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Ludwig Wittgenstein, Mathematics, Therapy and Life: research from the group on Education, Language and Cultural Practices in Brazil

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Abstract: This article aims to describe discursive regularities of theses and dissertations by researchers from the Group “Research, Education, Language, Cultural Practices” - Phala and their effects for / on Mathematics Education. Due to the nature of the proposed study, three axes of description emerged: (1) starting cultural archive and the literatures-traces triggered with respect to Mathematics; (2) therapeutic analog movements operated in research, and (3) aesthetics and writing style. We identified that the archives, taking deconstructionist therapy as a research lens, expand the debates about the understanding of Mathematics as a fixed, linear, compartmentalized, abstract and hierarchical set of knowledge, shaped to meet cognitive, structuralist and neoliberal school learning projects; as well as they broaden the debates about the ways of practicing research in a hermeneutic-analytical way, addressing problems that involve modern schooling, teacher training, indigenous and non-indigenous education, assessment of learning and historiographic and non-historiographical aspects of undertaking research in Mathematics Education

Keywords: Mathematical Education. Deconstructionist Therapy. Interdisciplinary problematization.

Introduction

“Doesn't problematizing put everything we've built so far at risk?”
Paula Massi Reis Pires (2015, p.65, *our translation*)

The interinstitutional research group on Education, Language and Cultural Practices - Phala - is registered in the Directory of Research Groups of the National Council for Scientific and Technological Development (CNPq), in Brazil, by the State University of Campinas and linked to the Graduate Program in Education, with the interinstitutional participation of the Federal University of Rio Grande do Sul, Federal University of São Carlos, Federal University of Rondônia, Federal University of Paraná, Federal of Pará, São Francisco University and, recently, Federal University of Minas Gerais.

This group, driven by the purpose of problematizing the relationship between language and sociocultural practices¹, has broadened discussions and reflections on other ways of conceiving educational practices, Mathematics and academic research, based on studies generically named here as post-structuralist². Within the group, there is a subgroup initiated under the guidance of Prof. Dr. Antônio Miguel and Prof. Dr. Anna Regina Lanner de Moura who has been practicing a deconstructionist therapeutic approach in her research.

Based on the therapeutic nature of Ludwig Wittgenstein's philosophy in dialogue conversations³ with Jacques Derrida, this article went through the purpose of *describing* some theses and dissertations produced under the supervision of researchers from the Phala group, seeking discursive regularities among them and presenting certain effects of these regularities for the field of Mathematics Education research. The research discusses central themes thread⁴ that were placed by their authors on the Wittgensteinian therapeutic *divan*. These themes thread were woven thread by thread seeking to deconstruct, that is, invert and displace conceptions instituted in academic investigations concerning Mathematics, the school as an institution that promotes the values of modernity, teacher training, Indigenous Education and forms of whether to carry out historiographical research or not, among others.

Academic productions treated as *archives* articulate and problematize theoretical references, destabilizing classic binarism through different channels, such as: scientific knowledge/Secular/empirical

1 For further clarification regarding sociocultural practices, consult (Miguel, 2016a).

2 The post-structuralist studies of the Phala group are located close to the deconstruction of Jacques Derrida, and / or the historiographical archeology of Michel Foucault, and / or the *therapy* of Ludwig Wittgenstein, among these and / with others. The understanding of post-structuralist studies is not supported by a simple opposition between structuralism versus post-structuralism, or between centric versus eccentric (Culler, 1998, p. 20). One aspect that unites all structuralist powders is the criticism “of the diverse philosophical constructions of the subject: the Cartesian-Kantian subject, the Hegelian and phenomenological subject; the subject of existentialism, the collective Marxist subject” (Peters, 2000, p. 31, our translation), with the purpose of deconstructing the metaphysical paradigm based on identity and conceptual representation.

3 We use the word ‘dialogue’ to denote relationships, articulations, interlocutions, hybridizations and / or approximations that emerge from the similarities between Wittgenstein and Derrida’s modes of philosophizing.

4 The themes thread expression indicates that the ideas employed in the research reports are woven into wefts as *if they were* threads that intertwine and form complete and endless fabrics.

knowledge, human/non-human, interior/exterior, nature/culture, form/content, theory/practice among others.

In the course of *describing*⁵ the theses and dissertations in the search for discursive regularities between them, we do not look for what could be hidden, but for what is displayed in the archives, bringing them together with voices evoked by the authors to dialogue with our specters⁶. Our purpose is not to produce a meta-analysis, but to approach the effects that the archives caused [cause or may cause] for / in Mathematics Education. In short, our work can be seen as an *archive from archives; traces from traces*.

The trace is truly the absolute source of meaning in general. Which comes to affirm once again, that there is no absolute origin of meaning in general. The trace is the différance that opens the appearing and the meaning. Articulating the living with the non-living in general, the origin of all repetition, the origin of ideality, it is no more ideal than real, no more intelligible than sensitive, no more a transparent meaning than an opaque energy and no concept of metaphysics can describe it. (Derrida, 2008, p. 80, italics by the author, our translation).

Thinking about *traces* in a *deconstructionist therapeutic* research means understanding that the origin of all meaning never existed. *Deconstructionist therapy* is based on the *description* of what is manifested in the *archives*, not to explain or defend hypotheses or theses, nor to look for original meanings, to fix the meaning of words or to look for what would be hidden in what was said, but to go through the uses of words (Wittgenstein, 2017).

Thus, in this study we are dealing with what is manifested in the set of chosen *archives*, as well as operating the references to other *archives* intentionally selected to achieve our purpose. The *archive*, in the Deridian sense, is the “place of memory management, but also the field of forgetfulness” (Solis, 2014,

5 *Italics* are a resource to indicate to the reader a change of meaning in the use of the word 'description', seeking coherence to the ways in which Wittgenstein (2017) operates it in his investigations and which will be outlined throughout this article.

6 The word 'specters' is used within the logic of Deridian spectrality. Derrida started it with the uses and concepts of grass, trail and trace. Finally, he extended it by using the words 'phantoms' and 'specters' to signify his conception of language: traces of the traces of signification. The uses of specters make sense in the Deridian defense that there is no original discourse and that the “notion of purity of any discursive event” (Haddock-Lobo, 2008, p.234, italics by the author, our translation) is non-existent. For Derrida, the discourse (the writing) is constituted from the other, from the other that comes from another, in an endless process of quotation of quotes. They are traces of traces; spectrum spectra. And “a spectrum is always a returner. There is no way to control their comings and goings [...]” (Derrida, 1994, p. 27, our translation).

p. 382, our translation). “An archive is a cemetery populated with lives and memories. It is the place of the living dead” (Idem, p.385, our translation). As a result, every archive is marked by the *evil of archives* (Derrida, 2001) by deletion and oblivion, which are also the necessary condition for its own renovation. The *evil of archive* is the possibility of its incompleteness, of the one that will always be open and waiting for another *archive* to come and there will be no to come, without repetition (Derrida, 2001, p. 101). Finally, *archives* are mobilizers of traces and producers of others.

Having made this clarification of how we understand the research [*archives*] we will resort to the approach of "*describing them*" with inspiration in the posthumous⁷ philosophy of Ludwig Wittgenstein. At first, it is not a question of defining 'what is' a research, or what is the essential that permeates all of them, but understanding them in their possibilities of other readings that broaden the debates on educational practices and research practices in / of Mathematics Education. It is worth noting that, both the *archives* considered here and their *description*, move away from the search for essentiality, for unique and fixed answers, to the defense of dogmatisms or scientific practices of hermeneutic-analytical purposes, in the words of Wittgenstein:

We feel as if we had to see right into phenomena: yet our investigation is directed not towards phenomena, but rather, as one might say, towards the '*possibilities*' of *phenomena*. What that means is that we call to mind the kinds of statement that we make about phenomena. [...]

Our inquiry is therefore a grammatical one. And this inquiry sheds light on our problem by clearing misunderstandings away. Misunderstandings concerning the use of words, brought about, among other things, by certain analogies between the forms of expression in different regions of our language. - Some of them can be removed by substituting one form of expression for another; this may be called 'analyzing' our forms of expression, for sometimes this procedure resembles taking a thing apart. (Wittgenstein, 2017, § 90, italics by the author).

Thus, both for us and for Wittgenstein (2017), it is about seeing through our forms of language.

However, our investigation does not address phenomena to reveal their essence, if not to see how in their *description* it is possible to destabilize dualities such as nature / culture, interior / exterior, subject / object,

7 We are referring to the following writings: Philosophical Investigations (2017), On Certainty (2012), Observation of the Fundamentals of Mathematics (1987), Frazer's Golden Bough (2007) and Culture and Value (1998).

good / bad, among others, that permeate the Western philosophy and that were established in the modern / colonial world as true, unique, neutral and universal.

Wittgenstein, in his posthumously published works, disrupts more drastically with the idea of language as a representational and essentialist symbolic system, of semiotic-representative purpose of the world, and inaugurates the expression *language-games*, inviting and provoking his readers to shift their gaze from the representationalist assertions about the world to *look* at how language works, to *look* at praxis.

Away from the desire to grasp the essence of language, Wittgenstein (2017, § 7. italics and quotation marks by the author) understands the “totality: of language and the activities intertwined with it, of *“language-game”*”, proposing to redirect the words from their metaphysical use, to their everyday use. The expression *language-game* seeks to highlight, with the word 'game', the importance of language praxis, that is, it seeks to highlight language as a theatrical and performative⁸ practice and, with this, the multiplicity of activities in which the language is inserted.

Wittgenstein's writing styles are aphoristic, non-conceptual, polyphonic, and questioning. This writing profile leads his different readers to different assertions, in a self-responsible process of understanding his writings. This intentional style of writing is intended to remove misunderstandings. A style of philosophizing that deconstructs images, concepts, conceptions elaborated from a fixed, dogmatic, representational, and external spectrum to the practice or phenomenon studied. The aphoristic and dialogical way of conducting this deconstruction calls to look how the practices occur. “Don't think, but look” (Wittgenstein 2017, § 66), see how the language works:

Consider, for example, the activities that we call “games”. I mean board-games, card-games, ball-games, athletic games, and so on. What is common to them all? a Don't say: “**They must have something in common, or they would not be called ‘games’**” a but *look and see* whether there is anything common to all. For if you look at them, you won't see something that is common to *all*, but similarities, affinities, and a whole series of them at that. **To repeat: don't think, but look!** – [...] many common features drop out, and others appear. **When** we pass next to ball-games, much that is common is retained, but much is lost. **Are they all ‘entertaining’?** Compare chess with noughts and

8 The theatrical and performative aspects of language in the signification process are set out in Miguel (2016a) based on (McDonald, 2001). For further clarification regarding the performance of the language as we understand it, see: Marim (2014, pp. 30 - 33, pp. 51 -58).

crosses. [...] And we can go through the many, many other groups of games in the same way, can see how similarities crop up and disappear. [...] And the upshot of these **considerations** is: we see a complicated network of similarities overlapping and criss-crossing: similarities in the large and in the small. (Wittgenstein, 2017, § 66, emphasis added).

In this aphorism, we can identify that the polyphonic dialogic style undertaken by philosopher Wittgenstein (2017) is permeated by questions, and he uses an 'if', which triggers a employment practice or scene of using the word, in this case, the word 'games'. Along with his conditional undertaking and interrogation, he exposes the use of the word using several examples and, in this case, presents arguments with the purpose of breaking the mirror of the representability / essentiality of language. This mirror cannot be sustained when observing the uses of words at work in / for life.

The nature of this style of Wittgenstein is permeated by literary writing choices, which displace, move and even deconstruct images and concepts conceived solely as mentalistic, representational, metaphysical, among others, such as those referring to the understanding of the act of reading, to the argument of private language, to the concept of number, to the notion of interpretation, the understanding of following rules, of learning a language, among others.

With this, the philosopher points out that the clarification and dissolution of conceptual misunderstandings need to resort to the *description*, the *search*, and the *identification* of this multiplicity of woven *language-games*, interwoven⁹ in *forms of life*. We understand that the *form of life* is one of the most potent expressions in Wittgenstein's writings (2017). The philosopher describes that *our* standards of correction are shaped by our agreements on *forms of life*.

“So you are saying that human agreement decides what is true and what is false?” - What is true or false is what human beings say; and it is in their *language* that human beings agree. This is agreement not in opinions, but rather in form of life. (Wittgenstein 2017, § 241, italics by the author).

Society's patterns of correction are variable, diffuse, and contingent, resulting in diverse forms of life that configure different social practices and their *language-games* with their own rules of operation and use. *Forms of life clarify* the uses we make of language based on our *performance*, agreements, beliefs, rituals, opinions, among other elements that make up lives. With this expression, the philosopher dissolves the

9 An expression of Miguel (2016c).

search advocated by classical philosophy, for ultimate foundations or for causal explanations of how *people* use language. With the aim of dissolving misunderstandings caused by the desire for *explanation* that permeates the ways of practicing philosophy. It seems to us that Wittgenstein, when *describing language-games* in *Philosophical Investigations*, inspires his readers to develop *similar* research, going through the uses of words and how they can be used in different ways, looking at each case as particular. For this, he practices *therapy* as a way to deal with language spells.

The *therapy* begins from the conception that “philosophy must not interfere in any way with the actual use of language, so it can in the end only describe it. For it cannot justify it either. It leaves everything as it is” (Wittgenstein, 2017, § 124). It does not discover anything, nor substantiate anything, it only makes *descriptions*. Baker and Hacker (2005) in the book “*Wittgenstein: Understanding and Meaning*” discourse about the attitude adopted by the philosopher in the face of philosophical problems, the following:

The philosophically relevant description of the grammar of words, the revelation of misleading analogies and analogies between uses of words, the arrangement of grammatical data to display the precise character of the philosophical illusion that grips us, the observation of the circumstances of use, the detection of images misleading in language, etc., etc. - all of this is a matter of skill. The great philosophical systems of the past rested on assumptions. [...] Wittgenstein, on the other hand, now offers a conception of philosophy that does not rest on any questionable assumption. (Baker & Hacker, 2005, p. 276).

Therapy does not aim to propose new theses on metaphysical themes thread to determine the essence that lies in the meanings of words and language, its purpose is to dissolve misunderstandings, “for philosophical problems arise when language *goes on holiday* (Wittgenstein, 2017, § 38). “The problems arising through a misinterpretation of our forms of language have the character of depth.” (Wittgenstein 2017, § 111).

Thus, *therapy* operates “against the bewitchment of our understanding by the resources of our language.” (Wittgenstein, 2017, § 109), enabling research attitudes that go against research practices that seek to formulate, defend, and confirm hypotheses and / or theses. Therefore,

[...] The real discovery is the one that enables me to break off philosophizing when I want to. - The one that gives philosophy peace, so that it is no longer tormented by questions which bring itself in question. a Instead, a method is now demonstrated by examples, and the series of examples can be broken off. — Problems are solved (difficulties eliminated), not *a* single problem.

There is not a single philosophical method, though there are indeed methods, different therapies, as it were. (Wittgenstein 2017, § 133, emphasis added).

Therefore, for each problem there is a *therapy*, and each *therapy* is based on analog remissions that will manifest themselves in the investigation for the researcher. But by no means, with such references, the construction of a theory or the defense of a thesis is not meant for, since every desire for *explanation* is flawed and the *description* should be put in its place (Wittgenstein, 2007), since,

this *description* gets its light a that is to say, its purpose a from the philosophical problems. These are, of course, not empirical problems; but they are solved through an insight into the workings of our language, and that in such a way that these workings are recognized a despite an urge to misunderstand them. (Wittgenstein, 2017, § 109).

João José R. L de Almeida, a Brazilian philosopher, scholar and translator of some of Wittgenstein's works, in the commented notes of the translation - from German to Portuguese - of the book '*Philosophical Investigations*' clarifies how the Wittgensteinian *therapy* seeks a *panoramic presentation* of problems to be dissolved, “[...] the word “panoramic” here intends to refer to an overview of the surrounding landscape, something that opens up a new panorama regarding a certain more restricted point, and not exactly a pure and simple “view from above”. (Almeida, 2017. p. 322 in Wittgenstein, 2017, our translation).

Some insertions of Ludwig Wittgenstein's research on Mathematics Education in Brazil

The thesis developed by Vilela (2007) was one of the first academic productions of this nature in Mathematics Education, in which different writings of Wittgenstein were triggered and discussed by the author with the purpose of going through the uses and adjectives of the term 'mathematics' attributed by the academic community of Mathematics Education in their research. The existing adjectives (for example, school mathematics, street mathematics, market mathematics etc.) were indicative of the existence of the plurality of mathematicians and their singularities of values, processes, meanings, concepts, among others. The author understood this plurality from thinking 'mathematics' in a Wittgensteinian way, like *language- games*, thus dissolving the supposed essence of meaning about what mathematics is. In dialogue with studies conducted by Pierre Bourdieu, Vilela (2007) also questioned the

acceptance of fixed definitions for mathematics and the fact that their legitimacy is based on the scientific field, notably the practice of professional mathematicians.

The studies carried out by Knijnik & Wanderer (2010) are similar to the production of the second Wittgenstein in dialogue with the philosophy of Michel Foucault in order to understand how mathematical content, seen as *language - games*, assumed unquestionable statuses of truth. They understood that school mathematics has its own meaning as a *language - game*. In this same direction, the studies by Wanderer (2007) and Giongo (2008) approached some of Wittgenstein's posthumous works to discuss central issues from the ethnomathematics perspective and to highlight the existence of different mathematical languages in order to problematize the rules that constitute the language of academic and school mathematics. For example, Wanderer (2007) developed his research with a group of adults who attended a rural school in a Brazilian municipality, in the 1930s.

The use of Wittgensteinian literature generated in 2018 a special issue for the Mathematics Education field in the *International Journal of Research in Mathematical Education* (RIPEM), entitled 'A view on Mathematics Education from the perspective of Wittgenstein'¹⁰. In this special issue, we can observe resignifications on the way of conceiving mathematics teaching practices such as mathematical modeling, as well as recommendations on the conceptualization of mathematics as a disciplinary body of knowledge, among other approaches outlined by Brazilian researchers.

The studies conducted in the Phala group that *adopted* therapy as a research approach were initiated by Prof. Dr. Antonio Miguel and by Prof^a Dr^a Anna Regina Lanner. These delineate different aspects in the field of Mathematics Education regarding the writing style, the chosen themes thread, the proposed undisciplinary problematization, the way in which researchers address their research problems, among others. More particularly, it is worth noting that these researchers inaugurate a non-conceptual way of understanding and articulating Wittgenstein's philosophy with Education, specially with Mathematics Education. These contributions have allowed the research that we have resumed here to be examples of

10 See: < <http://sbem.iuri0094.hospedagemdesites.ws/revista/index.php/riperm/issue/view/94> >.

investigations that are no longer subordinated to the disciplinary regime, but to the regime of socio-cultural practices, seen as *normative language - games* in the most varied *forms of life*.

Starting *archives* for the constitution of this research

The archive approached in this publication was constituted from the selection of theses and dissertations completed under the supervision of researchers from the Phala group. In a first selection, we identified that nine researchers advised studies in this field and based on these studies, we selected 43 research reports. Secondly, we established a time frame: only reports completed in the period from 2013 to 2020¹¹. The justification for choosing this time frame is based on the moment when Ludwig Wittgenstein's philosophy and his therapeutic approach began to nourish the studies and reflections of Phala group members. These selected criteria generated a file with 28 productions completed in this period.

In a third moment, we fully accessed the theses and dissertations through the institutional repositories of the Universities linked to the Phala group. Subsequently, we read in full all 28 selected researches, in an attempt to filter them for the studies of mathematical education which used Wittgenstein's late philosophy, either alone or in dialogue with other philosophers, also including those who have adopted a therapeutic approach in order to communicate / register the research via a dissertation or thesis report.

After this procedure, we selected 18 research reports [*archives*] (theses and dissertations), under the supervision of 6 (six) researchers (See **Table 1**). Due to the also descriptive nature of this study, we did not adopt previous categories of analysis, but rather axes of description of the *archives* that emerged after

11 Although our time frame for this work is understood from 2013 to 2020, it is important to note that the use of the philosophies of Ludwig Wittgenstein and Jacques Derrida in mathematics education by the Phala group started before 2013. In a Deridian perspective, we see the impossibility of naming the 'starting' moment, the origin, in a therapeutic way, but we admit as the 'folding' moment the publication of an article in *Revista da Unicamp, Zetetiké*, vol 18, year 2010, authored by Antonio Miguel, Denise S. Vilela, Anna Regina Lanner Moura, entitled: "Deconstructing school mathematics from a post-metaphysical perspective of education" (our translation). This publication can be considered an important milestone for deconstructionist therapy in mathematics education and language studies for this field.

reading the studies. The following axes were determined: (1) starting cultural archive¹² and the literature-traces triggered with respect to Mathematics; (2) analog therapeutic movements operated in research, and (3) aesthetics and writing style.

These axes used for the discussions in this work must be understood as *intersections* in our bodies of researchers, who also operate the *therapy* from what is shown in the archives. Inspired by the writings of Wittgenstein (2017), we understand that what the writings say about us and our purpose is not to be seen as their spokespersons, or to present them in what they are supposed to be - or say - in essentiality. The axes here *described* emerged from the immersion and experience of the three researchers with the selected *archives*, through the practices of reading, research, analysis, *description*, writing of this article, among other experiences in academic forms of life or not. The axes were identified by the authors of this text based on what the *archives* triggered, by analog examples in their tangible and intangible archives of *languages - games* that they integrate.

Table 1. Starting cultural *archive*, by year, title, author, advisor, and institutional link of the research.

Advisor: Professor Dr. Antonio Miguel		
Institutional link of research: Campinas State University (Unicamp)		
Year	Title of thesis (T) or dissertation (D)	Author
2014	(T) Mobilizing practices of arithmetic culture in the training of teachers at the Normal School of the Province of Rio de Janeiro (1868-1889): listening to imperial specters.	Kátia Sebastiana Carvalho dos Santo Farias
2014	(T) Children and their mathematical socio-cultural practices: between school and extra-school contexts	Guilherme Santinho Jacobik
2014	(D) AM[OU] a therapeutic-deconstructionist study of a passion	Márcia Maria Bento Marim
2015	(T) Language-Games in the profession and in the training of engineers.	Rejane Siqueira Julio

12 The questions that skew theses and dissertations described here operate as “starting points for a dispersive investigation between, on the one hand, possible - but not arbitrary - connections of meaning effects produced by such games of starting language on the body of the therapeutic investigator and, on the other hand, sense effects of other language-games that participate in the unlimited Tangible / Intangible Heritage of humanity [...]”. (Miguel, 2015, 629, our translation).

2015	(T) He war	Júlio Faria Corrêa
2015	(T) Indiscipline and transgression at school	Francis Roberta de Jesus
2017	(T) Come on, let's rock the world, until you get scared = a therapy of the desire for modern schooling	Carolina Tamayo Osorio
Advisor: Professor Dr. Anna Regina Lanner de Moura		
Institutional link of research: Campinas State University (Unicamp)		
Year	Title of thesis (T) or dissertation (D)	Author
2013	(D) Sociocultural practices and problems in the context of the internship of undergraduate studies: a therapeutic-deconstructive look.	Adriano Luiz Pedrini
2014	(D) Prova Campinas: an interdisciplinary public policy of systemic evaluation	Ludmila Giardini Noronha
2015	(D) Problematization of a training course: traces of pedagogical practices in school mathematics	Paula Massi Reis Pires
2014	(D) Interdisciplinary problematization of socio-cultural practices in initial teacher education	Érica Mitsue Nakamura
Advisor: Professor Dr. Samuel Edmundo López Bell		
Institutional link of research: Federal University of Rio Grande do Sul (UFRGS).		
Year	Title of thesis (T) or dissertation (D)	Author
2010	(D) Ethnomathematics: an ethical look at a game and its rules.	Anderson Santos
Advisor: Professor Dr. Carolina Tamayo Osorio		
Institutional link of research: University of Antioquia (UdeA).		
Year	Title of thesis (T) or dissertation (D)	Author
2017	(D) Nabba nana gala burbaba nanaedi igala odurdagge gunadule durdagedi nega gine: igal dummadi maidi sabbimala soganergwa naggulemaladi.	Richard Nixón Cuellar-Lemos

2020	(D) MathematicS and Peace at School.	Ángela María Quiceno - Daniela Montoya Osorio.
Advisor: Kátia Sebastiana de Carvalho		
Institutional link of research: Federal University of Rondônia (UNIR).		
Year	Title of thesis (T) or dissertation (D)	Author
2019	(D) Teacher self-training in professional education: episodes, lessons, and problems in scene - games	Vanessa Araújo de Oliveira
2019	(D) Don't think, but look! Black quota holders.	Andrelize Schabo Ferreira De Assis
2019	(D) Mobilizing practices of mathematical culture at Belezas do Buriti: voices in scene- games.	Marcilene de Sá Monteiro
Advisor: Professor Dr. Denise Silva Vilela		
Institutional link of research: Federal University of São Carlos (UFSCar).		
Year	Title of thesis (T) or dissertation (D)	Author
2016	(T) Mathematics teaching in Indigenous School Education: (Im)possibilities of Translation.	Helio Simplicio Monteiro

Source: elaborated by the authors.

Archives and their effects for/on Mathematics Education

The voices of researchers arising from their professional, ethical and situational involvement with research themes configure a belonging *ethnos* and *self-therapy* regarding the topics addressed. Noronha (2014) indicated the traces of professional practice that led her to investigate “how sociocultural practices were constituted within Prova Campinas, based on the historical path of its implementation”, indicating her “participation in the universe of practices that constitute the Prova Campinas is done in different ways [...] as a network professor [...] as a proofreader professor [...] Thirdly, as a researcher of practices” (Noronha, 2014, p. 15, our translation). The themes thread of the theses and dissertations are very diverse, some excerpts exemplifying:

[...] this research sought to problematize, based on Wittgenstein's philosophical therapy, what uses trainees / future teachers made while appropriating the terms of sociocultural practices and

problematization, in the three moments established throughout the discipline [...]. (Pedrini, 2013, p. xv, our translation).

[...] to problematize the statements by teachers and coordinators that the participation or non-participation of children in certain extracurricular activities would lead them to a better or worse performance towards the school practices of [mathematics]. (Jacobik, 2014, p. 10, our translation).

[..] what uses do students-future teachers make of the undisciplinatory problematization of sociocultural practices in their internship fields and / or in a discipline of the Pedagogy course? More specifically, what uses of the theory-practice relationship are mobilized in this context? The research aimed to accompany a group of the Pedagogy course during an academic semester, especially in the context of the discipline that involves the fundamentals of Mathematics teaching [...]. (Nakamura, 2014, p. 12, our translation)

To undertake a course of indisciplinary transgressive practice of constituting narrative scenes, which took place within a school organization [...] The investigations were driven by the interest of a large part of the class in practices of location, orientation and spatial displacement, motivated by socio-cultural practices in which their families were inserted. (De Jesus, 2015, p. ix, our translation).

[...] we set out as the main objectives: a) to problematize practices that mobilize Mathematical Culture in the context of the Municipal School Belezas do Buriti in Porto Velho; b) to analyze the teaching of school mathematics by means of conversations with elementary school teachers; c) to point out elements for the collective construction of proposals to redefine the cultural practices of mathematical mobilization in Belezas do Buriti. (Monteiro, 2019, p. 16, our translation).

To understand to what extent, both the translation and the creation of new terms for the indigenous language would fulfill the intention of transferring meanings and would lead the indigenous people to the mathematical knowledge considered as reference, in the context of the Xerente and Karajá peoples. (Monteiro, 2016, p. 28, our translation).

[..] to *describe* relationships that can be woven between mathematics, education and Peace by an indisciplinary questioning of military practices in the Mathematics class with fifth grade students of the Autonomous Educational Center and eleventh graders of the Emmaus Parish School. (Quiceno & Osorio, 2020, p. 9, our translation).

[...] to analyze the Quota Policy established by Law No. 12,711, dated August 29, 2012, from the perspective of black students of the Porto Velho North Zone Campus of the Federal Institute of Rondônia (IFRO) [...]. (De Assis, 2019, p. 57, our translation).

[..] to investigate practices that mobilize arithmetic culture that would have been carried out at the Normal School of the Province of Rio de Janeiro, from 1868 to 1889, with the purpose of training teachers to work in the so-called "first letter schools", emphasizing the innovative management of Normal School by José Carlos Alambary Luz." (Farias, 2014, p. 7, author's emphasis added, our translation).

[...] the purpose is to investigate the emergency conditions of Mathematics Education as an autonomous field of academic research, based on the statement by Paul Ernest who claims to be Mathematical Education the Daughter of the Cold War. (Corrêa, 2015, p. 7, our translation).

[...] the purpose of seeking, in narrative acts, the traces of meaning [and not the truth, the primary, essential, unitary or definitive cause] regarding [the] longevity of mathematics teaching practices, mobilizing traces of signification of mathematics teaching practices suggested by [didactic material] MA (Mathematical Activities - São Paulo State Secretariat - Brazil). (Marim, 2014, p. 20, our translation).

The interview excerpt "any engineer who sees this drawing will understand", marks the difference in university education, different ways of life and professional acting. The speech "we don't stop to

reflect on what we are doing” also brings up the difference between language-games of the interviewee's professional practice and talking about his professional practice. (Julio, 2015, p. 45, author's emphasis, our translation).

The problematizations in the mobilized archives comprise a way of treating and developing the research, or even, a position of the researcher in conducting their investigation which requires accuracy. To problematize is a way of undertaking research inspired by style, aesthetics and the purpose of dissolving “*conceptual confusions*”, understanding that “the confusions which occupy us arise when language is like an engine idling, not when it is doing work.” (Wittgenstein, 2017, § 132). The problematizations imply a peculiar way of carrying out research and communicating it, in addition to having the potential to create connections and analogies with an unlimited variety of *language - games* and literatures-traces, operating by cross-references and displacements.

The archives of the study developed by Marim (2014), Corrêa (2015), Silva (2013) and Farias (2014) showed us as a historiographical research, which starts from the assumption of the existence of knowledge and thought that are previous, transcendent or independent of language - games and which place their themes thread under *deconstructionist therapy*, which can cause effects in a broad sense, not exclusive to the field of History and/or Historiography.

In Basic Education, Marim's *deconstructionist therapy* (2014) causes teachers in the early grades to reflect on the longevity of school practices for mathematics teaching that are based on traces of the constructivist and intuitive teaching paradigms; Corrêa (2015) causes the reader to reflect on the relationship between mathematics and war practices, as well as their effects on school education; in the training of teachers, in the traces of Farias (2014) it is possible to problematize the practices of *teacher training* in mathematics who were (and still are) at the service of the social order of a Liberal Republican State project, among other effects. Finally, in the field of historiographies, these researches open the possibility of dealing with archives not in a linear and *explanatory* and causal sequence, but in an analogous and discontinuous way in which new objects and sources become important to problematize contemporary school practices in research historiography of Mathematics and Mathematical Education.

The purpose of historiographic research is to describe how and based on which rhetorical, argumentative, imaginary, scenic, literary or fictional strategies and resources these insertions produce their performance effects, that is, how they perform their own dissonances and contradictions, the transgressions of rules of their own grammars, their ungrammatical, the meaningless. The historian therapist never forgets the Deridian maxim that “every thesis is a prosthesis”. (Miguel, 2016b, p. 386, author's emphasis, our translation).

This problematizing mode of research engenders, either in their starting cultural *archives* or in the established analogies, questions, inquiries, and denaturalization of Mathematics as a discipline and field of academic-scientific knowledge. A wide range of *specters* are also presented, involving the themes thread identified as the modern school, teacher training, indigenous and non-indigenous school education, learning assessment, research methodologies (historiographic or not) - among others - as manifested in the following theses and dissertations:

These rules - norms, further explored below, aimed at valuing the development of “skills and abilities” are linked to the values that society produces and to its interests which, in our current political context of teaching evaluation, underlie the way of conducting and the constitution of meritocratic, competitive and ambitious Evaluation Systems, not consistent with the objectives of an education based on integral human formation. (Noronha, 2014, p. 33, our translation).

In the case of mathematics, for instance, its image as a domain of knowledge assumes a status associated with academic, formal mathematics, leaving behind other uses mobilized in different sociocultural practices. (Nakamura, 2014, p. 6, our translation).

[...] I have been observing in my mathematics and physics classes, that a teaching based only on rules, propositions and properties like the ones proposed in textbooks or handouts with the objective of preparing students for entrance exams or even for becoming mathematicians, physicists, chemicals, etc. does not have the support of most students and has not even contributed to their professional training. (Pedrini, 2013, p. 1, our translation).

[...] the difficulty [...] in making translations from the mathematical language to the mother tongue, since in this process, specific subjectivities, present in each of the languages, are involved. (Monteiro, 2016, p. 112, our translation).

[...] all social practices are producers of culture and have their own rationalities and this non-disciplinary look helps us to think that the uses of mathematics in war practices are different from the uses of mathematics in peacebuilding, since the purposes that guide the subjects are different. But be careful, I do not intend to define or categorize them. (Quiceno & Osorio, 2020, p. 30, our translation).

[...] We created the characters from the names of people directly linked to the educational and teacher training context of the Normal School of the Province of Rio de Janeiro in the period studied, with the exception of Maria Brasil, a character created with double inspiration, first in the work *The nights of Gymnasium: theater and cultural tensions in the Court*, and later, in Italian Marietta Maria Baderna. (Farias, 2014, p. 80, our translation).

Mathematics as a discipline in the school and academic institution is treated as an 'object' of knowledge, which is of a non-situated, cognitive, symbolic, formal, structured, generalizable nature, etc. At school, this 'object' is the end-purpose of a cognitive, stage-oriented, homogeneous, and linearized process called learning. The dynamics of its teaching are connected to the synoptic machine to discipline and monitor the bodies that make up this complex disciplinary institution.

The speeches constituted throughout the writing of the *archives show*, by the problematizations undertaken in them, that the unilateral diets and the fixed images of Mathematics have generated exclusion, selection, meritocracy, sanction, discrimination, imposition, elimination, fascisms and a hierarchy of knowledge, bodies and of *forms of life*.

The dissolution of these still images of mathematics and other themes thread treated in the *archives* are carried out by the dialogical way of operating also with a varied range of literature-traces. De Jesus (2015) intending to undertake a course of indisciplinary transgressive practice of constituting narrative scenes in a school in the municipal network of Campinas, built a writing in analogy to the literature-traces from the field of theater, when it seeks and intends to be "a space where scenes can be played freely, [...] a place of waiting in which we can suspend different truths and open discussions that will be relevant to the scenic - games of the future" (Idem, p. 30, our translation).

Academic literature in the field of theater is set within a dialogical movement in the writing of the thesis, due to its references to the purpose of the text and its potential for problematization. It presents itself together with historical-memorialist discussions about the constitution of disciplines in the school institution by academic literature in the field of philosophy, sociology, and education.

The evocation of voices is part of the scenes - sometimes anonymous, without origin and starting point, sometimes identified (children, school faculty, academic researchers, literary people, etc.) - to bring to mind a process of reminiscence that we are always discussing what is manifested in each scenic route. Thus, our choice for what is present in the vision is expressed, without imagining whatever is hidden from us. These voices always say: - Look! - Look! (De Jesus, 2015, p. 52, our translation).

In the mobilized *archives*, the voices of children, parents, principals, indigenous and non-indigenous teachers, students, in short, real or fictional voices constitute, *together* with the literatures-narrative acts,

among them the scene-games¹³ that question and examine the image mathematics as a discipline and its traces in unilateral diets. *Scene - games*, as a style of writing and a way of dealing with bad uses of language, are inspired by the Wittgensteinian way of dealing with these uses, employing examples, metaphorical comparisons, different types of dialogue, imagining situations (Moreno, 2005), with the purpose of showing the language in *operation*, in *praxis*.

The evocation of voices in a dialogical and interrogative style is not restricted to literature in the academic field, be it education or not. Paintings, music, poetry, articles, films, etc., are spectralities also called for narrative staging¹⁴ with the purpose of dissolving *conceptual confusions*. This therapeutic way of research has its own aesthetic in communicating and recording academic research reports that differentiate them from other research productions in Mathematics Education.

The *deconstructionist therapy* carried out from the archives, when going through the uses of language in the dissolution of *conceptual confusions* presented here, reveals other forms of seeing and conceiving Mathematics beyond the discipline spell and its entanglement in the webs of the disciplinary institution. Inspired by the studies of Miguel, Vilela and Moura (2010), sociocultural practices are seen by therapeutic researchers as promoters of displacements, inversions, resistances, transgressions and deconstructions not only in Mathematics, but also in the disciplinary institution that it operates and that operates on it.

Noronha (2014) shows a systemic evaluation policy guided by *sociocultural practices* as a practice that violates the assessments aimed at ranking, competition, meritocracy and governance of subjects and knowledge. For her, the assessment of Mathematics seen by the guiding principle of *sociocultural practices* has as a challenge:

that these practices appear as they are also mobilized outside of school in other language- games. I can have a measurement practice within this Legal text that talks about Environmental Preservation,

13 The archives studied here are inspired by McDonald's (2001) understanding, which researches of a literary nature in the Wittgensteinian light challenge to eliminate distinctions between form and content, between fictional and non-fictional narratives. *Fictional-games* do not have the function of affirming what is or is not reality, but of referring to the uses in their practices. The understanding of language as a praxis, indicates that it "performs linguistic acts within ongoing repetitive practices or language-games" (McDonald, 2001, p. 35).

14 In the sense of McDonald (2001) and Miguel (2016a).

where I can build and where I can't. It is different for the student to know how to measure with a ruler, as we do at school, where the measure a line segment, and say "it is this many centimeters" of being able to get to read a legal text and knowing how the measure is being mobilized. It is problematizing what is real, it is problematizing man's use of the division and demarcation of physical space for various human purposes. So, this is the school's challenge, not only to work on content that is different from the different uses of language and where that content is mobilized. (Noronha, 2014, p. 81, our translation.).

When problematizing *sociocultural practices*, displacements and transgressions are promoted as the themes thread that are placed on the therapeutic *divan*, at the same time that other forms of treatment are created: pedagogical and research practices, schooling, racist practices, the relationships between mathematics and peace, war practices, gender issues and teacher training, finally, *life*, as shown below:

The indisciplinary view of social practices, made from unexplored territories both by students and by us as teachers, allows us to bring stories, testimonies, investigating other points of view to the conventional classroom ... it is decisive for the class to transform into a communication scenario, a space from fostering reinterpretations of what is being problematized, opening room for the generation of reappropriation networks for the discourses that we invite to deconstruct. This offers, therefore, a possibility for productive reflection, which for Derrida is synonymous with subversion, disobedience in the case of Gros or, critical attitude in Foucault, or the understanding of different language-games in different ways of life in Wittgenstein. (Quiceno & Osorio, 2020, p. 100, our translation).

This perspective allows a new way of seeing the school, of mobilizing knowledge, of expanding our field of meaning. The role of the school is the decolonization of the subject. (Pedrini, 2013, p. 15, our translation).

Our purpose is to raise elements that enable a transformation of the school and not only say what the student knows or does not know. (Noronha, 2014, p. 82, our translation).

Knowledge is not cumulative and is not linearly acquired as the course information is received. There is no causality, there is no such regularity that we intend to put on the course, in the sense that teachers attend classes, feel empowered, apply in their classrooms, students learn and the assessment rates go up. (Pires, 2015, p. 66, our translation).

Deconstructionist therapy is a methodical attitude that helps us to deal with the other's speech, not to explain it, but to show the power it has. Derrida and Wittgenstein invite us to practice research as what can help us manage a disease, but never completely eradicate it by preventing it from taking on other configurations and turning into other diseases. *The disease called race* and the diseases generated by *racist practices* are transformed, they acquire other masks and other configurations that are often overlooked, but that are reinforced by practice, that's why we use the term "show". (De Assis, 2019, p. 70, highlight made by the author, *emphasis added*, our translation).

In this same direction, when assuming the conception that mathematical practices are unlimited sets of normatively oriented *language-games* with unequivocal purposes, the research by Tamayo-Osorio (2017), Monteiro (2016) and Cuellar-Lemos (2017) developed in Indigenous contexts show that there are other forms of normatively oriented rationality, which do not correspond to the standards of Eurocentric

rationality that predominates in school curricula. In addition, such *language-games* are not always adjectives by participants in these forms of life using the word 'mathematics'. As a result, these studies expand the uses of the word 'mathematics' and are not restricted to a single meaning, even allowing us to speak in mathematics, in the plural.

However, the researchers understand that such games are not seen as a transposition of 'school mathematics' or 'academic mathematics' into the form of socio-cultural practices. Looking this way prevents what Almeida (2007) calls "injustices"¹⁵. This can be manifested in scientific research when they are moved by the *desire for explanation* that, using *a priori* parameters and Eurocentric rationality, look to other forms of life to interpret them. For example, in *Observations on the Golden Branch of Frazer*, Wittgenstein (2007) describes in a panoramic way the functioning of magical and ritualistic practices and presents how the causal and analytical explanations made by anthropologist James Frazer resorted to elements *outside* these practices. This *failure* led the anthropologist to adjectivize them as wrong, primitive and even stupid because, in terms of Wittgenstein (2007): "[...] the undertaking of an explanation is already flawed, because one has to simply organize correctly what they know and add nothing else, and the satisfaction that they aspire for the explanation comes by itself" (p. 194).

Thus, normatively oriented practices are staged and they are the ones that should interest us, as they determine *forms of life* through which Mathematics is no longer seen as a domain of unitary, structured and logically consistent knowledge (Nakamura, 2014; Corrêa, 2015; Noronha, 2014; Monteiro, 2019; Cuellar-Lemos, 2017) and, becomes a heterogeneous and self-sufficient collection of rules of

15 "The disease, the cure, the drying, the magic, are grammatical: the facts only confirm them, because there is an internal relationship between empiricism and thought that are organized in a way for presenting reality. The difficulty only appears for outsiders, for those who do not participate in the activity, for those who do not have a special involvement with it. The latter sees the facts differently, within another arrangement, organized in a different way, through the lens of another grammar. It does not see what is similar between us and the primitives, for instance. It sees that the so-called primitives would be less evolved. And in that attitude there is the possibility of committing an *injustice*: between grammar and fact, grammar is always chosen; however, this choice should not be a judgment of values (cf. CV, p. 8). Here is the difficulty of being fair to the facts and the whole sense of the philosopher's grammatical investigation. Therefore, the preponderance of ethics in Wittgenstein's philosophical attitude is revealed" (Almeida 2007, p. 220, emphasis added, our translation).

performative staging of language (Tamayo-Osorio, 2017). These researches are no longer concerned with raising flags or ideals of uniqueness, a representation of the world or unity in diversity.

These elements raised on deconstructionist therapeutic research in the indigenous context can be understood through the speech of Roberto Cuellar, botanist of the Gunadule indigenous people of Alto Caimán in Colombia, registered by the indigenous researcher Cuellar-Lemos (2017, p. 136, our translation):

In our body is our "*immal iddogedi igala*", we do not have to go elsewhere to look for the tool to measure, to count, to calculate, If we need to measure something, we have our fingers, toes. With that we measure what we do in everyday life, this is very important because our measure is very different, I count through another culture.

When Roberto Cuellar says "*immal iddogedi igala*"¹⁶ he is referring to the Gunadule's normatively oriented games, in which participants are guided by rules that determine their bodily performances in sociocultural practices, so that by following them, the game can be played unequivocally. The fact that such rule games are guided by unambiguous purposes does not mean that *conceptual errors or confusions* cannot happen. If unequivocal purposes are not achieved, it is necessary to investigate the reasons that generated such confusion, instead of doubting the rules of normative *language-games*, as what is manifested is the transgression of the rules in performance, as Miguel (2016b) explained.

The research by Cuellar-Lemos (2017), as well as Tamayo-Osorio (2017) - even though they develop interdisciplinary studies in different ways and given the specific problems of the Gunadule people - allow us to 'see complete mathematics' in the Gunadule's performances, not because there are 'numbers' or 'measures' involved in the *immal iddogedi igala language-games*, but because their actions *must be* guided by the *unmistakable or undoubted meaning* that they *must* attribute, in each case, in order to make them contemplate the social purposes that are assigned to them. As Cuellar-Lemos (2017) clarifies, practicing *immal iddogedi igala*, '*ebisedi*' (counting practice), involves a body performance that develops in time and space with meaning and coherence, explaining the ways of life of the Guna society, which is why, "practicing *ebisedi* for the Gunadule people is related to the construction of the family, wisdom, music, intercultural incursions. In other words, behind this word is the meaning of the actions and rules that guide the Guna in their daily lives" (Cuellar-Lemos, 2017, p. 137, our translation).

16 "Imm al iddogedi igala" are normatively oriented and unambiguous language-games that organize Gunadule life. 'Imm al' means thing, object; 'Iddogedi' to understand, comprehend; 'Igala' means path, method; 'Gunadule' person. That is, the ability to see, to observe the reality of the social, political and economic world of Gunadule's cosmogony, the way to follow (actions) to understand, identify and organize knowledge when performing a social practice.

Final comments

The mobilized *archives* in this text and the analogical relations that we have developed here, *crossed us* as investigative therapists in different ways and issues. On the Wittgenstenian therapeutic *divan* of the researches it was possible to perceive that they promote ruptures, displacements, denaturalization, approximations, transgressions and resistances to unilateral, exclusive, meritocratic, neoliberal and colonizing ways by which the researchers involved in the theme proposed to put it at risk.

The authors of the research were involved in an *estrangement*, either initial or transversal, to the effects generated by the understanding of Mathematics as a disciplinary body of knowledge operationalized in the various institutional training environments, such as university, teacher training centers, indigenous and non-indigenous schools academic community, among others. This understanding admitted for the orientation of training courses, to parameterize institutional assessments, to guide research in / in Mathematics Education, to guide the school curriculum, among others, was put on the *divan* by the researchers. They - the researchers - denaturalized it, but they did so in a polyphonic, dialogical, interrogative, problematizing and mobilizing way of a variety of traces.

We agree that this is an unprecedented way of inquiring and conducting research within the scope of Mathematical Education inspired by the literary, fictional, and aesthetic style of Ludwig Wittgenstein and Jacques Derrida. *Deconstructionist therapy* is practiced as a research approach that, through discontinuous leaps and analogies, deals with the problems and misunderstandings that manifest themselves in language, by dissolving them. For us, this approach deconstructs without destroying, dialogues without imposing, listening to different voices without being the interpreter, asks without having the answer, diverges without dichotomizing, proposes without intending to be the truth and *poeticizes* about the *practices* that show the existence of other forms to mathematize, school, investigate, historicize, among others. And this is the great differential of the investigations developed by the Phala group, because Wittgenstein and Derrida are not referencing to support theories, on the contrary, they are

voices that when evoked to think about Mathematics Education, allow to take the problems of the field for their daily use.

When problematizing, these researches *put at risk* everything we have built so far, but problematizing means denaturalizing, and in these terms, it is a non-fascist ethical-political project. The problematization that mobilizes the *deconstructionist therapy* is a constant and endless movement, which allows to understand and think in other ways, as research shows.

These other ways of thinking generated in and by the undisciplinary problematization that goes through taking the problems manifested by the bad uses of language to the therapeutic divan, have contributed to the constitution of ethics centered on *practices*, whether of schooling or not, that move in the idea that human and non-human forms of life suffer the effects of the aggressions of neoliberal and fascist forms of government.

As they put naturalized and instituted ethics *at risk* as unique and true, problematizations generate so much force that they prevent their emergence (such as, for instance, the adoption of unique ways of conceiving mathematics, research, academic writing, historiography etc. by searching for parameters, models and goals to establish them), both those who allow its existence and impel its power. The latter allow themselves to be problematized by the limitless powers of *forms of life* and, thus, open a space to think beyond the rationalities that envelope life.

The researches of the Phala group when assuming life as an axis of educational action unfold in a double movement: the first, says about the fact that such researches are disconnected from the repetition of the disciplinary pattern of knowledge production that promotes the maintenance of a single *image* of mathematics. A second movement concerns the importance of researchers building horizontal relationships with social collectives, many of them, excluded and silenced at / by universities, placing Mathematics Education as a function of life, and not life as a function of Mathematical Education.

Finally, we believe that the subgroup of researchers from the Phala group, who operate the thought of Ludwig Wittgenstein in a *deconstructionist therapeutic* way, pave the way for undisciplinary educations to be staged and, so that research attitudes that do not colonize thoughts linked to *forms of life*

can be constructed and communicated in research reports. Thus, we understand that the research of this group of researchers from the Phala group positions Mathematics Education in the face of an ethical-political project that guides *forms of life* as an axis of ways of *practicing* Mathematics Education which does not exclude, discriminate, hierarchize and eliminate human and non-human forms of life, “You must bear in mind that the language-game is so to say something unpredictable. I mean: it is not based on grounds. It is not reasonable (or unreasonable). It is there - like our life” (Wittgenstein, 2012, § 559, our translation).

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