Zetetiké

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Knowing the other and yourself: telling, problematizing and reinventing mathematical memories in pedagogy

Conhecer o outro e conhecer-se: narrar, problematizar e reinventar memórias matemáticas na Pedagogia

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Abstract

The article aims to analyze inventive practices of future pedagogues in Mathematics Education through the remembrance of childhood stories with the subject of Mathematics. As methodology, we chose cartography, in which we problematize the processualities during the intervention, prioritizing the descriptive to the interpretative. We developed three devices: the production of reports; exposition of self; and the sample space. As a result, we noticed the difficulties facing the discipline, but the desire to build practices that overcome the barriers created throughout life with the area. The students also had a responsive look at their future teaching activities, which allowed an opening for the creation of other ways of being a teacher and an inventiveness of mathematical practices. Thus, we considered the emergence of (1) the fear of what mathematics can be in our lives; (2) the mathematics we will work with; (3) the quality of teaching and (4) the use of pedagogical materials.

Keywords: Mathematical memories; Pedagogy; Initial formation; Cartography.

Resumo

O artigo visa analisar práticas inventivas de futuros pedagogos em Educação Matemática por meio do rememorar histórias da infância com a disciplina de Matemática. Como metodologia, escolhemos a cartografia, em que se problematiza as processualidades durante a intervenção, priorizando o descritivo ao interpretativo. Elaboramos três dispositivos: a produção de relatos; exposição de si; e o espaço amostral. Como resultado, notamos as dificuldades frente à disciplina, mas o desejo da construção de práticas que ultrapassem as barreiras criadas ao longo da vida com a área. Suscitou-se, ainda, um olhar responsivo dos discentes sobre as atuações futuras de docência, o que permitiu uma abertura para a criação de outros modos de ser professor e de uma inventividade de práticas matemáticas. Consideramos, assim, a emergência do (1) o medo do que a matemática pode ser na nossa vida; (2) a matemática com que trabalharemos; (3) a qualidade de ensino e (4) o uso de materiais pedagógicos.

Palavras-chave: Memórias matemáticas; Pedagogia; Formação inicial docente; Cartografia.

The Beginning...

> Twenty students are waiting for me. Another semester begins. There is always a strange nervousness in starting a discipline. Now even more so, since I proposed to do something different, which generates a certain instability. I am a little afraid. I

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> have never worked with this class before. It will be the first time that they have class with me. I have already gone over many times the attitudes that I want to have with them. Finally, August 8, 7:10 pm, a Tuesday. The Content, Methodology and Teaching Practice classes will begin. When I arrive at the classroom, I see a group of unfamiliar faces, of all kinds. In all, twenty prospective teachers, eighteen girls and two boys. On the other hand, I notice that they look at me with a certain curiosity. After all, they must have heard about me from other students, about the way I work, about my quirks. They are groping me, just as I am groping them. Everything is new to us. Together we need to build our space. To think about what we will do and where we aim to go, what our formative quest will be. I can't decide this alone. I believe that, even if I wanted to, I couldn't decide for them which teacher they should be. I started the class as I had done the other times. With a light "Good evening", always answered in chorus. I also followed the pattern oriented by the institution for the beginning of each semester: presentations of the teacher, the group of students and the Teaching Plan of the Discipline (Logbook - Meeting).

The excerpt presents the first day of the researcher, author of this article, in a group of initial training of pedagogues. The curricular component refers to studies on Mathematics Education for Childhood and its resonance for practices in Early Childhood Education and Early Years. Throughout the teaching experiences of the researcher and his readings about initial training of teachers who teach mathematics (Curi, 2004; Nacarato, 2010; Nacarato, Mengali & Passos; 2009), the concerns, fears and anxieties of this group with this subject are always evidenced. Thus, there is always the care with the experience that will happen along the curricular components of Mathematics Education in Pedagogy courses.

Facing such reality, this research intends to overcome practices that aim at convincing the subjects to open themselves to Mathematics Education, as if the power of change of thought was in the trainer and not in the future teacher. In this sense, the aim of the study is to analyze inventive practices of future teachers in Mathematics Education through the reminiscing of childhood stories with the subject of Mathematics. Thus, we believe in the process of remembering, reliving and, possibly, re-signifying experienced mathematical situations.

The chosen research methodology is based on the assumptions of cartography, in which the research subject is considered an inventor of realities, one who, by "walking, traces on the way, his goals" (Passos & Barros, 2009, p.17). In this way, we bet on "thought experimentation - a method not to be applied, but to be experienced and assumed as an attitude" (Passos, Kastrup & Escóssia; 2009, p. 10). That is, our desire is to highlight the processualities during the research, prioritizing the descriptive method over the interpretive one (Passos & Barros, 2009).

For the arrival of our field visit, we created a device, the Narrate Yourself workshop. In the research, we see the devices as "machines that make us see and speak" (Deleuze,

DOI: 10.20396/zet.v29i00.8660868

1992, p. 155), capable of actualizing what is virtual[2] in the field of the workshop, producing modes of being and reality of saying. In its composition, we engendered two moments:

- *Production of personal experiences*: we began by asking each student to produce a story about his/her experiences with the subject of mathematics;
- *Self-Exposition*: each student exposes his/her story to the group.
- *Sample Space*: process of construction of syntheses and directions for future teaching activities.

In this context, the research is based on a narrative approach and, as a writing policy, we chose a descriptive process of events. The perspective is based on the idea of encounter. As proposed by Larrosa (2002), an encounter is what goes through us, touches us, happens to us, and is not mere transient information, incapable of leaving any trace.

Next, we point out the constructed processualities, calling them moments.

Moment 1: The Group Presentations

After that awkward moment between strangers, the class began as follows:

> **Me**[3]: Good evening, class!
> **Graduates in chorus**: Good evening!
> **Me**: How are you? Eager to start the semester? (Small laughter from the class). First of all, let me introduce myself to you. I am the *me*, and I will be your teacher for the subject Content, Methodology and Teaching Practice of Mathematics... This whole big name. Okay? (Little silence). I would like you to introduce yourselves.
> **Pink Butterfly**: Teacher, aren't you going to talk about what you have done in life? Like, college, master's degree... Teachers always tell. I like to know.
> **Me**: Okay... First, I am a mathematics teacher and an educator. I did my Master's in Mathematics Education and I did my PhD on that as well. For some time now I have been interested in your education as mathematics teachers. (...)
> **Pink Butterfly**: We are not mathematics teachers; we teach mathematics by accident... (Laughter)
> **Me**: Accident?
> **Pink Butterfly**: Like... We have to do it... It's part of it. Not that we are MATH TEACHERS. (Syllabic and higher pronunciation).
> **Me**: Well, I think we will have time to discuss this during our classes, after all, that's what we are here for, to think a little about what it is to be a mathematics educator... But...
> **Pink Butterfly**: Mathematics educator will do... We can do that. (...)

[2] According to Kastrup (2009, p. 22), the virtual is actualized according to a process of creation and differentiation. In this sense, it is distinguished from the possible, realized through a process of limitation and similarity. A good example of the actualization of a virtuality - as production of something that was already there - is the production of a pianist's hands through repeated practice.

[3] In the transcriptions, the term "I" was used to refer to the researcher and to demarcate the beginning of his speech. In this same perspective, each student chose a name for himself, which should be written in his notebook.

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> **Me**: (...) Let's go to the presentations! Where do we start? (Then the students start introducing themselves)
> **Pink Butterfly**: Start with myself, teacher. I am the Pink Butterfly and I don't like math. I'm afraid of this subject.
> **Helena**: I am Helena.
> **Philosopher**: I am the Philosopher... I don't like mathematics... Teachers already know[4] ... (Laughter)
> (Thus, the introductions followed each other). (Partial Transcript of the Meeting)

Throughout my years of teaching this discipline, the above discourse has been recurrent among undergraduate students of Pedagogy. It always frightens me when the name "Professor of Mathematics" appears. The authority of this figure presents itself. In a certain way, we notice that there is a stable configuration of the subject of the mathematics teacher. Something that they either don't want to be, or don't believe they have the conditions to practice.

The term Mathematics Educator, on the other hand, sounded more pleasant to them. In this sense, different terms mean different performances, that is, a work proposal that they consider capable of performing in Basic Education - something outside the rigid standard of what they know as a Math Teacher. From Fiorentini's (1994) perspective, we consider the use of the terminology Mathematics Educator powerful for thinking about the formation of the pedagogue. The mathematics teacher proposes to defend the best possible way to teach the contents of the subject, while the mathematics educator is reserved for the best possible use of mathematics for a quality education. It is in this last group that we want to insert future pedagogues.

Another element that appears in the group's speech, also recurrent in other classes, is the constancy of saying that they don't like/do not like/are afraid of mathematics, even though I didn't ask them to explain their relationship with the subject. This always sounded to me like an apology or an anticipated distress of a possible failure to perform well in the Subject. An act of convincing them that they will have difficulties with the lessons, as had occurred during school.

Moment 2: Introducing the Discipline

After this initial conversation, I made a slide presentation referring to the Teaching Plan of the discipline, as recommended by the institution.

> (?) **Me**: Well, people! Let's talk about the Discipline, then!
> I start the presentation of the Discipline.
> **Me**: (...) The Discipline has the following objective (I read the text):
> *General Aim*: To support, encourage and create opportunities for undergraduates and their trainer to move towards the breadth of their human potential, understanding mathematical knowledge - as historical production, linked to political, social,

[4] Philosopher is my undergraduate scientific advisor in a project about Gender, Sexuality and Science and he had told me before that he didn't like math. He reported, at the time, that he was afraid of what I might think of his intellectual capacity if he did not succeed in the discipline I teach.

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> economic and cultural issues - as one among the possible ways of thinking and intervening in reality.
> **Me**: The idea is to think how mathematics is a human production and can be something that allows us to intervene in our daily lives.
> **Ana**: Like this... The delta (referring to Bháskara's Formula), I use it to do this, this and this... With the x, I do such and such... (Laughter from the student).
> **Me**: The goal of the discipline goes a little further than that. I thought we should discuss mathematical thinking. We have some ways of thinking that involve the act of doing mathematics.
> **Pink Butterfly**: Teacher, I won't know how to do mathematics. N-E-V-E-R, never, never and ever. (...)
> **Me**: Let's think about it another way, Pink Butterfly. Let's think that the discussion here is to see how we can enhance this thinking in the children, when you start teaching.
> **Pink Butterfly**: That I think is cool. Very nice. Really cool. (...)
> **Me**: So, our proposal will go like this (I read the contents/actions on slide):
> (...) (I change slide)
> **Philosopher**: Wait, professor! I want to copy. I thought it was cool, I want to think about it at home. Maybe it will be usable when I teach. (TP Meeting)

For some time now I have been concerned about blaming the pedagogue for a lack of mathematical knowledge. As if they don't want to work with such knowledge in their daily lives. Possibly, there are teachers who do. But a generalization is worrying. This leads us to blame them for failures in their own training. In my capacity as a trainer, this could perhaps be a place of comfort - to claim that the lack of commitment in the field of Mathematics Education is due to the undergraduates. I believe that everyone would accept such an assumption.

However, I note, in the previous speeches, the responsive interest of future teachers (D'Ambrosio & Lopes, 2015). The Pink Butterfly and the Philosopher, even contrary to their own interest in mathematics, when they imagine that the actions in the discipline will enable them to enhance the mathematical knowledge of their future students, they get involved with the discipline.

Still about the discipline, we discussed its evaluation, a subject that is always among the most awaited at this moment.

> (...) **Me**: Well, people, regarding the evaluation, I wanted to decide with you.
> **Ducarmo**: How so? Are we going to choose how the test will be?
> **Me**: Not the test itself, Ducarmo. It is the question of the evaluation as a whole. Everyone knows that I need to put a grade at the end of the system. So, we need to talk about how these things are going to be.
> **Norberto**: There could be no test, right? (Laughter)
> **Me**: Yes, you know that I have to do Ev1[5] and Ev2. These are things that the teaching model requires. (...) What we can do is think about how to do this. We could do other things in parallel.
> **Norberto**: Really... Work is cool... Important... (Laughter)
> **Me**: How to do the assignments and the tests is the question?

[5] Ev stands for evaluation.

DOI: 10.20396/zet.v29i00.8660868

> **Pink Butterfly:** You didn't say that there is this practice thing for math. There you go! It could be how we should be graded. You can give points for our activities, the ones we do.
> **Me**: I like that. I can do it like this: every time I give the activity, I propose what I want and evaluate it. (...)
> **Philosopher**: In the exam, the teacher could give us some topics to choose from and write about, worth a higher grade.
> **Helena**: We can draft the topics the teacher gives us at home. Like they say it is in the master's test. (...)
> **Me**: That's it, then. Grades on the activities and on the tests, this question of text production. (TP Meeting)

The students consider it a different act to discuss with them the modes of evaluation. At first, I was also afraid, since I believed they could somehow "pervert" the process. However, it became an interesting element of debate as to how we arrived at a shared path.

With their suggestions, I found myself working with another logic. Different from the idea of a grade, a prescription of the system: we entered the context of learning (Luckesi, 2014). How to evaluate without the consent of the subject or separated from the learning proposals undertaken throughout the process of the Discipline? Perhaps we often forget to produce ways of evaluating that are consistent with the learning valued and promoted throughout the class.

Moment 3: Research Together

Once the discussion about the Discipline's Teaching Plan was over, I decided to talk with them about the research that will be consolidated.

> (...) **Me**: Another thing I wanted to tell you, as some of you already know, this discipline will be part of a research project.
> **Helena**: That's why, teacher, you are doing these different classes? Now, I get it!
> **Me**: Yes, and no. Actually, the proposal came about because of the research. I used to talk so much about teacher training and suddenly I realized that I wasn't changing anything in what I do myself. (...) Then I thought about it and saw that it would be necessary to do something different with you in order to be a good researcher. (...) So, in a way, that´s why I say no also. I thought that this attitude can make me better, a better teacher, who looks for proposals that better meet the relationship of what I expect you to be as a teacher. (...)
> **Philosopher**: Wow... What happens here will be written. People will know that we are bad at math?
> **Me**: Look Philosopher, I can't say that what we experience will not be seen, and it is part of the research, me analyzing. But, to be very honest (laughs), I think I am more afraid than you are. I will kind of show everybody what I do. You won't be identified, I will. (...) I am trying my best to put myself in check, too, I think I can be a better teacher too. This is a little bit scary. (...) If you don't want to participate I will understand.
> **Joy**: I don't care... (Laughter)... It will be good to know that you will suffer with us with mathematics. Just kidding, teacher... (Laughter). (Everyone agreed to participate in the research) (TP Meeting).

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When we talk about research, I notice a fear of exposure on the part of undergraduates. This fact reminds me of the little sincerity with the subjects of some research in the field of Education. I have been the research subject of others, and the view that we are being judged always prevails. However, I cannot tell my students that research does not present some form of value judgment. Besides lying, that would be to walk by an assumption of Science as a neutral production (Lacey, 2006), removed from the social, cultural, historical and political issues we find ourselves in. On the other hand, if a certain value judgment is put into action, what I can offer them is my participation as a subject that exposes itself in the research and that intends to create a contribution to a more inventive vision about mathematics.

Moment 4: The Production of Reports

To start the interventions, I told the group a little about my undergraduate stories, present in other studies. Then I suggested that we could do something similar:

> **Me**: So, people. One of the elements that I thought would be interesting for you and for the research is that we try to record some accounts. I did this a lot in my college, as you have seen, and it has helped me to think about the paths I am taking and maybe it will be interesting for you too. (...) So, I got little squared notebooks for us to register our things (TP of the Meeting).

The checkered notebook was chosen as a field of record to follow how students would deal with the checkered and millimeter space. Another reason refers to my childhood relationship with this material, which was widely used in math classes. As my age is not too distant from my students' ages, I imagined that the notebook could bring some memories regarding childhood to our reflection.

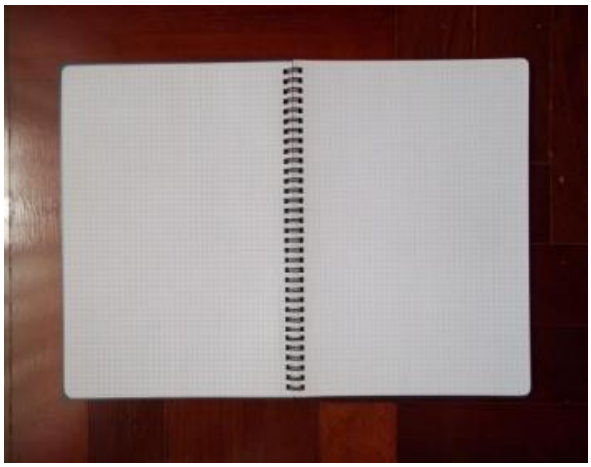

Figure 1 - Checkered notebook
Source: Own elaboration.

> (...) **Gabizinha Cinderela**: Oh, that's great, teacher! I always wanted a checkered notebook. (Laughter from the classroom)
> **Philosopher**: Oh, yeah! You've never had a notebook like that... I had several of those in the early years. I used to do multiplication tables in them.

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> **Gabizinha Cinderela**: They didn't have them at my school. This here (picks up the checkered notebook) is a private school thing. In public school, we don't have this.
> **Philosopher**: Dear, someone around here studied in private school. We are all from public school.
> (...) **Gabizinha Cinderela**: But it is cute. It is to draw, to enlarge, right? The symmetry stuff. (Showed how to do it)
> **Philosopher**: It's about multiplication tables. (He showed how to do it)
> (...) **Me**: Guys, the squared notebook is for us to do whatever we want. It depends on the objective the teacher had, how useful it was to meet that. (TP Meeting)

In view of what I observed in the classroom, I have been thinking a lot about the relationship between content-methodologies-pedagogical material. Especially in the training of Early Years teachers, we are used to associating certain materials with certain contents. Some time ago, I myself presented a workshop called *How to use Golden Material*[6], showing the ways to teach the Decimal Numbering System. I don't deny the applicability of this material for this connotation, but, also, I don't deny its potentiality to discuss issues of area and perimeter[7].

Many times we, teachers, forget that between the pedagogical materials and the content there is the intentionality of the act of planning. What can be seen in the discussion about the checkered notebook, in its attempt to define an object for this, or for that.

Moment 5: Love and Hate of Mathematics...

> (...) **Me**: Let's go. The first activity that we will do in the notebook, we will tell our story. Our history with mathematics. Our relationship with it.
> **Ana**: Are you sure about that, professor? There are so many stories to tell...
> **Me**: Yes, I am. I want to get to know you a little better. (...) Then you can write. (The undergraduate students write their stories)
> **Me**: We could each share our own story, right?
> **Angelina**: Oh, teacher! It's so private. (...)
> **Me**: I think we need to tell it, so that we can think a little bit about what we will do in the future with all this. (...) I tell my story at the end too.
> **Angelina**: It's easy for you. You are a math teacher.
> **Me**: (...) Whoever feels like it, can tell it okay? (All nod their heads). (Meeting TP)

We had some volunteers to tell their stories, some of which follow:

Part 1 - The Return in Time

Ana Cristina has read her story:

[6] The workshop was presented in 2016 by the Municipal Department of Education of Ourinhos for teachers of the Early Years of Elementary School. It is also worth mentioning that the Golden Material was developed by Maria Montessori, with the intention of working with arithmetic.

[7] In the workshop, I remember one of the teachers looked at me and said: 'this material is really cool to make little houses, can they? My answer was in the negative, pointing out that the material was good for something else.

DOI: 10.20396/zet.v29i00.8660868

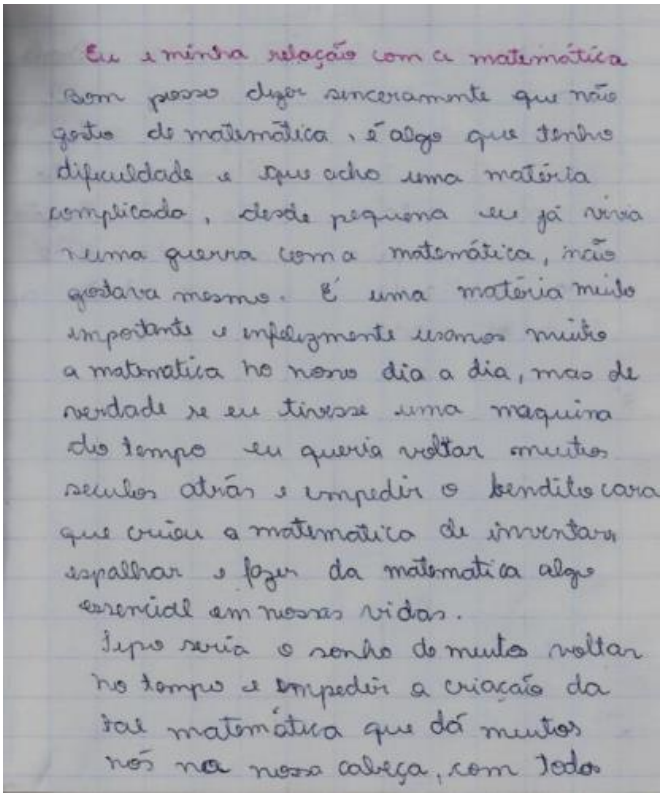

Eu e minha relação com a matemática
Bom posso dizer sinceramente que não
gosto de matemática, é algo que tenho
dificuldade e que acho uma matéria
complicada, desde pequena eu já vivia
numa guerra com a matemática, não
gostava mesmo. É uma matéria muito
importante e infelizmente usamos muito
a matemática no nosso dia a dia, mas de
verdade se eu tivesse uma maquina
do tempo eu queria voltar muitos
seculos atrás e impedir o bendito cara
que criou a matemática de inventar,
espalhar e fazer da matemática algo
essencial em nossas vidas.
Isso seria o sonho de muito voltar
no tempo e impedir a criação da
tal matemática que dá muitos
nós na nossa cabeça, com todo

Figure 2- Relationship with Mathematics - Ana Cristina
Source: Ana Cristina's notebook

Once the story was finished, the debate began:

> **Me**: Does anyone have anything to comment?
> **Philosopher**: What a dream... (Laughter). We could destroy that man. (Laughter)
> **Me**: Who is this man?
> **Philosopher**: I don't know... Pythagoras or the mask. One of these guys... One can be a reincarnation of the other. You (pointing at me) can be a reincarnation of one of these guys... (Laughter).
> **Ducarmo**: Afraid of you, philosopher.
> **Ana Cristina**: It's like this, professor, someone invented it. If someone invented it, they could have not invented it. They could have invented something else, I don't know. (...) Like an art that could solve the same things as mathematics, a matecarte (she says looking at the philosopher for approval).
> **Me**: What would matecarte be like?
> **Ana Cristina:** It could be something that involves drawing, painting, music... I don't know. Something that had life. That I could touch it, deal with it.
> **Me**: Why isn't math like that?
> **Ana Cristina**: Like, the guy did a formula for a triangle. That guy there, that you said (referring to Pythagoras) and nobody did anything else with it.
> **Me**: Why do you say that?
> **Ana Cristina:** Because that's how it is. (Moment of silence)
> **Noah**: At least that's what the people said. Back at school. (TP Meeting)

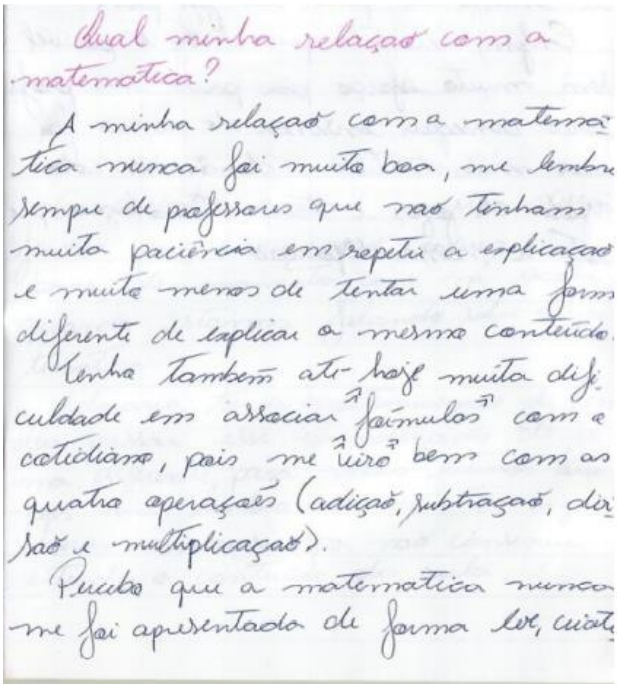
In some moments of the previous dialog, I wanted to present a perspective of mathematics as an elaboration of the trajectory of humanity, as a cultural construct.

DOI: 10.20396/zet.v29i00.8660868

However, I believe that the field of imagination, of inventing something that would solve problems without mathematics might be more interesting. Perhaps, the matecarte is a prototype of an attempt of a more humanized mathematics, of an ethno mathematics in action (D'Ambrósio, 2005).

Part 2 - I do well with the four operations

Another who was willing to read her writing was Brida:


Qual minha relaçaõ com a matemática?

A minha relaçaõ com a matemática nunca foi muito boa, me lembro sempre de professores que naõ tinham muita paciência em repetir a explicaçaõ e muito menos de tentar uma forma diferente de explicar o mesmo conteúdo.

Tenho também até hoje muita dificuldade em associar fórmulas com o cotidiano, pois me viro bem com as quatro operaçaõs (adiçaõ, subtraçaõ, divisaõ e multiplicaçaõ).

Penso que a matemática nunca me foi apresentada de forma lúdica,

Figure 3- Relationship with Mathematics - Brida
Source: Brida's notebook

As soon as she finished reading, Brida already speaks up:

> **Brida**: Is that right, professor?
> **Me**: I don't know; why wouldn't I be?
> **Brida**: I don't know... If I'm going to be a teacher, do I need to relate in a different way?
> **Me**: I don't know; would you?
> **Brida**: Oh, teacher! Answer. (Silent time)
> **Cecilia**: Can't you see that the teacher is trying to make us think? Look, teacher, I think it would be important for us to have a good relationship with mathematics, but I also think it's our job, I may not like it, but it has to be done well.
> **Me**: I have the following opinion, you know. If a teacher doesn't like math, it is very likely that his students will feel that and will not like it either.
> (...) **Cecilia**: It has to be like theater, teacher. A good teacher is a good actor too, he has to pretend that he likes it and that it's the best thing in the world. (TP Meeting)

We can see that the group is concerned about the quality of the teaching they will offer. This shows us the students' responsive attitude. On the other hand, there is some suffering on the part of the group with the mathematics that they believe they need to teach their future students. One way out the group finds is through theater. Like the mother who

DOI: 10.20396/zet.v29i00.8660868

hates vegetables and pretends to enjoy herself in front of her child in order to motivate him, the teacher of the early years would also do the same with mathematics.

Who knows, perhaps the way forward is to explain what mathematics is for, or to say that it is a valid historical construct in its own right.

> **Me**: Brida, tell me something, why do you say that formulas are not associated with reality?
> **Brida**: I don't know, professor. I have never used Basic. I don't even know where you use it. It is strange to learn something that you don't even know what it is for.
> **Me**: So, why do we learn it, classroom?
> **Philosopher**: We saw that it is because it is something produced in society and in culture[8], so that we learn how to be human, we need to learn all this.
> **Me**: And what do you think? (To philosopher)
> **Philosopher**: Hello?
> **Me**: What do you think of this idea?
> **Philosopher**: Hmm... I guess that's true. (...) I just want to know how we can learn new things that have been happening. We know that computers, internet, face.... have a lot of mathematics. But I don't know what[9]. (TP Meeting)

Figure 4 - Graphs - image sent by a philosopher to the researcher, via WhatsApp
Source: sent by philosopher.

The students see that there is mathematical knowledge that is happening in the world, but that is little discussed in the school field. This makes us think about the participation of these future mathematics educators in the choices of what to teach in Basic Education, as well as the propensity of the mathematics produced at school to intervene in issues experienced by their students.

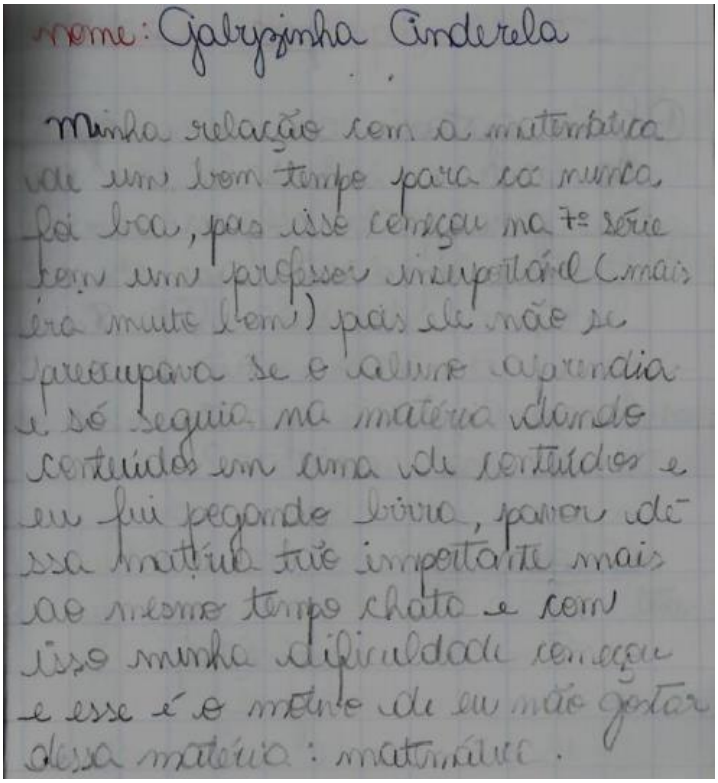
Part 3 - Good teacher, but he didn't teach...

Gaby Cinderella also wanted to share her story:

[8] Philosopher was trying to reference Critical-Historical Pedagogy. It is worth mentioning here that the transcriptions are from the students' speeches.

[9] Figure 4, about graph theory, was sent by Philosopher to me on 08/16, motivated by our discussion, with the following sentences: "it could be something like this in school, teacher".

DOI: 10.20396/zet.v29i00.8660868


nome: Gabyzinha Cinderela

Minha relação com a matemática
de um bom tempo para cá nunca
foi boa, pois isso começou na 7ª série
com um professor insuportável (mais
era muito bom) pois ele não se
preocupava se o aluno aprendia
ou só seguia na matéria dando
conteúdos em cima de conteúdos e
eu fui pegando birra, passei de
essa matéria ficou importante mais
ao mesmo tempo chato e com
isso minha dificuldade começou
e esse é o motivo de eu não gostar
dessa matéria: matemática.

Figure 5 - Relationship with Mathematics - Gaby Cinderella
Source: Gaby Cinderella's checkered notebook

After reading it, my first reaction was to ask:

> **Me**: How was he good, Gaby Cinderella, if he was unbearable? How could that be?
> **Gaby Cinderella**: He was a good teacher because he taught the whole subject. We always did the whole workbook. But, I didn't like him. He was unbearable, he didn't even want to know about us. (...)
> **Me**: Looking at how he was, what did you learn as a teacher?
> **Gaby Cinderella**: I didn't want to be like him, I wanted to be different. But I am afraid to do the same things. In the day-to-day life, we get lost, we forget to take care of our students.
> **Me**: So, I think it would be good for us to think about what a quality mathematics educator would be. (TP Meeting)

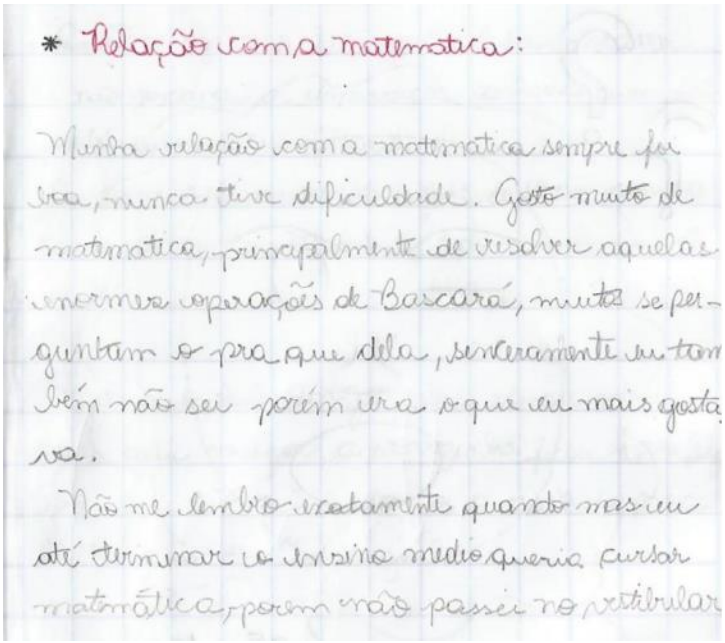
One of the elements present in Gaby's speech is the understanding of what a good mathematics teacher is. In this sense, the student associates a good teacher with one who knows the mathematical content, not necessarily with one who is concerned with other areas of her teaching.

I see this as one of the aspects that was in force in the previous format of the subject Content, Methodology and Teaching Practice of Mathematics. The focus was on the mathematical content before any discussion, which led many undergraduates to leave the course with the understanding that they were flawed and incapable, a debate also held in the first chapter.

Part 4 - I like it, but it doesn't make sense

DOI: 10.20396/zet.v29i00.8660868

Ana also decided to read her story:


* Relação com a matemática:

Minha relação com a matemática sempre foi boa, nunca tive dificuldade. Gosto muito de matemática, principalmente de resolver aquelas enormes operações de Bascará, muitas se perguntam o pra que dela, sinceramente eu também não sei porém era o que eu mais gostava.

Não me lembro exatamente quando mas eu até terminar o ensino medio queria cursar matemática, porem não passei no vestibular

Figure 6 - Relationship with Mathematics - Ana
Source: Ana's notebook

Me: That's nice, I think you're the only one who wrote that likes math.
Anne: I really do.
Me: What do you like best about math?
Ana: I've always liked calculus really. In school, I liked to think while I did math business.
Me: What do you mean, thinking?
Ana: I thought about life. It was just like memorizing what to do. Then I would do the exercises that the teacher would give me. Then he would go and give me ten exercises to do in a class.... I would think about things and do them... It was de-stressing. (...)
Me: But thinking about math?
Ana: Oh, teacher! You don't need much, you just take it and do it... Just like that. (TP Meeting)

Part 5 - Trying, memorizing, and wanting to learn

Three students decided to present their writing together. The first was Cecilia:

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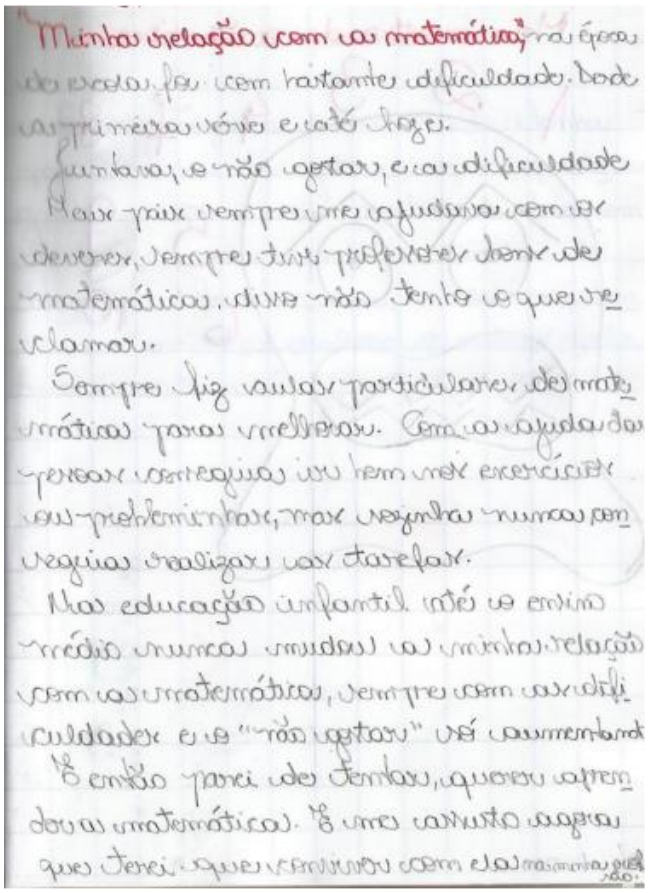

Figure 7 - Relationship with Mathematics - Cecília
Source: Cecilia's notebook

(...) **Me**: Really, Cecilia? (referring to the passage I stopped trying). You gave up math?
Cecilia: Oh, Professor. There's not much to say. I chose pedagogy because I thought I didn't have math. It's embarrassing to say, but it is... It makes me afraid... I accepted that it wasn't my thing.
Me: Shall we try one more time? Who knows, maybe a maticarte? (Laughter)
Cecilia: Oh, pro... I really can't... I'll try. I promise. I've even looked for a private tutor.
Me: No need, Cecilia. Let's wait and talk. Is that okay? We'll work it out... everything will work out.
Cecilia: Pro, I am from the Human Sciences. I really identify with those "memes" like Helping People from Humanities to make beads[10], do you know, teacher?
Me: No, no.

[10] Facebook humor page.

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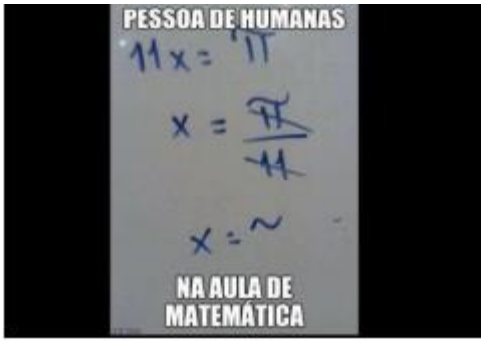

Figure 8 - Image sent by Cecília

Source: WhatsApp conversation

Cecilia: They joke and accept themselves without knowing mathematics. They make fun of math.
Bianca: Pro, can I read an excerpt of mine?
Me: Read it, Bianca.

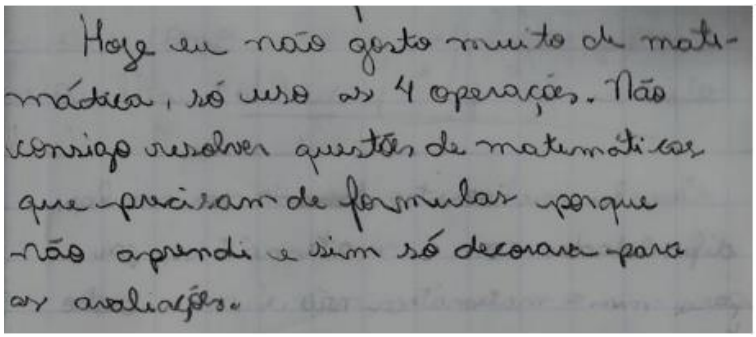
Hoje eu não gosto muito de matemática, só uso as 4 operações. Não consigo resolver questões de matemáticas que precisam de formulas porque não aprendi e sim só decorava para as avaliações.

Figure 9 - Excerpt - Relationship with Mathematics - Bianca
Source: Bianca's notebook

Me: Why this passage?
Bianca: In order to say that you, Cecília: "crazy friend, just decorate". (Laughs)... you don't suffer. Like, a math teacher started teaching, you learn what he likes, he does everything in class that way. I had a teacher who had a book that he used to pass out the exercises, I saw which book it was and got one just like it. He only gave the exercises to review the book for the exam. It was like, he would ask someone good at math to do them and I would memorize them. (...) Too bad I told you about this, teacher...(Laughter)... I only told you this because I know that you will have several papers. (...)
Joy: I want to read mine now, too.
Me: Read it, Joy. You're the ones in charge here anyway (Laughter)
Joy: I wrote it like this:

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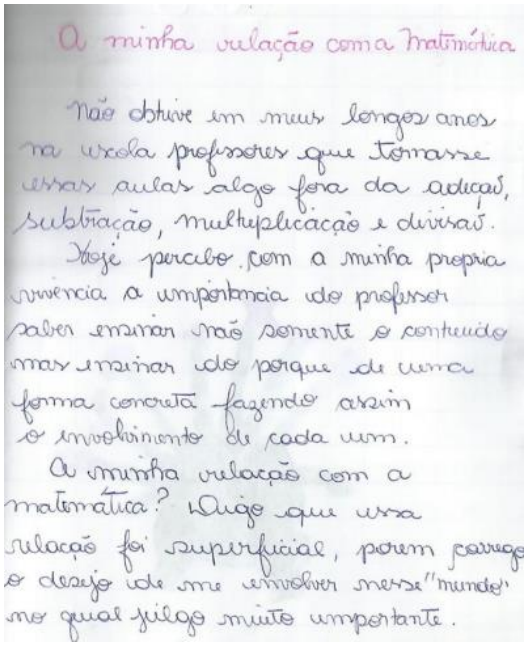
A minha relação com a matemática

Não obtive em meus longos anos na escola professores que tornasse essas aulas algo fora da adição, subtração, multiplicação e divisão.

Hoje percebo com a minha propria vivencia a importancia do professor saber ensinar não somente o conteudo mas ensinar do porque de uma forma concreta fazendo assim o envolvimento de cada um.

A minha relação com a matemática? Hoje que essa relação foi superficial, porem carrego o desejo de me envolver nesse "mundo" no qual julgo muito importante.

Figure 10 - Relationship with Mathematics - Joy
Source: Joy's notebook

Me: Great!

Joy: I want to learn... I want to enter this world; I think I'd be happier.

Me: Happier?

Joy: Happier, that's because we feel left out. I wish I could understand the numbers in the newspapers, in the magazines.... You read and don't understand things. Then you get fooled. We are left out.

Me: You know... There are times when I see this being outside and think that there are so many people outside that you can't tell who is inside and who is outside... (Laughter in the room) (TP Meeting)

Each of the undergraduates dealt with the denial of belonging to mathematics in a different way. Cecilia feels a mixture of defeat and relies on humor to overcome this disbelief in her abilities. Bianca has found survival tactics, which I wouldn't call dumbing down, since she is fully fit into the educational system. Joy still insists on learning, she has this desire, even with all the discouragements.

However, there are so many people on the outside that, for a moment, it seemed to me that being outside was the norm and being inside something unusual. Looking back at this moment, I see that I gave in to the separatist and segregating discourse toward mathematics. A logic that prizes geniuses, considering them standardized and few. Subjects who are on the inside, while there is no harm in the rest of humanity being on the outside. After all, mathematics is for the few.

Part 6 - The sixth story... Mine

(...) **Ducarmo**: Teacher, what about your story? Room in chorus: Yesssss.... (Laughter)

Bianca: You have to tell it...

DOI: 10.20396/zet.v29i00.8660868

> **Gaby Cinderella**: Like, we exposed ourselves and you will be unharmed... no-no-no. You can tell.
> **Me**: I will tell (My laugh): Once upon a time there was a boy in the countryside of Paraná, who was born in a rural area. That boy was me (Laughter mine). In first and second grade, I was in a multigrade classroom. One that has several grades in the same classroom and only one teacher for each class. (...) In the first grade, I had a very bad teacher, Dona Célia (fictitious name for writing). She was very angry. I don't forget that on carnival day she gave us a Carmem Miranda to paint, which, at the time, was for me a woman with a bunch of fruit on her head. I painted the whole woman green. I thought it was beautiful (laughs from the room). It was the first drawing I had ever painted in my life. (My laughter, in a justified tone). She sat next to me to do the alphabet reading. I was very bad. She started shouting that I was very bad. I didn't know what to do. So, I opened my beautiful drawing of Carmem Miranda and showed it to her. She looked at me, said with all her words: What a horrible thing, you... (I omitted the word). She crumpled it up and threw it away.
> **Bianca**: Pro, didn't your mother do anything?
> **Me**: We were at a different time and my parents have always been like... Teacher is always right. (...) But let's continue... I suffered a lot with that. I was already a silly child, more so than I am today (my own laughter). Then, I finished the year and did not learn to read and write. I didn't want to go to school anymore. Then, on the first day of second grade, I didn't want to go, but my mother made me go. I remember that Dona Célia no longer worked there. The city hall changed her school because of problems with some parents. Then a teacher came, Professor Alessandro. Professor Alessandro was different. He complimented my new tennis shoes and I remember I smiled. It was a love relationship at that moment. (Laughter). But I couldn't read and write and I wanted him to like me, so I decided to be the best math student he had. It was to read problems that I learned to read. Mathematics in a way saved me.
> **Ducarmo**: Oh, teacher! How beautiful! Actually, the one who saved you was Professor Alessandro. That's beautiful!
> **Cecilia**: Did you ever meet him after that? After he was an adult?
> **Me**: Yes, I did! I have a very grateful relationship with him. But I'll tell you the funniest thing I found out... Professor Alessandro doesn't like mathematics. In fact, he told me he hates it (Laughter from the room).
> **Cecilia**: Yeah, pro! He did his part. That's nice. (TP Meeting)

At this moment, narrating myself brought back beautiful memories. I believe that the undergraduates and I had an impression of how important a teacher is in the formation of a child. But, I am still left wondering, who saves a life: mathematical knowledge, or teacher?

Final Thoughts and Updates: Sample Space - Mathematics Education + Us = New Space

Besides the discussions in class, the undergraduates had the opportunity to read after the meeting two texts about the field of Mathematics Education[11], which I considered relevant to the debate that was being put into action until that moment. In view of this, we

[11] (1) D'AMBRÓSIO, Ubiratan et al. Society, culture, mathematics and their teaching. Education and Research, São Paulo, v. 31, n. 1, p. 99-120, 2005; (2) FIORENTINI, Dario. Some ways of seeing and conceiving the teaching of mathematics in Brazil p. 1-38. Zetetiké, v. 3, n. 1, 1995.

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made our Sample Space[12] in the classroom, collectively on the blackboard. This sought to present the space that we want to constitute from the encounter between the experiences that we live in our lives, the school that we know, the school that we want, and our goals for life and training.

Here's how it came out:

Figure 11 - Sample space
Source: collective elaboration

The first conclusion we evidenced inferred that the act of reviving memories, life stories, and relationships/understandings about mathematical thinking enhanced the readings of the articles. *The readings seemed to speak to me (Philosopher). We can't be afraid to look at our past pains; we need to value our life as a learning experience (Luíza).* The second consideration that we believe pertinent to this moment was the creation of our Mathematics Education, one that would match the mathematics educator of the Early Elementary School.

In this sense, some fields within our Sample Space emerged and made themselves significant in the debate:

- The fear of what mathematics might be in their teaching lives

Two options were taken into consideration as ways of life toward mathematics and teaching:

- *Following the oppressor-oppressed logic* (Freire, 1987), in which we would blame ourselves for a possible inability to enter the garden of the mathematician (Lins, 2004), believing that this space is for the few. Such an approach would imply the reproduction in

[12] We defined sample space, consciously, as the organization of everything we discussed in a meeting with the academic readings we did about them. The texts were sent by e-mail at the end of the meeting.

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teaching of the excluding practices and discourses experienced by the group in Basic Education;

- *Even with fear, we should walk towards the subversion of the excluding discourse*, based on the vision of mathematics for the few. This would be our attitude of Teaching Insubordination (D'Ambrósio; LOPES, 2015), built by the responsive sense with the students we will have, *fostered by our will to do differently* (Angelina).

We decided that the second option is necessary if we wish to change education and transform the school into a better space. At this point, we raised the importance of our *network of friends to support us in this journey* (Cecilia). No one can, or needs, to make this change alone. *We have each other* (Angelina).

- The Mathematics we will work with

We have chosen to go to Matecarte. Ana was surprised that her prototype of Matecarte as she had imagined it already exists, Ethno mathematics (D'Ambrósio, 2005). *Those things that you think about, but cannot elaborate, that someone goes there and does* (Ana). This ethno mathematics is *a cultural mathematics* (Helena), that is, "[...] a study of the cultural evolution of humanity in its broad sense, from the cultural dynamics that can be seen in mathematical manifestations" (D'Ambrósio, 2005, p. 102). *We believe that this can give life to our teaching* (Philosopher).

"Another interesting point of this Mathematics Education is the question of a mathematics for all, which allows thinking about the respect of other ways of thinking and which aims at peace." (Philosopher quoting D'Ambrósio, 2005). *But not a silly peace* (Pink Butterfly), *a peace that is not the same as crossing your arms, an attitude that implies action and raising the flags of human ethics* (Luiza).

- The quality of teaching

A quality education is one that allows life to happen in its fullness and that has learning as a synonym for this search. *Only a mathematics with life and for life is capable of giving meaning to what is learned, as well as the will to learn it* (philosopher). For this, this school needs a teacher who thinks about his or her students. *One is not a good teacher just because he knows the subject* (Norberto). We need to be a teacher who assumes "[...] attitudes of creative insubordination on behalf of those they educate and the knowledge they produce and promote" (D'Ambrosio & Lopes, 2015, p. 10), as a way to "support, encourage, and create opportunities for all children, youth, and adults to reach their human potential" (D'Ambrosio, 2015, p.02).

Other shortcuts we take to teaching can be painful and damaging to us (Pink Butterfly). Shortcuts such as *the theatricalization of liking mathematics* (Cecilia) and the content *for its own sake* (Gaby Cinderella), dissociated from *its production and the possibilities of interventions in everyday life, make a mathematics of bitterness that no one likes, but sees as necessary* (Me). Then there is no use in looking with an irritated look when our students *face mathematics with a sarcastic humor or by memorizing exercise*s (Pink

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Butterfly). These are attitudes of resistance to the exclusionary process expended by such shortcuts (Knijnik, 1996).

- The uses of pedagogical materials

It is not possible to think of a school without intentionality or, even, as the result of political, cultural, and social neutrality (Sacristan, 1999). Therefore, if we need to have this intentional action, it needs to match the mathematics we want, *this mathematics for life* (Luiza). *You can't forget everything that is lived outside of schoo*l (Cecilia). This intentionality translates itself from the contents we teach to the pedagogical materials we use.

If we are looking for a mathematics of action, we need to *let the pedagogical materials be explored and investigated* (Philosopher), used as a *way to relate to the world* (Angelina), to *get our hands on* (Ducarmo), and *not necessarily stuck to a mathematical concept* (Me). This needs teacher inventiveness and creativity (D'Ambrósio & Lopes, 2015).

And every time I feel helpless?

And every time I feel helpless with mathematics, I *will remember my childhood stories* (Cecilia), I will think about the school that lives in counterpoint with the school I desire, I will hope to realize a better life space (Freire, 1987).

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