



## Practice Readings: an Opening to the Form-Action of Teachers who Teach Mathematics

### Leituras de Práticas: uma Abertura à Forma-Ação de Professores que Ensinam Matemática

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#### Abstract

In this article we expose aspects of a larger research, advised in Teacher's Formation in Studies and Research Group (GEForProf). We investigated the practice readings of three teachers working in the Municipal Education System of Curitiba, guided by the question: "What is revealed about formation in the encounter between mathematics literacy teachers when they think about their practices?". We tried to highlight ways of being a teacher through math literacy actions reflected in the daily teaching, trying to accommodate what was educational, considering the teachers' practices encounter. For this purpose, we present a methodological path and interpretations-comprehensions conducted according to the phenomenological approach. We conclude that the practice readings have shown themselves as a formative possibility for teachers who teach mathematics in the early years, which has the potential to have repercussions on the teaching action's thinking, thus contributing to research and practices in the field of mathematical literacy.

**Keywords:** Form-action, Practice readings, Mathematical Literacy

#### Resumo

Neste artigo expomos aspectos de uma pesquisa maior, orientada no Grupo de Estudos e Pesquisa em Formação de Professores (GEForProf). Investigamos leituras de práticas de três professoras atuantes na Rede Municipal de

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Ensino de Curitiba, tendo como guia a interrogação: “O que se descortina sobre formação no encontro entre alfabetizadoras em matemática ao pensarem sobre suas práticas?”. Procuramos destacar modos de ser professor pelas ações alfabetizadoras refletidas no cotidiano docente, buscando acolher o que se mostrou formativo, tendo em vista o encontro com as práticas das professoras. Para isso, apresentamos um percurso metodológico e interpretações-compreensões conduzidas segundo a abordagem fenomenológica. Concluímos que as leituras de práticas se mostraram como uma possibilidade formativa aos professores que ensinam matemática nos anos iniciais, que tem potencial de repercutir no pensar a ação docente, contribuindo, assim, com pesquisas e práticas no campo da alfabetização matemática.

**Palavras-chave:** Forma-ação, Leitura de práticas, Alfabetização Matemática.

## Introduction

As teachers and researchers in the Mathematics Education field, in the Teacher's Formation in Studies and Research Group (GEForProf), we have been discussing the formation of the teacher who instructs mathematics. A lot of these undertaken studies, have what have been experienced with teachers of the early years as a common thread, considering that we intend to investigate formative movements in which literacy practices appear as a possibility for teachers to keep themselves in formation.

As indicated by Gatti, Barretto and André (2011) and André (2011), in mappings and meta-analysis of projects and programs' research that aim to train teachers, much progress has been made towards the teacher's centrality in the training process. However, as Nacarato (2016) cautions, the gap between what is pointed out by the researches and the perspective of elaboration and realization of public policies that ensure them remains latent.

We also understood that there is still an orientation to investigate the formative actions' models that, most of the time for us, have been sustained in the search for the teacher's understanding of the activities and methodologies with potential to be reproduced in the classroom.

This way of "shaping", in our understanding, preserves the logic of the exercise in a technical-instrumental rationality and has driven us to investigate the meaning of a continuing formation for teachers that goes beyond the information's exchange, often arising from the teaching content's selection. This requires a systematically investigative and intentional formative work, in which what is experienced in the teachers' daily life, that mobilizes to make it possible their formation.

In order to problematize these and other aspects of the teachers who instructs mathematics' continuing formation, we present in this text, aspects of a larger research, oriented in the GEForProf. We resume part of the data constituted in Mancini (2019), in which we investigated the practice readings of three literacy teachers working in the Municipal Education System of Curitiba, now guided by the question: "What is unveiled about formation in the meeting between mathematics literacy teachers when they thought about their practices?" and with it, we highlighted ways of being a teacher through literacy

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actions reflected in/of the daily teaching, seeking to welcome what proved to be educational, bearing in mind the meeting with the teachers' practices.

For this purpose, the article was structured into four sections. In the first, we present the methodological path undertaken in the seven-week meetings with the literacy teachers. The interpretations-comprehensions of what they expressed, conducted according to the phenomenological approach, are described in the second section. In the third section, we explain the interpretative movement undertaken, and, finally, we highlight how the practice proved to be a formative pedagogical approach that has the potential to resonate on the teaching action's thinking, thus contributing to research and practices in the field of mathematical literacy.

### **Meeting the teachers: methodological aspects of the study**

Seeking the knowledge of "What is revealed about formation in the meeting between mathematics literacy teachers when they think about their practices?", we rely on the effective collaboration of three teachers who worked in a municipal school in the southern region of Curitiba, who were invited and legally supported by the Ethics and Research Committee, through the Consubstantiated Report n. 2.867.991 and the authorization of the Department of Elementary Education of the Education Municipal Department of Curitiba.

The collaborators were contacted at the school where they worked, a moment aimed at clarifying aspects of the research, such as its relevance, objectives, organization of virtual meetings (from October to November 2018), the researcher's responsibility with the information confidentiality, the risks and benefits of participation, the criteria for inclusion and exclusion of participants, as well as the rights of permanence or dismissal from the research. After that moment, and with the acceptance of the teachers, signatures were collected in the documents "Invitation to participate in the research" and "Terms of Free and Informed Consent and Term of Consent for use of image and voice".

The data constitution's collaborative process took place over a period of seven weeks, on the *Moodle* platform, using two rooms for virtual meetings. The room 1, named "Mathematical Literacy in Practice", was directed to the insertion of weekly reports on the question "How was the planned and experienced meeting?". The room 2, named "Mathematical Literacy in Practice", hold fortnightly collaborations between the participants.

The effective collaboration of these three teachers, from the beginning to the end of the data constitution, favored the analysis, in the light of the guiding question, of the practice readings as a formative possibility, highlighting the experiences in the school's daily life.

We careful read the participant's posts, guided by the questioning, to highlight the passages that seemed more significant, given the questioning.

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We embarked in the communication interpretive-reflexive discussion, as guided by Bicudo (2010, 2011a). This means that we did not analyze the posts of the collaborating teachers based on their expressions, but we reflected on the educational possibilities in the meeting between mathematics literacy teachers as they think about their practices.

We describe, in the aftermath, the teachers' reports and the discussions held in Room 2, which were all in written text form; for the purposes of description and interpretation, we named the teachers participating in the study as P1, P2, and P3.

### **Concern about mathematical literacy and the care with the student: teacher's way to be in the form-action**

In the light of the question "How was the planned and the experienced meeting?", three literacy teachers discussed mathematical literacy practices every two weeks. In the dialogues that took place, educational actions are unveiled when teachers allow themselves to think about their practices.

P1: [...] by reporting, record about the experience's planning, it's possible to replan, bringing a new meaning to practice. [...] And it is in this reflection action about the practice that we learned more, advancing in the student's learning. (Excerpt from the teacher 1 report, 2019).

P2: When I reported the difficulties and successes of the proposals, I realized what I should change or add. The simple fact of reviewing my own report from one week to the next, new ideas and possibilities emerged. [...] I evaluate my practice during the reflections, rethinking and taking back what didn't work out in the classroom, as well as what can be improved. This makes me look for new strategies and studies about the contents. (Excerpt from the teacher 2 report, 2019).

P3: [...] when I give a new meaning to the planning from the colleagues' observations or through a personal look to the students' difficulties during a proposed game, I realize new possibilities emerging from learning. (Excerpt from the teacher 3 report, 2019).

The comprehensive-interpretative reading of what the teachers said, in the guiding question's light, it first reveals a different look to what is produced with the students and mathematical literacy, when this is stated and revisited. More than the perception of what was done, there is an openness to what can be done, given the mathematical literacy's intentionality and their students.

The formation action stands out when the cooperating teacher reinforces the becoming<sup>5</sup> in her projection of what could become: "The simple fact of reviewing my own report from one week to the next, new ideas and possibilities emerge". We understand that a

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<sup>5</sup> The becoming understood in the philosophical perspective of "change or flow of things" (Abbagnano, 2007, p. 268). It relates to the devolve into, and we approach it when we form ourselves in the measure that we understand it as the possibility of being, and thus in a eternal changing movement, from come to be.

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different guidance of what is understood by formation is showing itself and we interpret it based on Gadamer (1997).

This author starts from a hermeneutic analysis, exposing an understanding of formation as a "genuinely historical" concept. He points out to the fact that the word form is increasingly appearing apart from its meaning and, thus, being interpreted in a purely dynamic and natural way. This author explains that this is not random, since the word formation (*Bildung*) is found in the word *Bild* (image), which encompasses "copy" (*Nachbild*) and "model" (*vorbild*); corresponding to "a frequent transfer from becoming to being"; in other words, the meanings attributed to the term in question currently end up emphasizing the result of the process of becoming rather than the process itself, as mentioned in Mocrosky, Orlovski and Lídio (2019, p. 225).

Gadamer (1997) explains that this transfer is understandable, "[...] because the formation's outcome is not produced in the form of a technical finality, but it is born out of the internal process of constitution and formation and therefore remains in constant evolution and improvement" (Gadamer, 1997, p. 50).

Therefore, the formation, in the context of the study, is not a result to be achieved, but something desired that moves as the teacher begins to show himself. This is where this concept surpasses the cultivation of an aptitude, because when it's supposed that something will be cultivated, then it is assumed that it already exists and, in this way, the formation would be understood as a means to an end, a product and not a production.

Formation has been understood by us as a continuous process of becoming, as an uninterrupted movement in which action and form are mutually given. With Bicudo (2003), we assume the "form-action" of teachers as a launching himself in the path to be a teacher, whose professional shape arises through the invested action, considering

[...] that this form provokes new actions, and these actions bypass new forms, that provoke new actions and new forms..., in a movement coordinated by the 'from come to be', which is always implicit in the form, and that calls an action for its completeness. However, this completeness is always expected, what shows a formation as a continuous search movement (Mocrosky, 2010, p. 105).

This search will show itself amid the daily teaching:

P 1: During the game, I would ask the students some questions, for example: "the number 11 is bigger or smaller than 25?"; or I would question in the images: "which of the cards have the most objects?". One situation arose when at the end of one class, one group of students were organizing the cards that hold numbers and putting them in order from 1 to 30. However, I noticed that they were swapping some number's order, for example, the number 13 with the 23, 15 with the 25. (Excerpt from the teacher 1 report, 2019).

P 3: I asked the students to divide themselves in groups of 4, they started to choose some classmates and exclude others, I gave them some time, but they couldn't organize themselves. So, I organized the groups. Each one received 4 playing card ranging from 1 to 9. Next, I explained the rules of the game: the cards were from the

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group, that should organize it during the game in a way that they were closest to the target number that I would write on the board. I had to remind them several times the arrangements, they shouted the number, got up to show me, didn't work as a group when choosing... After playing a few times, they were more focused. I worked out how much was left or missing for the target number, place value (tens and hundred) demonstrating on the Place Value Chart <sup>6</sup>, instigating them to raise their hypotheses [...] (Excerpt from the teacher 3 report, 2019).

As the collaborating teachers think how they work, they realize what they perceive on a daily basis in the education action, showing how they become teachers in their relationship with the student, which changes their pedagogical practice. Whereas they keep their attention on teaching, contents and procedures, they worry about how mathematical literacy unfolds itself.

Danyluk (1998) proposes to think the mathematical literacy, explaining it as the result of an action originally located in the way of be from the human being. He explains that this human being has the possibility to develop a way and assume the "languages system representation", in which language is understood as the perceived meaning expression, and the "being", based on the Heideggerian conception, as a constant questioning related to the knowledge production.

Consequently, the literacy act is about understanding and interpreting the signals, with meanings, printed in a text, as well as the written expression of those meanings. To be literate, then, is to understand what you read, and write what you understand about the science's first notions (Danyluk, 1998, p. 29).

This author refers to literacy as the action of deciphering a given code by interpreting it (reading), and expressing the understanding of what was perceived through the signs (characters) of a given writing system. Thus, language is located in the human being's way and how he reveals his understanding of himself and the world. In this regard, the term "alphabet" encompasses other symbols and not only those that constitute the mother language's linguistic system.

Alphabet: means an arrangement within a certain conventional order of a language's order. They are also the first notion of any science or, even, any conventional series. It can be said that there are different alphabets, which can be represented by graphical element and displayed by the peculiar language to each science (Danyluk, 1998, p. 29).

Therefore, mathematical literacy would not only deal with the mathematics' alphabet code. As a "linguistic system", no symbol, sign, or character can be understood separately, or without relations to others, and its understanding enables the "other systems understanding". In other words, mathematics uses symbols to communicate meanings, but it is not only this, formal language, although it cannot "do without one" (Danyluk, 1998, p. 30).

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<sup>6</sup> The Place Value Chart (PVC) is a teaching tool used to visualize the place value of a digit in a number using numerical orders and classes.



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The action of literate children goes necessarily through the understanding of the formal mathematical language, but that while being with it, the teachers will mobilize ways for the student to overcome the deciphering, the decoding, reaching the dimension of communicating meanings also in this human way of knowledge, mathematics. In this way, it is possible for the comprehension to take place in the sense of a totalizing action and that, through it, it is possible for children to express understandings of themselves and of the world.

Similarly, Danyluk (1998) explains the complexity of working with mathematical literacy. Because this educational activity requires the teacher not only to work with the construction of technical-scientific mathematical knowledge, but also to build, with the student, possible means for him to organize his ideas, considering the knowledge brought by the student from his experiences, and express what he is understanding by communicating intelligibly, requiring the teacher to be with the student. The following excerpt targets the teacher's thinking directed toward this horizon, that of mathematical literacy as a formative component:

P2: During the proposition, the students showed interest and willingness to participate. However, they presented difficult in solving operations, requiring constant support. Although we had collectively built the multiplication tables and they had previously solved operations and problem-situations, the students did not understand what multiplication is. Therefore, I had to review the planning and choose new activities for the students to understand the multiplication concept. One of the possibilities will be to work with double and triple situations (Excerpt from the teacher 2 report, 2018).

The teacher's action in making the school contents work on the classroom make sense to the students, considering his experiences and the search for ways to understand what is being proposed, it also moves the way as the teacher understands himself and how he understands the student.

This pedagogical action, which connects the mathematical content and the concern with the student's understanding, is not only based on one way to handle this content as an object, from the construction of an associations' network. More than this, the teachers say that the meanings of what is studied in the classroom are built in everyday school life, taking different forms in the student-teacher encounter.

Thus, it is in the be with the student that the teachers are shown the possibility of becoming teachers and changing their actions, by placing themselves in a state of listening, opening their way of understanding, keeping themselves in form-action. But what mobilizes this dynamic of form-action?

At the same time, the participants express how they are becoming teachers with their students as they are teaching mathematical literacy, showing care for the student and for what they are doing. The care for how they are choosing to teach, how they work, and with whom they are, as reported:

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P2: I showed the students a bundle of candies. Then estimates were made by the students as to how many candies they thought the bundle contained. The counting of candies was made collectively. It was 100 candies. The number was represented on the board emphasizing the hundred, the ten, and the unit. Then I explained to the students that I had brought the candies to the class, and how I could make sure that everyone could receive the same number of candies. The suggestion was to divide the bundle among the class. After that, the students were asked to write in their notebooks how the teacher could divide the candy among the 30 classmates, remembering that each one should receive exactly the same number of candies. In general, most of the students answered that the teacher should hand them out one by one until the bundle was finished. However, some students pointed out that since there are 30 classmates, the teacher could give three candies to each student, which would result in a total of 90 candies. Although, there would be 10 that could not be handed. Each student tasted the three candies and drew them in the notebook, emphasizing the ones that were left. The referral continues next week. (Excerpt from the teacher 2 report, 2019).

We understand that the collaborating teachers tell us the ways in which they occupy themselves and worry about the pedagogical action with their students, how they are busy planning, in how the planned will direct the next actions and in how their developments will open formative possibilities to students, situated in the experience lived with them, bearing in mind the teaching. According to Bicudo (2011b), we occupy ourselves, because as presence<sup>7</sup>, we are and we worry, because we always foresee the possibilities of what we might be. As teachers, it is possible for us to occupy and worry about the educational action and the student in different ways.

Each of these ways to worry about the student refers to what Bicudo (2011b) calls "deficit mode", when worrying anticipates the "lack". That is, when what is emphasized by the teacher is based on what he believes the student lacks. In doing so, the teacher ends up worrying about the other seeing him as an "object":

Heidegger (1988, p. 173) says that it [worrying], so to speak, takes away the other's care, becoming and overtaking the duties, replacing it. This way of proceeding steals the other's worries, and with this, his possibilities to be. Seeing himself blocked in what he should do, he withdraws, letting those who care for him to do what he should be doing, dismissing himself of his duties or, later on, he didn't care to use it. He doesn't get involved. He doesn't take responsibilities. He can become reliant from others and be subdued, even in a silent subduing, not immediately perceptible. The other is taken, by those who exercise this duty model, as something to be occupied (Bicudo, 2011b, p. 90).

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<sup>7</sup> The author uses the term based on Heidegger (2012), *Dasein* – translated as pre-sence. This is one way to understand the human being as the being that stretches into the world as a totality (space, time, historicity in general). Where the stretching is understood by the ability to question the world and the worldly relations in order go to a horizon opened to comprehensions. The possibilities that present each one a life is on the horizon, and that reflects the world construction and, thereby, the pedagogical action.



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Somehow, the concern can be manifested by the understanding of the other as a presence. The concern as an anticipation of the other taking care so his possibilities are realized, it will manifest itself in two different ways, as we occupy ourselves and as we simultaneously concern ourselves. The occupation involves how to take care of teaching and how to teach (Bicudo, 2011b).

Although the attention of the interviewees is on what to do it, or how to do it, their intentionality is directed to the student. There is a manifestation that the teachers keep themselves busy teaching, with the way as they are going to carry out their pedagogical action. However, it is also evident that their speeches repeatedly focus on foreseeing what this pedagogical action will mean for the student in the future, showing their concern, as illustrated in the following speech:

P 1: In the third-grade classes, the students are at very different levels regarding the mental calculation. That's why I don't end [the game] at the first Stop. I wait for most of the class to say "stop". Gradually we are reducing the time. I like to invite them to the blackboard to record and check the result. There have been several discussions about calculation's errors and strategies to be leaner. (Excerpt from teacher 1 report, 2019).

Facing the teachers' expressions and the understandings that are being made, we understood that their concern is aimed to the student's becoming. They are concerned with foreseeing how the action taken in the present may open different actions possibilities to the students in the future.

P 3: My goal is that they create strategies that allows them to attribute meaning and significance to mathematical ideas, in order to become capable to establish relationships, justify, analyze, discuss and create. Before this exchange, we talked about how the mistakes in the game should be reviewed in a natural way, without frustrations, stimulating new attempts, planning better moves and using the acquired knowledge. Overall, I felt that I provided a "mathematized" environment with discussions, games, interaction and challenges capable of encouraging students to propose solutions, explore possibilities, raise hypotheses, develop mathematical notions and reasoning (Excerpt from the teacher 3 report, 2019).

We understand that the teachers reveal their way of being in their relationship with the student, a careful form that manifests itself through occupation and concern with the pedagogical action, foreseeing what it will mean, as a possibility of the formation's horizon of himself and the other one. The care expressed by the teachers is not only understood as an attentive way of being with students, but it also reveals itself in an ontological dimension.

Care as healing (*sorge*) is indicated as the process in which the being, that wonders about the meaning of being, articulates an understanding of caring for itself, that manifests in caring temporally and spatially for others, since we are "being-with<sup>8</sup>". In other words, by

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<sup>8</sup> Segundo Bicudo (2014) o ser-com na obra heideggeriana "diz de um modo de ser ontológico do ser do ser humano, denominado por ele de Dasein. Para a autora, com base em Heidegger, tal modo de ser do ser humano expressa que ontologicamente não há ser humano sem mundo e sem os outros. Não há possibilidade do ser

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caring for the other, we also care for ourselves, constituting ourselves. This is an ontological dimension of the person, the care for others and for things that guides the way we constitute ourselves as humans, that is, it moves the meanings we attribute through language (Heidegger, 2012). Thus, we understand with Bicudo (2011b) that the

Education, so, is assumed as caring, as helping, being together with the other in solicitude, so that the pre-sense is freed in the direction to become its cure, that is, also to be in the ontological aspect. It is a being-with in an attentive way, not allowing ourselves to be trivialized by daily life in its sameness and the daily public demands. To be with the student means to see him, to feel him, to think and live with him where you are with the another. It is to live in the opening possibilities of being-the-in-the-world-with, in a worried and busy way. But without just by the uniformity and mediocrity of what is like everyone else (Bicudo, 2011b, p. 91).

The teacher's occupation and concern with Mathematics Education was expressed as care in the speeches. This concern is based on the ontological constitution of pre-sense as being-with and can be presented in a deficient as well as in a positive way. Presenting itself in a deficient way, the teacher's worried pre-sense can be occupied by another, against another, without others, and not being touched by another. The positive forms of the preoccupied pre-sense, on the other hand, can occur in a substitutive way and as a liberating anticipation.

As a dominating substitution, the preoccupied pre-sense takes the place of the other in occupations by limiting the possibilities of being in his occupation. In liberating repositioning, the concerned pre-sense does not withdraw the care, but returns it as it makes room for the being, be, helping the other "[...] to become, in its healing, transparent to itself and free for it" (Heidegger, 2012, p. 537). In the reports and discussions, it was the positive form of concern that revealed itself, denoting the teachers' care for the mathematical literacy of the students, as well as, in caring for the other, the teachers' care also revealed itself in form-action.

## Final considerations

Going back to our guiding question, "What is revealed about formation in the encounter between mathematical literacy teachers when they think about their practices?" we understood that the care with the students, with mathematical literacy it was revealed in the teachers' attentive way of being, what was shown in the encounter between planned and experienced, as well as the establishing of intentional actions to (re)mean their practices. Collaboratively, and focusing on the reflection about the encounter of the planned and the experienced, the teachers evidenced that the individual and collective practice readings put them in action-formation.

A form-action guided to mathematical literacy, addressed to students in the early years, revealed itself in the care for the other, once it guided the pedagogical actions,

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humano ser sem ser no mundo, revelando que o modo de ser-com se refere também aos modos como compartilha estando no mundo com os outros e um dos modos de ser-com é o cuidado.

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indicated postures, attitudes and procedures to be taken/assumed by teachers to conduct the teaching and learning processes. The approach, attitudes, and procedures to be assumed were featured in the speeches of the cooperating teachers in their meetings between the planned and the experienced.

We seek to highlight the form-action as setting ways to be a teacher, whose professional form is taken by the invested action, in which it constitutes oneself as a teacher, on a daily basis, thinking about the practice (a movement that leads him to research, to study the teaching content and the methodologies to better develop it, to look for peers in the school phenomenal field to help him unveil the phenomenon that is shown among other actions) producing his pedagogical action.

Hereof, we point out, that the form-action's understanding as a process, a continuous movement, reflects in the understanding that the form-action of the mathematically literate teacher involves a way to be occupied and concerned with the teaching and learning of mathematics, caring for the possibilities of being and be of another in the process of mathematical literacy.

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