the fact, repercussions and their impact. dimension. The term "crime" as opposed to the term "accident", represents a large part of the circulated and socially constructed beliefs that, as crime is a serious violation, the fact cannot be considered an accident. In addition, the environmental and social damage confirmed by the rupture of the dam underscores the demands of the population not to consider an accident.

Discourse and sustainability: The idea of sustainability has a broad meaning and is geared towards a desirable, safe, peaceful and happy situation to achieve. Venturini and Lopes (2015) consider the tripod of sustainability to be more important for organizations, which is composed of financial, environmental and social sustainability and which is related to the treatment of the human capital of a company or society. This way of looking at sustainability can be expanded to include other ways. Sachs (2000) considers that sustainability has 5 dimensions which are: social, economic, cultural, spatial and ecological. The situations experienced in daily life do not

always necessarily fit only in these conditions, for example: an economically good situation can include many goods owned by a person. However, at the moment it may be financially weak or in difficulties with "cash flow" or financial or money difficulties, since finance and economics deal with different aspects and in this way, more forms of sustainability can be considered and, this comes with Paula & Shitsuka (2011) who see several dimensions, such as the environmental, political, economic, financial, commercial, business, social, technological, energetic, physical, cognitive and many others. The authors also consider the differentiation between sustainability and sustainable development to be important, similarly to Moles *et al.* (2008), since this would be the necessary process to reach the final state desired by sustainability. It is observed that through this way of conceptualizing, sustainability can only be achieved through the process of sustainable development.

In this way, when it comes to sustainability, it becomes interesting to consider the existence of several dimensions or which dimensions are considered to be important for a particular case. All concern with policies aimed at preservation and conservation for future generations, with regard to actions aimed at improvement, growth and sustainable development, is oriented towards the correlation between sustainability and social responsibility. After all, taking care of the environment and the social refers to responsibility for your own practices.

In the case of dams, as the upstream dams are technically more unsafe and, it can be considered that they have less physical and environmental sustainability in relation to the downstream dams previously presented. When looking at the mathematical balance, the cost of the upstream dams is lower and, in this way, favors another type of sustainability, which is financial, since at a lower cost, more money is left to be used in other actions that include the payment of taxes. and investments that can even be made to improve society. There is, on the one hand, the generation of wealth through processing that adds value to the ore and, on the other hand, the rejected by-products that may offer some risk to society and, among these, the rupture of tailings dams. Rafael (2012) presents several cases of upstream dams that ruptured throughout its existence, leading to several losses. Upstream dams have less physical sustainability as mentioned earlier. In addition to the aforementioned cases, in 2015 the *"Fundão"* dam broke in the municipality of Mariana causing numerous environmental damage and in 2019 the *"Córrego do Feijão"* dam broke in the municipality of Brumadinho. Both are examples of the structure of dams of the upstream type that, when broken, brought damage to the environment, people and organizations. These start to rethink the issue of sustainability, initially in its three dimensions as recommended by Venturini & Lopes (2015) and, later, through its developments, in many other dimensions as seen by Paula & Shitsuka (2011). One of these developments comes in relation to the issue of discourse in relation to the generation of wealth, its by-products and the impacts on society in some or several of its aspects of sustainability. Another aspect comes in relation to cognitive sustainability, since it involves perception and image formation in the minds of people, in the formation of relationships between mental concepts in individuals and in the development of social representations in the group in relation that will allow people to develop their value judgments in relation to the phenomena in progress and in this way, one sustainability may end up affecting another, such as the rejection of dams, which are nevertheless necessary and as a result the search for new solutions may occur in a similar

way to the adage popular that prays that necessity is the mother of inventions so that we believe in the emergence of optimized solutions for many of the difficulties experienced today.

Final Considerations

This article contributes to the knowledge about cognitive linguistics and sociocognitive perspective that is interesting for understanding communication, learning and the development of human thought. This study sought to analyze the role of multimodality in textual argumentation, from a sociocognitive and interactional perspective. We tried to understand the argument from a cognitive bias and it was found that Cognitive Linguistics is concerned with understanding how knowledge happens through language. In order to carry out the study, cartoons circulating on the Web were used and it was observed that in the case of cartoons around the tragedies that occurred with Vale, it is possible to observe, in fact, a dialogue, through a certain repudiation and population revolt over the events. However, all the repudiation pointed out in the speeches around this theme are not necessarily equivalent to manipulation speeches, since they use argumentation as a manifestation and representation of other speeches that underlie the events of the dam breaks. Multimodality acts as a form of argument and suggests a correlation with cognition.

It is suggested for future studies that more research be carried out aimed at understanding the relationship between language and human cognition that enable the formation of reasoning and human communication, as well as the understanding of what language is and how it works.

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