A way to do research in Mathematics Education as an Archeogenealogy: Report, challenge and opportunities wearing the lens of a Discourse Analysis

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Abstract: This paper deals with a proposal to do research in Mathematics Education field. It refers to a way of researching that may be constituted in the doing of a movement, thinking, event, problematization, inquiry practice and not a priori. It can be labeled (unintendedly) as a theoretical-bibliographic work that emerged from a doctoral dissertation based on the Michel Foucault's Philosophy and on Post-structuralism talking about Problem Solving and Philosophy of Mathematics Education fields. Although it is difficult to speak about methodology in this philosophical field, the Archeogenealogy arose bore on in the way of the Archeology, Genealogy and the Ethic (Care of Self) worked by Foucault. Archeogenealogy has been taking up place in the academic landscape of Mathematics Education in a slow but very consistent way with the demands of a qualitative research befalling on subjectivist processes. It is a way of operating and engendering concepts and ways related to a Discourse Analysis, as it has been done in the researches of some research group in Brazil related to Problem Solving, Mathematics, Education, subjectivity and its broad practice, besides running them.

Keywords: Mathematics Education. Archeogenealogy. Post-Structuralism. Michel Foucault. Discourse Analysis.

1. Introduction

There are a lot of ways or methods to do a research in the Mathematics Education field that go through a path from objectivism to subjectivism as epistemological position. Our interest is to carry out an analytical study about the Foucault´s Discourse Analysis proposal situated on Subjectivism and Post-structuralism. This work emerged from a PhD dissertation in the Post-graduate program in Mathematics Education on State University of São Paulo in Brazil (UNESP). Our research question was brought up from the necessity to make a study with interviews and documental discourses in a strictly structured area as Problem Solving. This helped us to open a new way to work with discourses inside the data, institutions, practices, etc.

Ways to do research in Mathematics Education from several perspectives were discussed in the IV Discussion Forum: Parameters of research in Mathematics Education in Brazil. In that Forum, we had joined the Discussion Group number 8, that discussed and figured out philosophical ideas to the development of the Mathematics Education research with a philosophical viewpoint. This meeting was very interesting because it has originated many ideas to set up a free and creative research that was not preconceived and tied to watertight standards. We point out that this article as well as that PhD dissertation are based on an insubordinate way to do a research. When the methodology arises after the establishment of the problem of a research, it can be a way of searching for answers to the same problem and advancing on what was not previously thought, besides ending up in answers as something inaugural in the researcher's thinking, and this may be the unprecedented object for a research (GD-08, 2017), that some researchers call insubordinate research (Barbosa, 2015).

A research in Mathematics Education must be a free way of expression to understand the educational events without being stuck in previously chosen methodologies, because in the understanding of that researchers' group, the knowhow of the research is built on development of the recurrent practice. Several elements had appeared in our study that are important to consider when we must write a scientific or philosophical work over some practice, such as: language, word, interpretation, subjects, discourses, knowledge, power, ethic and other problematic concepts that can restrict a research that do not work with any criteria. Every work under Foucauldian lens must be critical and cut inflexible and rigid points of view off to might perceive other elements that are interesting in a rigorous research, but just if it goes on or shows up in this practice as a possibility to work freely.

The archeogenealogy is a way to do research that it is not much disclosed in the international scene. It is a subject of research as the Foucauldian archeology and the genealogy. It is a way that is very used in applied social sciences, linguistic and philosophy. In Brazil some groups of researchers had devoted themselves to

spread that way, domain or subject of search by knowledge that analyses the elements that constitute it as: *savoir*, knowledge, power, ethics, etc. Araújo (2007), Fischer (1996, 2001), Leal Junior (2018) and Pereira & Alvez (2011) worked this perspective, that we intent to bring to Mathematics Education Field. On the international scene, we do not find this label of archeogenealogy as an institutionalized form of research. It does not mean that there are not researchers working, doing or running that research form. Contrariwise, we had contact with some researches that we think they can be a good example of this way of research, such as Szheurich and McKenzie (2005).

2. A research proposal

In a subjectivist research, the meaning "does not come out of an interplay between subject and object but is imposed on the object by the subject. Here the object as such makes no contribution to generation of meaning" (Crotty, 1998, p. 9).

By the word field we are getting about an "environment", locus, a place of conflicts and confrontations, power and knowledge[1] (*savoir*), tensions and projections, decision-making and etc. It is important to point out that notion of field guides us to a local and regional work, that is not global and universal. In that environment we can talk about praxiological knowledge and practice in sense of an "articulation between social agent and social structure, [...] as a trying to get over the dichotomy between objectivism and subjectivism: in the defense of a dialectic relationship between subject and structure" (Pereira, 2015, p. 343).

Words as norm, presuppositions and principles are presents in any study based on Foucauldian's philosophy, subjectivist and post-structuralist perspectives. According Vianna (2003), when we speak in "presuppositions", we are referring to something that, at the same time, is basic and may became consensual (you can disagree with my presupposition, but you would be able to wear it to understand my reasoning). It is something initial in our actions. How we see, it is not already the same thing when we use the term "principles", and the fundamental difference is: principles are normative. You may agree with my presuppositions or not, but you cannot disagree with the discipline's principles (in general, the word 'principle' is dissociated from the subject that enunciate it, and it one is dislocated to a generality as a discipline). Within 'discipline's principles' we cannot think in disagree. A norm is something that hold upon us, that we try to understand and must be obeyed.

Making a detour from that discussion in order to talk about Discourse Analysis, we can perceive that some concepts are recurrent in this perspective. A Discourse Analysis in a Foucauldian view with an archeogenealogical discipline of research[2] is an emergent way to research. Our intention is to figure out new ways to make a Discourse Analysis inside a determined and regional field. As we will show ahead this method consist in the search by discourses and practices that are propagated in academic scene based on to think discursive conditions over, to sort problem practices out, to understand the reasons to emergence of a determined discourse, etc. We must look for lectures, pronunciations, books, intellectual productions, papers, articles, interviews, political discourses, police activities, commercial practices, institutions, etc.

When we had done our first version of the PhD dissertation, we wanted to hear the researchers' voices, echoes, utterances[3], enunciations and the discourses that permeates the Problem Solving and Philosophy of Mathematics Education fields, to study a lack of understanding of the philosophical tenants that pass their first practice. So, based on Crotty (1998) and Creswell (2007), our research proposal could be presented as subjectivist while epistemological position, within Michel Foucault's philosophy and post-structuralism as theoretical perspective, Discourse Analysis as methodology and archeogenealogy as a method of doing research.

1Here is necessary to explain what Foucault and we understand by knowledge. We make it through a citation from the French philosopher. In Latin languages the word 'knowledge' can assume two meaning that depend of a context of its use. In the Archeology of Knowledge, Foucault (1972, p. 261) says: "By 'Archeology', I would like to designate not exactly a discipline but a domain of research, which would be the following idea: in a society, different bodies of learning, philosophical ideas, everyday opinions, but also institutions, commercial practices and political activities refer to a certain implicit knowledge (savoir) special to this society. This knowledge is profoundly different from the (formal) bodies of learning (des connaissances) that one we can find in scientific books, philosophical theories, and religious justifications, but it (savoir) is what makes possible at a given moment the appearance of a theory, an opinion, a practice". To avoid problems of translation into Foucauldian theory, when we refer to savoir, we will keep the term in French, and when we refer to connaissances, we will translate to knowledge.
2In this writing we understand this as a method, although it is a problematic word for Foucault as we will explain ahead.
3Utterance, here, means product or structure of an enunciation.

3. Discourse Analysis

Foucault (2014) says that discourse is constituted as reverberation of a truth that become alive in front of us "when everything can, finally, become a discourse, when everything can be said, and the discourse can be said about everything, that is possible because everything, having manifested and interchanged its sense, can come back to silence interiority of the conscience of themselves" (p. 46, our translation). To philosophy, the discourses are a game of writing, reading or speaking and in all of cases what is at stake are the signs. Therefore, it is a meaning process that resounds and modifies itself from the moment and historical-ideological context and it is a social and cultural perspective. About this, the discourse is a historical environment, where the discourse only is possible in a political-ideological relationship that is favorable to its emergence; where the discourse has been permeated by sense, that is ideologic and particular. The sense is constituted by a relation between power, *savoir* and language (Barros, 2015).

According to Foucault (2015), the signs are linguistic elements or set of meaning elements of the language that refer contents, things, phenomenon, etc., that are in the world of individual discourses. The *savoir* and the discourse are related in distinguished way because the discourse breaks up the relationship with the things it speaks about. However,

> This new disposition implies in the appearance of a new problem so far unknown: Indeed, we can question about the possibility to identify whether a sign can really designate the thing that it meant; since the 17th century, it will ask how a sign can be related to a thing that it means. That question is answered by classical age through sense and meaning analysis. However, there is a way that the language is not more than a particular case of representation (for the classical researchers) or of meaning (for us). The deep interdependence of the language and of the world came apart. The importance of the writing is suspended. Then, this uniform layer disappears where what we see and read, the visible and the enunciable are indefinitely intersected. The things and the words break up themselves. The eye will be designated to see, and just to see; the hearing only to listen to. The discourse will really have as function to tell what something is but does not will be nothing more than what it says. (Foucault, 1999, p. 59, our translation).

So, in that perspective we cannot indiscriminately name the things and we must analyze and understand that the things have meaning, sense and support in a local and regional practice. We do not present a discourse as general interpretation, because we believe that the premise has basis in a generalization proposal of essential and fundamental concepts from a specific practice. This practice, always local and regional, goes against this idea, establishing misunderstandings. This impossibility is result from several concepts of the places, environment, contexts, practices, subjects, singularities e multiplicities that do not get along with generalization, because they are juxtaposed and opposed in the treatment of certain matters.

Firstly, for Foucault, "In every society the discourse production is at once controlled, selected, organized and redistributed by a certain number of procedures whose role is to ward off its powers and dangers, to gain mastery over its chance events, to evade its ponderous, formidable materiality" (Foucault, 2014, pp. 53, our translation). This idea becomes alive beside of the other perception (Gerhardt & de Souza, 2009; G. L. D. Souza, 1999), where

> Commentary averts the chance element of discourse by giving it its due value: it gives us the opportunity to say something other than the text itself, but on condition that it is the text itself which is uttered [re-iterated] and, in some ways, finalized. The open multiplicity and fortuitousness are transferred by the principle of commentary, from what is liable to be said to the number, the form, the masks and the circumstances of repetition. The novelty lies no longer in what is said, but in its reappearance. (Foucault, 1972, p. 221).

Then, for archeogenealogy as a Discourse Analysis, a research does not have to ask what the things is nor if exists some relationship between them. But, the goal of this discipline is to look for perceptions on their manifestations in the (research) practice. For that discipline is more interesting to ask questions on their operating and their potentialities. Yet, we can represent the chaos of a research and to manifest the multiples discourses that affect us, cause the research to participate of the constitution of our discourse(s).

For Dreyfus and Rabinow (1995), the resultant discourse from archeogenealogy is also a new/other discourse that will be designed as a production that is effective itself in the social acts. Souza (2007) and Souza

& Fonseca (2010) say that Foucault "takes off the sovereignty of the subject from discourse, and takes off the function of the representation of the language to come out that the discourse is the order of the event" (p. 35).

Moreover, a corpus of research must not be defined by rigid criteria, but it must be composed by diverse elements with a strategic connection, such as: books, interviews, articles, intellectual production, lectures, questionnaires, thesis and etc., and writing production as verbal production of subjects of investigation. According to Carneiro (2000), that corpus "expresses everyday practices and brings a possibility to capture all gamma of utterance in a short space written, even as the formation of strategies and of the truth devices that are fundamental to understand the problem of the subject constitution on schedule" (p. 192).

3.1 Archeogenealogy

As we have highlighted in this writing, the archeogenealogy is an emergent research field based on Foucault's Philosophy. In Brazil many researchers have dedicated themselves to work with this perspective in named way. Possibly other researchers work in/with this perspective, but they do not present their works under nomenclature of archeogenealogy, even when they carry out articulations between archeology, genealogy and care of self in Foucault. Our research is a bibliographical study on these domains and their articulations. We had studied a lot of journal articles and books dedicated to these subjects. In an international scene, we do not have works about this term – archeogenealogy – but there are works, as Scheurich & McKenzie (2005), that aimed to make articulations between these Foucauldian's domains as a way of doing a possible archeogenealogy. In the carrying out our study, we found works as: Alves (2009; 2010), Araújo (2007), Fischer (1996, 2001), Veiga-Neto and Fischer (2004), Fonseca-Silva (2004), Paiva (2000) and Pereira & Alves (2011) that permeate this writing.

Usually several researchers have insisted on coming apart the Foucault's work in periods as archeology, genealogy and the care of self. This partition is quite controversial and do not have consensus of how that can be done or not be done. However, we believe that the French philosopher did not like the labels or partitions of his work. Yet, to show better the archeogenealogy proposal, we have to mention some consideration about these periods, because it is much better to work with Foucault showing his reverberations to the research and how his concepts are used to bear it. To figure out an archeogenealogy it is not to do an archeology or a genealogy, but to operate and transit by these two disciplines of research. Being the archeogenealogy a mix of other methods that are composed by a subjectivist dimension inside philosophy, we need to resonate through each one of them without to stop in some of them, but to stay in constant movement, how a come and go movement, to be dynamic in the research process.

In a Foucauldian study, questions about the being became possible in discordances between researchers. In the book As palavras e as coisas (Foucault, 1999), the author presents the emergence of the subject of knowledge (*savoir*), he studies the events that emerge from a relation between this subject and *savoir*. In another way, by genealogy, he deals with the constitution of this subject by the power. To understand the gist of Foucauldian archeology it is crucial to comprehend the difference between knowledge as *savoir* and/or connasseiment. According Foucault (1994), archeogenealogy is a movement of research, while archeology and genealogy are not movement, because they act on bodies and practices that involve these bodies above mentioned. The Foucauldian archeology is a study method that is interested in the discourses in analytic way dedicating itself to relation between the discourse concerning the being and the Discourse Analysis. It allows to understand the constitution of the subject of the knowledge (*savoir*), from where he problematizes the own figuring out of the knowledge.

In the genealogy field as a method, essentially established on the relation around the concepts of power and *savoir*, he calls for the understanding on the constitution of the subject of action over other subjects. He will do that problematizing the emergence of something inside of the relation between power and *savoir*. We highlight in these methods that Foucault goes back to methods to implement archeology and/or genealogy as archeological and/or genealogical methods, but not considering methodologies as academic fields of knowledge, because for him they are tools to work or act in research.

The third field, the ethic or the self-care, it has been influenced by the firsts fields or domains and are centered on relation of self-being, that wants to understand the subject of the action on the self. In this situation, there is a movement that problematizes the own subjectivity and figure out the archeogenealogy. It justifies the preference of several researchers in speaking about domains or periods of Foucault's work.

Summing up these ideas:

The *archeology* is supported by the objective to obtain the conditions of the emergence of the discourses of *savoir* from a certain time. It is not about to do archeology, but to do an archeology, that refers to a horizontal cut in mechanisms that articulate different discursive events, the local *savoir* with the power. In this domain, he stans up to the question about historicity of the objects of *savoir*, problematizing the own belonging to determinate regime of discursivity and to a configuration of power (Foucault, 1972, 1994, 2015).

The *genealogy* comprehends the work since the diversity and the dispersion of the chance, beginnings

and accidents. It does not intent to go back to time to reestablish the history's continuity, but instead, to look for restitution the events in their singularity. About this method, it consists in going against the discourse order, because it does not look up just in the past the mark of singulars events, but it wants to infer about the contingency that made us what we are, the possibility of to be/do/think no more than what we are/we do/we think. For Foucault, there are three dimensions for genealogy, such as: (1) the historic ontology of ourselves that emerges of our relation with the truth, that allows us to constitute ourselves as subjects of *savoir*; (2) in our relations inside a power field that allows us to constitute ourselves as subjects that act over others; (3) in our relation with the sense of morality, that allows us to constitute ourselves as ethics agents (Foucault, 1999, 2014; Revel, 2005).

The *ethic* consists in a way through which an individual becomes her/himself the main subject of her/his moral conduct, it also implies necessarily in a subjection mode – the way by what an individual supports a rule or a system of rules and go through the obligation to lay it in action in the process of turn into subject. Thereby, this dimension re-proposes the analysis of the field from the subjects' ethical constitution and from the production or understanding the subjectivity (Foucault, 1980, 1998, 2011; Leal Junior (2018).

According to Weizenmann (2013), Foucault pointed out to three principles in the archeology and genealogy, such as:

a) The abandon or the retreat of a presented consciousness of the modality;

b) The drop out of hermeneutics as methodology;

c) The end of the own global perspectives and the historiography that conceives the history as a macro-consciousness.

In this way, Foucault backs out with the ideas of a historical workmanship, of a deep and immanent sense to wait for a cognoscenti subject. Thereby, related to subject, the genealogy intends to think her/his as a subject entity by elements of the internality and exteriority of her/himself. In other way, the archeology works with the first conditions of that endeavor through the essential decentralization of its nucleus by a hermeneutic proliferation means (Weizenmann, 2013). So, we are not interested in description of a horizontal discourse, but in the analysis of the utterances that composes the discourses, because this one already is irreducible. This analytic way also consists in a genealogical analysis, that is configurated as "a history way that bear the constitution of the *savoir*, of the discourses, of the objects' domains, etc. Without having the obligation to refer to a specific subject, either transcendent with relation to event field or searching an empty identity through the history" (Foucault, 1996, pp. 7, our translation).

In another angle, still related to Foucault (1996), in the archeological analysis in *Microfísica do Poder* (Microphysics of the Power), the author wants to carry out a discontinuous study about constitutions of *savoirs* in different times, however relating them. In this domain, Foucault is concerned about the analysis of conditions, the rules and laws that exist to set up *savoirs* constitutions from which the discourses are found submitted to the historic times. Indeed, the archeology defines and characterizes a level of analysis in the fact's domain, while the genealogy explains or analyzes in the archeology level (Veiga-Neto, 2011). Thus, we can realize that the Discourse Analysis does not live exclusively in just one pole of these domains, but it resounds through both domains and engenders them pointing out certain influence of the ethic domain.

From this, the archeological method is based on (discursive) practices that constitute the *savoir* of a certain time and an environment promoting "the effectively said utterances and the discourses operation. It deals with discourses articulators about what we think, say, and do/make, as several others events" (Andrade, 2008, pp. 60, our translation). For this author, the archeology is like history seen from down, a perspective to (historical) analysis that is not began by official great narratives, by small and insignificant sources, obscure narratives and fragments of texts (Andrade, 2008). Then, we can say that in that perspective we are interested in discursive formations, in constitution, operation and coming out of the discourses.

When talking about genealogy, we must highlight the connexon between knowledge and *savoir* with local and regional histories and memories, that participate of the constitution of a historical *savoir* and a subject that becomes alive inside this historical articulation. In this domain, the relations between knowledge and power are intensified. In fact, these are not domains that exist separately. Foucault engenders these concepts figuring out problematizations that emerge from certain discursive formation. Here, he tries to think about emergence and precedence of the events around power. He is not interested to know the system beginnings, but the true policies around this theme.

Thus, any analysis will be critic when evoking the art of not to be submissive to any game of power, not to be governed. Here, its structure must be genealogical, and its method must be archaeological, resulting in the understanding of the things inside objectives practices implying objectivations of determined practices. According to Veiga-Neto (2009, 2011), method is a certain way of inquiry and a set of analytic strategies of descriptions and also a set of inquire procedures and analysis, which might not be stuck or tied to applied practices rules to technical and concrete problems, but it must be conceived as certain ways to a well-specific

analysis related to epistemological vigilance with a subjacent theorization or a theory in act.

Table 1 - Research proposal in Foucault

	Foucauldian Proposal	
Archeology	• To study the discourse and the subject of the *savoir*;	
	• To find answers for questions as:	
	• What and / or how can I know?	
	• What *savoir* is there and how were the conditions for it?	
	• To study the subject of knowledge/*savoir*;	
	• To problematize the constitution of the subject of knowledge.	
Genealogy	• To study the subjects and the discursive practices inside relations, web, power and *savoir*;	
	• To find answers for questions as:	
	• What and / or why can I know?	
	• What elements do participate in the formation / transmission of the knowledge (*savoir*) disposed in society and how do they work?	
	• To study the subject of the action over others;	
	• To problematize the arising of something. relates knowledge/*savoir* with power.	
Ethic	• To look for to understand relations being yourself, subject with her/himself, and self-care inside/around themes as: knowledge, *savoir* and power;	
	• To look for answers/understanding questions as:	
	• Who am I?	
	• Who can I be?	
	• How did I become / constitute the subject of discursive practices?	
	• How am I constituted in what I am?	
	• To study the subject of action over her/himself;	
	• To problematize subjectivity itself.	

Source: prepared by the authors.

Coming back to cases of interviews and questionnaires, it is important to point out that the researchers approach the discourses specter already institutionalized and, from certain way, they are crystalized in discursive practices of the involved subjects. Because these research tools are good ways to study and to perceive some answers for the questions on the table above. The shape of speak or the way of colocation of an information or knowledge cannot modify their gist, historicity and episteme.

By "Episteme", Foucault proposes an archeological concept that identify the basic set of rules that control and hold upon the production of discourses in a determinate time (Koopman & Matza, 2013; Veiga-Neto & Saraiva, 2011). This is related to a discursive policy that legitimizes and authorizes some discourses in determinate historical moment and environment: the appropriate, the inappropriate, the permitted, the nonsense, the convenient, the true, the false, and etc. That one concept – Episteme – was evoked by Foucault in Foucault (1999) - *As palavras e as coisas* (The words and the things) and it is very polemic, precisely because it emphasizes principles of ordering *savoirs* prior to any discourse aimed at knowledge.

For him and for us, discourse must be presented in operating, evidencing the reality around the things. Because of this, discourse is a productive concept, effective in itself and found its place inside social practices, where multiple discourses contest spaces to confirm themselves as true discourses. In such realities production, the work and the operation of the "discourse involve relations of power and *savoir*, even the discourses are interfaces of *savoir* and power, of true and power" (Foucault, 2006b, p. 229).

Besides, Foucault (2014) says that "discourses must be treated as discontinuous practices crossed by time and also ignored and excluded, […] a violence we do to things, as a practice we impose on them in every case, and it is in this practice that the events of discourse find the principle of their regularity" (p. 50).

According to Díaz (1998), we believe that the researchers' discourse is not constituted as a projective shape or an autonomy speaker from communicative intentions, because it is constituted inside an internal order of a system of discursive production with principles control that acts on its reproductions of meaning and its practices.

However, we want to consider, in this moment, the connection between discourse, interviews and questionnaires. Silveira (2002) says that interviews are tools quite used in educational researches and they are arena of meanings, likewise the other questionnaires, because they are not constituted as an individual true or revelations of isolated character. They are discursive representative tools that they "held upon by discourse of

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their time, of lived situations, of experiences, of instituted trues to social groups of their members" (p. 130). Souza and Fonseca (2010) emphasize these discourses as "complex and unstable games that involve confrontations, fights, inventions and productions. Discourses that intertwine in the midst of real games, true games, fabricating realities and subjects" (p. 43).

In a research proposal based on Discourse Analysis, there is not any visceral separation about theory and practice, and both are understood as things highly related in a plan of mutual constitution and of immanence, that is,

> Theory and practice do not have relations of implications, but relations of reciprocal constitution. In this way, the great and celebrated concepts of Foucault were built from local practices, which culminate in rigorous, historic and philosophical analysis that they are effective in theories and/or theorizing. That relationship between theory and practice does not talk just in a way to an implication from practice to theory or vice versa, but from an engendering between them, where does not exist differentiation from one to another, in the real sense of the concepts (Leal Junior& Miskulin, 2017, p. 315).

Within this discussion, we try to deal with concepts related to the theory and to the method in a Foucauldian view. To Foucault (2014, 2015), Veiga-Neto (2009, 2011), Andrade (2008) and Fischer (1996, 2001) these questions are related to a disciplined inquiry, because the method is not the most important stage of a research that can be determined a priori to build determined knowledge, by the way, we must firstly pay attention to the questions "that can be formulated inside one or another way to conceive the relations between subject, method, *savoir* and power" (Andrade, 2008, p. 50). It is because what we said about an object not being the object itself, much less a representation of its. When we speak of it, we are setting up such object and when we proceed like that and look for or analyze that object, we are figuring out problems related to it, sorting out problems in a broad way from that restriction of school, job, the everyday and etc., such that, problems of the world that we live in all of its aspects.

To understand and deal with questions about discourses from Foucauldian perspective is not a trivial task and, overall, it requires us a vehement recuse of the dogmatic thought. It is necessary to pay attention to and to be situated on discourses' surfaces, on the level of words or on the level of the things that were said. What implies to analyze, and to discover and to explore in intensively way the own discourse, allowing the discourse to emerge from its complexity. Foucault (2014) and Fischer (2001) say that we need to run away from to look the discourses as a set of signs, as textualizing of contents full of meanings and intentions, as something constituted by occulted or subliminal ideas, senses or meanings.

4. Thinking with thinkers / researchers (about) this research proposal

For Foucault there is not nothing to be reveled, unveiled or found, what exist are the utterances and their relationships, that the one's own discourse put on operating. The Discourse Analysis consists in to perceive and to capture the historicity and the practices presents on discourses. Besides, it is very important that the researcher lays off her/his judgments and the facilities to look for the text's framework. That can show the historicity while social, historical and cultural context production.

About objective reality, we must point out that it is built inside by a discursive plot, it can mean an idealist option, because discourses are autonomous practices in terms of objectivity. This implies that the subject is not the author of an utterance, but it is a determined function when "with regard to the subject, we point out that he does not identify with the author of the statement, it is a determined function "insofar as a single individual can occupy alternately in a series of utterances, different positions and assume the role of different subjects" (Fischer, 2001, p. 113). So, regarding the relation between other utterances or the associative domain, it is important to highlight that an utterance does not exist in isolation, because "there is not general, free, neutral and independent utterance", however, "it develops a role inside others, sticking up for themselves and distinguishing: it is always integrated in an enunciative game" (p. 112).

Actually, as interview and questionnaires, opened or semi-opened, they consist in making analysis through researcher's perceptions about what and how that enunciations produces and their effects on discourses inside materiality or material existence of discursive practices that cannot be mixed up, but it must partake the one's own utterance's constitution, where it needs "to have a substance, a support, a place and a date" (p. 123), what is related to reification of ideas and thoughts that can be reproduced by possibility of repetition and update of them. Indeed, these practices make "a place to link what is said and what is done, the rules that are imposed and the reasons given, the projects and the evidence" (Foucault, 2006, p. 338).

Moreover, such practices constitute a political perception when it tries to clear up the framework that

sets up these inquiry regions, what implies in the configuration and the legitimation of the differences or the approximations between any inquiry regions, and they are constituted by discursive formations. The discursive formations need to be studied and understood inside a discursive field and a field of *savoir*. On this account, the rapport between them is very close and idiosyncratic, such that, the discursive formations are always situated in relation to certain field of *savoir*. Each discourse is supported by systems of discursive formations from their respective fields of study, as well as mutually constitute these fields.

These works with Discourse Analysis are possible inasmuch as utterances analysis and enunciations production are subject's products made within discursive formations in interaction, where they work in synergy, often to tangentiate and to converge to a certain understanding about practice, which is not closed in on itself (Fischer, 2001). For that Brazilian researcher, "the discursive formation must be seen, first and foremost, as a dispersion principle and of partition of the utterances, […] out what it is known, what can and what must to said within determined field and in accordance with certain position that it occupies in this field" (p. 203). That is, it depends on the relation between *savoir* and power of its time, in historical perspective. It leads us to think that discursive practices are not restricted to textualizing of ideas, beliefs, conjecture and thoughts about determined subject. For Foucault, the work with this in a Discourse Analysis is the same as working with a discursive practice to point out and to know the laws and relationships that engender and corroborate the existence of determined discourse.

As an archeogenealogical proposal as well as Discourse Analysis way, the utterance is not hidden, because it is characterized by the its own existence of a set of signs, and its analysis just can be done about/on "the things that were said, the sentences actually proffered or written, to meaning elements that were articulated, and more precisely, to that singularity that makes possible their existence and their emergence to observation and reading" (Foucault, 2015, p. 133). Another way to search for this is questioning: "why is this said here, in this way, in this situation, and not in another time and place or in a different way?" (Fischer, 2001, p. 205). Obviously, this question guides us to other subject, the discursive heterogeneity, that refers to utterance's dispersions. Utterance's dispersions deal with how the utterance arose and how were distributed inside a certain set, overall, where the unity is not defined by analysis objects. That unity is a representation and development unity, a place of reality multiplication, and in an effort of synthesis, "to the analyst, the discourse is the place of the multiplication of the discourses, as well as the place of subjects' multiplication" (p. 211).

Still in this perspective, the author says that "when we are analyzing a discourse even if the document considered is the reproduction of a simple act of individual speech, we are not before the manifestation of a subject, but somewhat we are confronted with the place of its dispersion and of its discontinuity, "and explains that it is due to the fact that the" subject of language is not a subject in itself, idealized, essential, irreplaceable origin of meaning: it is both speaker and spoken, because through it other speeches can be said"(207).

Regarding the authors of utterances or speeches (discourses), we must point out that it is possible to accomplish a research without to identify the participants, anonymously. In a Foucauldian perspective, we do not stop to identify what is, which is or who is the subject. But this identification can be done without loss of the research principle. Since the researcher can perceive, for Foucault, the subject is multiple, and these questions come apart from other questions as: "what is the status of the enunciator? What is her/his competence? Where is she/he? What is her/his *savoir* field? What is her/his institutional place? How she/he is related hierarchically to powers other than her/him?" (Fischer, 2001, p. 208). It does not matter to focus in respondent subjects, but to focus in questions and answers analysis. The subjects are not important in itself or *per si*, but what they say, tell, write, the discourses are made by them. These discourses never allow to catch up a true discourse. This happens because from these discourses, we can problematize or figure out new discourses, independently our analysis to beat the original discourse.

In Foucault's work, it does not matter to know whether certain discourses are true or not, what is able to make up as from certain discourses and practices, and to see which truth policies are reared. In Foucault (1996), The intellectuals and the power, a chapter of the book Microphysics of the power, these questions are discussed as a common system in set, a multiplicity of components that are at the same time, theoretical and practical, "by this the theory does not manifest, does not translate, does not apply a practice; because it is a practice" (p. 42). The philosopher Deleuze, in this same dialogue says that "a theory is like a toolbox. It has nothing to do with the signifier. It has to work and not for itself" (Foucault, 1996, p. 43).

What guide our writing to the influence of the experience is an important question in this discussion. The experience is related to experience subjects as dealt with by Larrosa (2002), because making a Discourse Analysis requires to think about the experience that supports this discursive practice. The subject of experience "is not the subject of information or data, of opinion, of work, and she/he is not the subject of *savoir*, of to judge, of power, of desire, and of to want". She/he is, overall, a subject dependent of the experience conception that is adopted. If the experience is what "goes through us, the subject of experience would be something as a transit territory, something as a sensitive surface that because of what happens affects in some way, produces

effects, inscribes some marks, leaves some traces, some effects ". Also, it can be perceived "an arrival point, a place where things arrive, as a place that receives what arrives and which, by receiving, gives place to it". However, when the experience is seen as "what happen to us, the experience subject is a space where the events can happen" (p. 24-5).

5. Our Proposal

Regarding the methodology in Foucault, it is difficult to choose "methodologies to analyze these discourses, because it does not present us with a methodology, in the traditional sense of the term, but possibilities, that must be sought in all their researches, trying to understand as he proposed to [...] make an analysis of the speeches "(Souza & Fonseca, 2010, p. 43). Therefore, we are not interested in focusing on the deponent subject, neither on his essential interiority, on his identity, or on the superficial capture of his truth, since this subject consists in a fabrication of modernity. Since Foucault's discourse presents itself as a "field of regularity for several positions of subjectivity", which allows us to search "in the network of discourses, the threads that constituted, in a historical plot, the production of subjects", as it is emphasized in Souza and Fonseca (2010, p. 44).

It deals with the understating of that perspective as a methodological posture and philosophical attitude of transgression in the face of the power of truth and of the traditional methods and methodologies while an insubordinate posture of research in a theoretical-bibliographical study (Barbosa, 2015). Foucault highlights that to keep a philosophical posture it is necessary to leave from absolute territory of true, but it is necessary to think about initial questions in the discourses from the rapport power-*savoir*, operating transversally by archeology, by genealogy and by care of self, Foucauldian domains (Leal Junior, 2018).

Referring to Discourse Analysis, the history around a discourse is set up above the senses and truth of it, by the reason of the its historical constitution. The temporality is an important element in a Discourse Analysis, and it must be considered by chosen documents, improved practices, texts, "of the social formation in question, of the involved concepts way and still of the own researcher positioning" (Fischer, 2001, p. 216). This analysis "must make the called non-discursive domains seem related to utterances and their regionalities: institutions, politics events, economic process and cultural activities, such as, all shape of practices implied" (p. 216). On these considerations, we must always consider the subjects as discursive effects, which are "made inside several and well concrete institutional, social and economic relationships, that there are not on bodies anymore" (p. 218).

We noticed the G. Cantor case, reported in Silveira Filho (2012) and Boyer (1974), when that mathematician proposed the infinity idea. Today, we ask: how did the mathematicians of the 19th century not understand as truth what Cantor said about the infinity? George Cantor talked about numbers and sets, tried mathematical methods and developed his studies in a strange and unknown territory for his age. Actually, other mathematicians and physicists before him had already perceived, even intuitively, other ideas that pointed out infinity concept, as Aristoteles and Galileo Galilei when they had it used in their researches. Even that discourse could be strange and new, it could compose the mathematical discourse of that age, as axiom or conjecture. However, those discourse was not accepted.

Cantor revolutionized all the mathematics, especially the one that had been built up to that point when he presented the theory of transfinite numbers. This theory, according to Hilbert in 1925, would be "the most extraordinary product of mathematical weighing and one of the most beautiful exploits of pure human intellectual activity". The controversial nature, to the mathematics of that time, of Cantor's theories about infinite sets shocked the scientific community. Among the intellectuals who vehemently attacked the Cantorian theory, Poincaré and Kronecker stood him up, saying that it was a disease that mathematics would never cure, it was mysticism or vain theology.

He had saw the truth of his theory, but it was not "in the true" mathematical discourse of that time. The attacks he suffered were quite strong and incisive, what made it more serious it was the temperamental behavior of Cantor, leading him to a neuropsychic exhaustion, which culminated in his hospitalization in a psychiatric hospital in Germany, in the last years of his life. During this period, he had devoted himself to working and developing his theories, but he did not conclude them. Only a few decades later, Gödel and Cohen began to prove the truth of their theories and to constitute a discourse that would situate Cantor's ideas "in the true" discourse.

To say the true in a space and time outside our own is what Foucault calls the wild exteriority, but it is extremely difficult to remain true when we do not submit ourselves to the rules and formative laws of a discursive "police" that must be evidenced and revived in our discourses as a necessity to be attributed the academic validity. About these considerations, we can say that the example is related to the Foucauldian concept of discipline, that is a principle of control of the discourse production. It sets limits to it by the play of an identity which takes the form of a permanent re-establishment of the rules (Foucault, 2014, 2015).

After these articulations around Discourse Analysis, we could still ask ourselves: But what is the originality of this, to analyze what has already been said by others?

The research originality based on a Foucauldian Discourse Analysis lies in the look that the researchers attribute to their construct. As proposed by the authors listed above, in particular, we quote an excerpt from Andrade (2008), in which "the look becomes, therefore, the depository and the source of clarity; the gaze has a certain direction - in the gaze, the subject illuminates the object in a focus and darkens in another; the look is vectors of visibility, it is spots of light that illuminate certain objects and put others in shadow". He adds that "the eye illuminates and clarifies, so it dominates. The gaze that illuminates is the gaze that dominates. Gaze is power; the look is a vitality. You assign life to objects" (p. 59), and we should begin to look down from the small things, from the small and minute things, to look at the molecular (the small parts of something constitution), not just the molar (the final product, the general shape, the total set of molecular parts).

This question about originality becomes superficial to Foucault, and, at the same time, problematic, because it involves the question of the discourses precedence. He says that "precedence is not an irreducible and first fact: it cannot play the role of absolute measure that would allow to evaluate any discourse and distinguish the original from the repetitive" (2015, 174). According to Dreyfus and Rabinow, the philosopher himself, whom we intend to follow, proposes to carry out an archeology (of *savoir*), where he studies the formation discourse and its institutionalization; a discourse genealogy, when it focuses the relations of power-*savoir* within discourses; and, finally, an ethic that stands out in the self-care of the subject, in the constitution of the subject in relation to others.

6. Conclusive Inferences

To finalize this work, we intent to show how we have worked with these concepts in our researches. How we had mentioned at the beginning of this writing, we are carrying out a research about the philosophical presuppositions/tenants that support the Problem-Solving practices. In that research, we have tried to analyze discourses inside Problem Solving and Philosophy of Mathematics Education as inquiry regions since discourses of researchers that work in that discursive formations. Our aim was to build a Discourse Analysis with archeogenealogy while study method. We have searched for articles, interviews and responses for questionnaires that we made based on the principles above.

We had produced a questionnaire that was used to figure out the enunciations that are relevant to understand the object and the objective of our proposal. In this way we walk by archeology, genealogy and ethic to look for understanding, to see the discourses and their support, formations and constitution, their sceneries and their matter for the community of Mathematics Education. The intention with this study is the establishment of an instrument for other research to be based on ours.

The topic of our research was named: "Tessiture (articulations)" about discourses upon Problem Solving and its philosophical tenants in Mathematical Education: "Cosi è, se vi pare" (so it is, if you like). Our research problem was: Lack of understanding of the philosophical concepts that permeate Problem Solving, and our research question was: How can philosophical presuppositions support the discourses present in Problem Solving practice? Our epistemological position to implement this dissertation was the subjectivism, the theoretical perspective was Foucault's Philosophy and Poststructuralism, the methodology was Discourse Analysis, and our method to develop this employment was archeogenealogy.

This way to do research is a challenge for us, because it helps us to understand problems related to the constitution of these inquiry regions. The first institutionalized sources do not have responded anyway our research question, because they do not deal with the philosophical tenants of their practices or, if deal with it, they do that in a superficial view and do not have any relation with the Problem-Solving practice. Because of this, we seek to work with interviews and questionnaires to get other responses and utterances that can help us to figure out our answer or other answers. The Problem-Solving practice is very interesting for us, because it is present in the Brazilian standards for teaching of Mathematics – PCN – National Curriculum Parameters for Education in Mathematics, and to understand the ideologies and philosophies that permeate it. It is interesting to understand better some problematic questions related to political, social, cultural and historical problems present in process of education.

Below, we present a table with the principles and proposals to guide our writing as a conceptual displacement of the theorization that we have presented.

Table 2- Our research proposal

Our Group's Proposal as archeogenealogy	
Archeology	• What and / or how can we know something through the academic discourse on Problem Solving and under the influence of its philosophical assumptions/presuppositions? • How are these discourses put into operation? • Why did they arise at this historical moment?
Genealogy	• What and / or why can we know from the academic discourse on Problem Solving and from its philosophical assumptions? • What assumptions and events support these discourses? • What elements come into play to make these discourses possible and accessible? • What other discourses come into this composition?
Ethic	• How do the discourses participate in the constitution of the subjects in the discursive practices of Problem Solving and its philosophical presuppositions/tenants? • How do we become the subjects of these discourses or do we generate them in our practice?

Source: Prepared by the authors.

In addition to all of the above, it is important to emphasize that in this theoretical-methodological perspective of doing research there are no rigid and structured forms to figure out and carry out a research. In fact, what matters is dictation, enunciation, utterance, discourse, practice, how these elements relate and how they are put to work. This is more important than who says, for she/he is a subject constituted within discursive policies coined in the forms of power-*savoir* relations. When we analyzed speeches/discourses present in Problem Solving researchers' practices, we were interested in understanding what knowledge, values and subjects were brought to our society and how they were constituted and running them, and what new elements they put into the discursive games, what elements made up this generation.

In developing the thesis there was a need to involve some other elements in the *corpus* that prevented us from standardizing it, while the conversations, questionnaires and interviews that made up an important part of our research practice were not limited by questions and materials previously defined that could stop the speeches or discourses of the deponents. This occurs in this proposal because we consider research to be a movement of coming and going, a walk that is accomplished by walking along unknown paths with obstacles, uncertainties and unpredictability, as said by Leal Junior (2018).

We would consider these factors as weaknesses, were it not for the potentiality of developing future work such as, for example, working on other assumptions of problem solving practices, other than those already outlined and analyzed in other works published in academia. As a result, it also resulted from the researchers' statements that there is an extreme need to take this research to the classroom, aiming at the events in that scenario and involving other subjects, bringing us closer to the teachers and students about the facts, events and phenomena that permeate such an environment.

Considering Problem Solving practices, their relationships with other practices of the same motto, highlighting their assumptions systematically and aiming at transforming their contexts and environments has proven to be a relevant factor for Mathematics Education. In the case of Problem Solving, looking at the events that emerge from this practice and focusing on its phenomena, results, developments and imbrications is vital not to rest on the aegis of a simple methodology, but to broaden your horizons and work with others prisms, as theoretical-philosophical assumptions, which is a way of doing Philosophy, of working knowledge, the subject, society, values, ethics and morals from their field of problematization (Leal Junior, 2018).

Finally, there is a range of elements and questions that may prove relevant in the course of research, something much more productive and rich than preordaining itself in previous questions, to escape from existentialism and structuralism through questions such as: what is it? In Mathematics Education, it is no different since it has constituted itself as a multifaceted, fragmented field that is crossed by several lines of force, which can lead us to others scenery.

So, do we have in here the final thoughts of this work? Definitely not! As a philosophical study, we do not intend to close or designing any conclusions here, even though much of what we are trying to do here is in our currently researches in our Group of research, namely Grupo de Pesquisa Educação, Matemática e Subjetividades - GPEMS and Grupo de Trabalho e Estudos em Resolução de Problemas – GTERP, Brazil. We believe that we can only potentiate readers' thoughts and looking for affect them in good ways. We want to wind

researchers up with differentiated thought to figure out others thoughts or others ways to do research and to come along nearest of classroom practice. Our proposal may be interesting or may cross some study on some subject that is unknown to us. However, our actual goal is to make possible that the issue about Archeogenealogy is present in future research, standing out as a fertile territory for understand a lot of point of views from what goes on in the educational research, allowing that others studies can be carried out studies with this one or from it.

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