

Biogram in educational research: meanings constructed about learning rights in teaching mathematics*

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Abstract

Narrative research has been used by several researchers in the fields of education and mathematics education, using different devices to produce data. One of them, which is still not very well known in the field in our country, is the biogram: a map of the participant's professional career that makes it possible to highlight events that occurred through their chronology and the value given by the participant himself, in dialog with the researcher. The aim of this article is to discuss the possibilities and limits of using the biogram in educational research, based on its use in studies about the training experience in the National Pact for Literacy at the Right Age (PNAIC), in relation to learning to teach mathematics in the early years of elementary school. To this end, the use of the biogram in the research process is presented and discussed. As with any device aimed at producing data, the use of the biogram has some limits, such as the difficulty of synthesizing information from an interview and the need to make interpretations according to what was explained by the participant. On the other hand, it offers the possibility of reflecting on professional development trajectories and training programs that constitute milestones (critical incidents) for the construction of new beliefs, classroom practices, and teaching knowledge, among others. In addition, it can promote self-education for both the researcher and the participant, by allowing the process of valuing conversations in a time and space, triggered by the present lived and narrated.

Keywords

Biogram - Narrative research - Public policies - Mathematics.

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Introduction

Narrative research has gained prominence in the fields of education and mathematics education. Many researchers have developed investigations based on theoretical and methodological references from this perspective, as well as using various devices to produce data, such as written and oral narratives, life stories, autobiographical narratives, narrative interviews, memorials, and biograms, among others.

We will look in more detail at some meanings constructed about the biogram³, exploring an example and its potential for data production and analysis. The aim of this article is to discuss the possibilities and limits of using the biogram in educational research, based on its use in studies about the training experience in the National Pact for Literacy at the Right Age (PNAIC)⁴ in relation to learning to teach mathematics in the early years of elementary school.

The biogram is conceived as a map of a person's life trajectory. We found references to its use and importance in the social, human, and behavioral sciences (Agra; Matos, 1997; Azevedo, 2013; Grilo; Paula, 2020; Oliveira, 2020). In our research, we used a processing and retrospective approach to understand the life trajectory of teachers and pedagogical coordinators.

Therefore, this resource constituted a map of the professional trajectory of the participants who narrated events that took place, which allowed us to organize them based on a chronology and the participant's own valuation in dialogue with the researcher. According to Bolívar, Domingo and Fernández (2001), drawing up a biogram allows the researcher to grasp various aspects that have occurred throughout life, personal or social aspects that interfere with a teaching career.

We present and discuss the use of the biogram in the research process, given our experience of its use in the first author's doctoral thesis, together with interviews and document analysis in a narrative approach.

It proved to be a powerful resource for producing and analyzing data, as it favors feedback, continuity of interviews, and revaluation of processes or events with the participants to understand the professional development of teachers in relation to mathematics education.

Our first contact with this research device was in 2019, after studying the narrative approach and reading the book *La investigación biográfico-narrativa em educación: enfoque e metodología*, by Bolívar, Domingo and Fernández (2001). The book was the subject of a study by the Mathematics Education Studies and Research Group (GREPEM) at the Federal University of Juiz de Fora, which includes teachers and researchers from the university and basic education. That year, the group members used the biogram concurrently with the narrative interview, in an investigation that was published by Silva,

3- We use the expression data production because we understand that the data is not ready in the field, but the researcher produces it for his research.

4- PNAIC was a literacy policy of the Ministry of Education (MEC) between 2012 and 2017. It involved a partnership between the federal government, states and municipalities, and its actions included continuing teacher training.

Rezende and Carneiro (2020) and which enabled us to extend its use, as well as investing in its use in Silva's doctoral research (2022).

The construction of biograms has proved to be powerful, as it favors the act of remembering, as characterized by Placco and Souza (2006, p. 31):

The act of remembering can bring with it resources of vitality and spirit, generated in the thickness of an experience. When questioned and reflected upon, it reveals inexhaustible meanings and opportunities to draw on other meanings. This movement favors possible inclusions and interpretations, acting directly on our porosity and enhancing new learning.

This new learning can take place for everyone involved in the dialogue, since it allows us to "retrace experiences with today's images and ideas" (Placco; Souza, 2006, p. 31) in emerging contexts that culminate in the relationship between social and individual aspects. In the words or biography of the other colleague, in the moment of narration, we also find ourselves, establishing evaluations of our trajectories and our teaching development. That's why we also understand that the elaboration of the biography can be self-forming, provoking movements in the different types of knowledge that constitute us.

The very composition of the word biography brings to mind the meaning of life and all its vitality, which is expressed by the prefix bio. It is a resource that aims to identify the origins, trajectories, and beliefs that make us who we are. Thus, in our research, the biogram has promoted the production, organization, and analysis of knowledge through mapping with a chronotopography, and has proven to be fundamental for the defense of the learning rights of students and teachers⁵.

In the following sections, we will try to illustrate some of these aspects. To this end, we will first discuss the biography and its organization, and then present and analyze some data produced by this tool. Finally, we will draw some conclusions.

The biogram in educational research

In narrative research, various devices and methodologies are used to produce data. For the research supporting this article, we used interviews, biograms, and document analysis. We highlight the biogram because it is rarely explored in Brazilian studies. By using it, we have constructed new meanings to organize the trajectory of a training policy based on the development of teachers.

Ávila (2018, p. 55) explains the origin and meaning of the biogram, which was used by researchers from the Chicago School to obtain mass data. The biogram is defined as a new type of life history, written in response to the researcher's request, which guided the reports/records in a certain social group. The focus was not on a particular individual.

5- The authors of the PNAIC guiding documents and training books chose the term learning rights when referring to the objectives and learning needs of students in the various areas of knowledge, which led us to look for possible meanings for this choice. Thus, in Silva's thesis (2022), by analyzing documents and narrative interviews, we investigated, appropriated and expanded the term learning rights. Also in the thesis, the search for the meanings of students' learning rights culminated in the defense of teachers' learning rights.

Ávila also notes that the meanings constructed from the biogram have evolved to either a qualitative or quantitative perspective.

The meaning chosen and appropriated in this study is based on the work of Bolívar, Domingo, and Fernández (2001), who view the biogram as a narrative research element used for analyzing and providing feedback on interview data to the participant. When the device was used, it became apparent that it had the potential to retrieve data and generate it.

According to Bolívar, Domingo, and Fernández (2001), a biogram is a graphic and chronological resource that records and analyzes critical incidents that have shaped a teacher's life and career. It provides a structured and defined account of their professional trajectory.

The authors emphasize the value of biograms in understanding a teacher's experiences (Bolívar, Domingo, & Fernández, 2001, p. 177).

[...] an initial way of analyzing a professional life story by drawing up a map of their career, combining events and chronology. Drawing up professional life biograms makes it possible to represent individual trajectories as a chronological chain of different administrative situations, institutional commitments acquired, positions held, training activities undertaken, and discontinuities experienced, as well as other significant events experienced throughout life and career.

When creating our biogram, we utilized this tool along with the narrative interview to gather data. By having participants narrate events chronologically, such as in relation to PNAIC, memories were triggered for the researcher, leading to further questions and reflections throughout the research. The experiences with this particular training and its role in the professional development of the interviewed teachers and coordinators revealed singularities and regularities, leading to an intertwined set of stories.

This experience prompted us to explore this resource further, which is still underutilized in Brazilian research. In our doctoral research, we experimented with it after conducting an initial interview with a participant. During device usage, we noticed gaps in the interview process. This enabled us to focus on other areas and revisit certain aspects with the first participant.

During the data analysis, we examined and emphasized the elements that contributed to the professional development of the participants as a result of the PNAIC in mathematics. We reflected on the individual and collective aspects that they narrated and emphasized in their accounts, based on this device and the transcripts of the narrative interviews.

The organization of the biogram of a teacher's professional development trajectory

In the doctoral research, nineteen interviews were conducted with eleven participants. Once transcribed, they were organized and analyzed based on their respective biograms, to understand the meanings constructed by the interviewees during their participation in the PNAIC training policy, through their professional development trajectories.

For data production, analysis, and feedback on the interviews, we adapted a biogram model (Chart 1) based on Bolívar, Domingo and Fernández (2001) and Sá and Almeida (2004). It was organized into seven predefined columns, while its rows emerged during the research process. In Chart 1, we give an example of teacher Rose - a fictitious name so as not to identify the participant - which we will explore to defend the rights of teachers to learn.

Chart 1 - Teacher Rose's biogram

Phases	Chronology	Vital age	Professional age	Events (facts)	Valuation (meaning of events for you)	The consequences for teaching practice
Basic Education			0	- Relationship with mathematics	<ul style="list-style-type: none"> - "Math was never my favorite subject; I cried when I didn't understand it (division by two). I was terrible at math, very abstract." - Beliefs that people who have an aptitude for mathematics are considered more intelligent. 	<ul style="list-style-type: none"> - Doing things differently from our experiences as students. - Investing in manipulative materials, playfulness. - Understanding and not memorizing. - Value the thinking process, not just the final answer (right or wrong).
Initial training	2010			<ul style="list-style-type: none"> - High School: Teaching - Higher Education: Languages 	<ul style="list-style-type: none"> - Time spent with family (children), between training and starting teaching. - Moving to another city: "I spent a long time just waiting for my son to grow up, looking after my son, and then resuming work. But then, when I saw it, too much time had passed, and only teaching... I didn't even have the courage to look for a job. Because I knew it was too little and that I was way behind, right? Time-wise. And I needed to go back to school. And that's when I started again. And that was my life. Then I started in 2010. It was my first contract. 	

Further training and practice				<ul style="list-style-type: none"> - Specialization in Portuguese Language Teaching - Entry into the municipal network by contract - Entry into the municipal network by competitive examination - Pro-Lettering 	<ul style="list-style-type: none"> - "I've always loved taking part in training courses. So I took part in Pro-Literacy. And I was always available. And, even though I was there as a regent teacher 1 in literacy..., I wasn't content with what I knew. I always felt that I needed to take part in these training policies so that I could improve my work. And not just stay there. Because I think, 'Oh, that's great; now I know...'. No, because the first year of literacy is also a challenge, isn't it? And if you're standing still, you're not... looking for other ways to do your job better. I think... I'd be very desperate if I just stuck to 'rice and beans'. So every course had something good for us to learn and exchange. - "Difficulty speaking in public [faced the fear of public speaking]" - "I had to present a paper (experience report). It was a challenge to report" - Writing beyond a formal obligation (TCC): "I think this movement was significant". - Teacher authorship. - Experience reports. - It's not a magical transformation: "For the teacher, I think he was shaken". - He received the training grant.
	2013 to 2018			<ul style="list-style-type: none"> - PNAIC, I have always participated as a course participant 	<ul style="list-style-type: none"> - "Difficulty speaking in public [faced the fear of public speaking]" - "I had to present a paper (experience report). It was a challenge to report". - Writing beyond a formal obligation (TCC): "I think this movement was significant". - Teacher authorship. - Experience reports. - It's not a magical transformation: "For the teacher, I think he was shaken". - He received the training grant. - "I had to do all that, report on my experience, and occasionally, I felt cramped because I had to take care of everything at school, plus the activities that were given to us to apply in the classroom. So, no... there was no difference. It was just that. It was... within the content we were studying. But we had to apply that theory in the classroom. And, you know, we also have the demands of the school". - Acquiring books and manipulative materials.

	2014			<p>- PNAIC in Mathematics (and other training courses - Pro-Literacy, Literacy Network)</p>	<ul style="list-style-type: none"> - A (re)meaningful relationship with mathematics. Experiences have shown that mathematics is enjoyable; proximity to social practices. - "You can have two movements: become a bad teacher (revenge) or grow up and become different." - "Children don't become literate only in Portuguese". - "Seeing mathematics in a different light, that's what I brought from the Pact". - Working with problem situations: seeing the logic of the student's thinking. - Training requires effort: "[...] she leaves school tired, sometimes sick, and goes straight to the Teacher Training Center, sometimes she eats something, has extra tasks... But when she finishes, she sees that it's worth it". - The Coordination supports the teachers (materials and practices, training sessions at school). - Coordination alerts: "Look at mathematics". - Math box assembled with own resources; later the school invested. - Golden material. - "This Pact thing, where you live the experience, is a very cool thing, which wasn't just there: 'There, theory, theory, theory'. No, let's see how it works here in practice? Let's have an experience?" - "Yeah, because you've already played, you've seen how it works, what difficulties you've had, right? Suddenly a child will do better than you. You have to understand what the game process is like. And that's how it has to be. Even to put together a Tangram, which isn't easy." - "The literary books that were used for Mathematics; you told a 'delightful story', more focused on Mathematics." - Interdisciplinary work. 	<ul style="list-style-type: none"> - Applying theory to practice. - The Tangram practice was developed at the school, involving the whole class, with the participation of an autistic student. - Geometry is in everyday life: "Geometry is in their everyday lives. So they observe things in the classroom that have that shape, you know, that they're sometimes assembling into a figure. So they pick it up and look at it and turn it around. Then they're like: 'Wow, that's the same as that! Huh? It attracts attention. And then they'll remember things in their house too, or even on the way to school". - She tries to work on understanding with her students. - "It empowers them to defend their work with their parents: math isn't just counting. I became more confident". - "Each student does it, draws their own hypotheses". - "And the golden material is something they really like. It makes a bit of a mess. Because those little pieces fall on the floor... [laughs], I used to make little groups of four. And then they'd build... ah, houses, these things... I think it helps the child to visualize what you're talking about. And they change the little bars and so on. It's interesting. And then, in 1st grade, we go like this... at first, you give it to them, you let them manipulate it, really play with it". - "You provide material for the students to manipulate and make relationships with: tape measures, straws, toothpicks, mats...". - Activities to measure tables with the children. - Math box for the big ones (final years), because they need it. Some are ashamed to say they don't know; games, playful activities are good for everyone at all ages. - Grandpa's problem.
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2020 - Currently	2020	55 years	10 years	- Reflection	<ul style="list-style-type: none"> - "Everyone thinks they can be a teacher". - "There's always something new to learn, that's why training is important." 	<ul style="list-style-type: none"> - Investing in training. - "I've been teaching 1st grade for ten years now, but every year is a challenge. It's not like, 'Oh, I've been doing this for ten years, I know everything'. You see, we were speaking with more experience. But then came the pandemic. And then it pulled the rug out from under you. How am I going to do it now? How am I going to teach literacy? And that... you know, interaction with the child and... What's it going to be like? It's all very new, very different.
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Source: Research data, 2022 (Interviewed teacher Rose).

The biogram's structure was enhanced during the research by adding the seventh column, 'Developments in Teaching Practice.' This addition allowed for analysis of the meanings that emerged in the interviews related to the research objectives regarding PNAIC. It also provided insight into the resizing of resources and beliefs, particularly regarding mathematical literacy, in the professional development of teachers and pedagogical coordinators. The rows were organized according to the first thematic analyses that emerged during the interviews and their transcriptions.

The first column, labeled Phases, indicates four stages of teachers' professional development: basic education, initial training, continuing training, and the years 2019, 2020, and 2021. Although professional development is viewed as a continuum without a break between initial and continuing training (García, 2011), we used these expressions to identify events and meanings that teachers associated with each category. These expressions were also the most commonly used in the group.

The initial stage of education was identified as a significant factor in the participants' experiences with mathematics, as revealed in some narrative interviews. This led to subsequent interviews where we explored the memories and meanings of mathematics in relation to this stage of education, as well as their impact on professional development and the construction of new meanings.

The years 2019, 2020, and 2021, accompanied by the expression 'currently,' were used to contextualize the meanings and events highlighted during the interview that were relevant to the participants' experiences, whether they were related to PNAIC. These years refer to the research construction period, which involved the interview, biogram, feedback, and validation processes.

In the chronology column, we have included the years of the training and events, where possible. The purpose was to establish connections with the broader context and identify individual and collective indications of professionalism. Although this chronology was not always explicitly stated, we requested that participants fill in this field whenever possible.

The third column indicates the participants' age at the time they described events during their initial and continuing training. In Chart 1, only the participant's age at the time of the interview is recorded, as the other fields were left blank.

The fourth column, Professional Experience, indicates the length of time the participant had been working in the teaching profession at the time of the highlighted training or event. This data could assist in identifying experiences gained in the professional field and relating them to the training cycle discussed by Huberman (2013), enabling us to make interpretations.

The fifth column, 'Events', includes a brief record of significant events in their professional life and completed training. In some biographies, we used specific terms and phrases to describe the events, while in others, we utilized excerpts from the interviews to emphasize them. This decision was based on clippings from the interview transcripts and supported by field notes taken during the interviews. This task was challenging because much of the data was crucial for depicting critical moments - those that facilitated changes, belief consolidation, and professional decision-making.

In the sixth column, Valuation, we record the value that participants gave to the events. The emphasis on PNAIC training highlighted the common and unique aspects attributed to this program by both teachers and pedagogical coordinators. This was a key device for cross-referencing stories and defining thematic categories.

In the seventh column, Developments in Teaching Practice, we aimed to exclude examples of practices narrated because of events and subjective evaluations.

We informed the participants about the purpose of the device and invited them to complete, correct, or expand the biogram if necessary. They were instructed to use a different font, color, or typeface and send it back to us. Alternatively, we offered to conduct the exercise orally via telephone or online chat application.

This approach aligns with Ávila's perspective (2018, p. 62):

Upon receiving a copy of the biogram, the teacher was invited to review and revise it. The purpose of this was to: 1. Fill in any gaps left by the initial interview; 2. Analyze the instrument for accuracy in relation to the previous meeting; 3. Identify any critical incidents that influenced their career as a teacher; 4. Organize the events that shaped their career. Confirm or attribute new meanings to the events reported; 5. Organize the events that made up their career in consecutive phases. 6. Indicate the critical incidents that were decisive in the choice and direction of their career as a teacher. Indicate any necessary changes, including additions.

The analysis of the biogram is a valuable tool in the research process. It allows for an understanding of both the unique characteristics and commonalities of the group being studied and the phenomenon being analyzed (PNAIC). Additionally, it serves as a means of synthesis and dialogical continuity, confirming or attributing meanings constructed by both the participant during the interview and the researcher during transcription and interpretation.

During our initial research experience, we received three prompt responses regarding the biograms: two with minor additions and one without any. As the research progressed, we constructed additional biograms and distributed them in the same manner as before. Further contact was made by email and telephone to validate the biogram, which was comparatively quicker than the validation of the interview transcripts. This demonstrates the point made by Sá and Almeida (2004, p. 185). During interviews, individuals may not

have sufficient time to review all the material produced. Therefore, the biogram resource has proven to be useful in organizing data and providing feedback.

The initial biograms were up to eight pages per hour of interview. After organizing the professional trajectory based on the indicated columns, we used to include entire passages of the event in the valuation field. We then paraphrased them into synthetic sentences in an attempt to reduce them to keywords, which was not always possible. The colors were utilized to establish a thematic analysis system. Initially, categories were created for each interview, and subsequently, they were associated and organized with all the others, resulting in a general categorization and cross-referencing of stories.

It is important to note that several revisions were required for each interview to cross-reference the stories and determine which ones would be included in the thesis. The research objective evolved as it progressed. The focus was on relating the biogram data, obtained from interviews and documents to the authors, who were invited to discuss topics such as learning and teaching mathematics, professional teacher development, and learning rights.

Professional development: approaches to defending teachers' learning rights

This text discusses professional development and the experiences of a teacher named Rose. It explores commonalities among her research peers and herself, as well as her unique qualities. The biographies of the individuals referenced in the doctoral thesis (Silva, 2022) establish connections between childhood, graduation, teaching, PNAIC, and Mathematics. These connections lead to reconfigurations of meanings for both students' and teachers' learning rights. The term 'teachers' learning rights' is presented in the thesis based on the researcher's dialogue with the interviews, biographies, and analyzed and produced documents.

The term 'learning rights' was first introduced in the PNAIC guiding documents in 2012. It is linked to the concept of citizenship and expresses a set of rights that enable individuals to actively participate in the life and government of their people (Teles, 2014, p. 39). In this context, it refers to the right to knowledge regarding school curricula, including their implications and needs.

This conception leads to considerations about the rights to knowledge in various areas, such as the right to learn mathematics with the active participation of both students and teachers. Demands for the right to training, knowledge, and the use of technology are also prevalent. The issue of the right to knowledge, for both teachers and students, implies a curriculum that includes orality, writing, mathematics, science, and production techniques, as well as the mastery of cultural instruments and equipment to qualify work as a human activity (Arroyo, 2007, p. 27). The curriculum aims to expand students' human experience rather than reduce it to a commodity.

The argument presented here supports the idea of a school that acknowledges and collaborates with students as capable learners who have the right to seek the conditions necessary to exercise their learning with their logic. Therefore, we propose incorporating

the right to learn into the teaching field, as suggested by the PNAIC with regard to school knowledge.

The biograms highlight critical incidents that are not disconnected from a larger context and that strengthen the defense of teachers' learning rights. According to Bolívar, Domingo, and Fernández (2001), critical incidents are defining or crucial moments that determine decisions and directions in professional trajectories or in life itself. They are typically identified after the events have occurred and been reported. They gain significance and recognition as being decisive for changes from one stage to the next. Often, this recognition only occurs when professional and/or personal experiences are narrated and organized. For this reason, this device is useful for training and self-education, as it enables an understanding of the personal, academic, and professional journey, as well as the context in which decisions were made.

Teacher Rose's biogram was selected for this discussion because it represents the majority of the other participants in the research. She stated that mathematics was never her favorite subject due to its abstract nature and the perception that those who excel in mathematics are more intelligent. This negative relationship with the subject has led many individuals to avoid pursuing it as a career.

However, when considering a career in teaching or pedagogy, one must engage with mathematics. As a multipurpose teacher responsible for various areas of knowledge in early childhood education and the initial years of elementary school, how can you teach without reproducing your childhood memories or undergraduate fundamentals exemplified by Rose? Additionally, how do training policies contribute to the professional development of multipurpose teachers who have sought to distance themselves from the exact area because they don't feel comfortable with its constructs?

Excerpts from interviews were used to understand the relationships that teachers and pedagogical coordinators have developed with mathematics throughout their professional development. By transcribing and placing them in the biogram, we can identify our path. Looking back at our experiences as students, as well as our training in secondary school, undergraduate studies, and programs such as Pro-Literacy and PNAIC in the field of mathematics (Brazil, 2008, 2012, 2014), along with our teaching and pedagogical coordination practices, we reflect on the models that have shaped our beliefs. Nóvoa (2020) and Nóvoa and Alvim (2020) refer to the school and its professionals in times of pandemic, highlighting the internalized school that exists within us. We appropriate their statement to consider: what kind of mathematics do we internalize?

In many research biograms, the relationship with mathematics is often portrayed as difficult and challenging. This thesis highlights the importance of small factors that can make us appreciate mathematics more, with the goal of broadening and redefining our understanding of mathematics for pedagogical purposes with students, both in terms of its form and conceptual appropriation.

Ferreira and Araújo (2012, p. 205) state that narratives can lead to changes in the way teachers perceive themselves, others, and the situations they encounter. The authors suggest that by reflecting on their experiences, teachers can develop theories about their beliefs and desires. This process can lead to new opportunities for learning,

transformation, and professional development (p. 205). Thus, the mathematics that the research participants and we ourselves encounter through PNAIC becomes more enjoyable and meaningful in the early years of elementary school.

Teacher Rose inspires us by pointing out that a teacher can either become a terrible teacher, taking revenge on their students, or grow and become different. He emphasizes the need for continuous professional development:

I wasn't satisfied with what I knew. I always felt that I needed to take part in these training policies so that I could improve my work. And not just stay there. You know, because I think: "Oh, that's great, now I know..." No, because the first year of literacy is also a challenge, isn't it? And if you're standing still, you're not... looking for other ways to do your job better, I think... I'd be very desperate if I just stuck to "rice and beans", right? Let's put it that way. So every course had something good for us to learn and exchange. (Interview and biogram of teacher Rose).

Although Rose studied for a degree in Languages and Literature, she acknowledges that children are not only literate in Portuguese. Citing the PNAIC in Mathematics, she suggests that looking at Mathematics from a different perspective and working with problem situations to understand the student's logical thinking is an option to improve student practices in basic education.

In these narratives, researchers and participants revisit and evaluate their experiences. They re-evaluate their beliefs, construct new meanings, and recognize that mathematics has its characteristics, with a language that can be developed, understood, interpreted, and communicated. As researcher Danyluk (2015, p. 25) points out, after being prompted by the question, "How does the child enter the world of writing mathematical language?"

Mathematics is a highly abstract field that employs a language of complete abstraction. Like any linguistic system, mathematical science uses signs to communicate mathematical meanings. Therefore, reading mathematical language requires a deep understanding and interpretation of the signs and relationships implicit in what is being communicated. To read mathematics meaningfully, one must have a clear awareness of the mathematical meaning and significance of what is being read. Mathematical literacy involves comprehending, interpreting, and communicating mathematical concepts. It encompasses the processes of critical analysis and transformation, which direct consciousness towards the subject. The reader can critically evaluate the text and simultaneously revise the discourse they are reading.

The research on continuing education practices reveals an expansion of consciousness towards mathematical signs and an increased repertoire for working with children. This favors the composition of meanings related to social practices, making language present and necessary in the school context and beyond. As Rose pointed out, the responsibility for the literacy process is not solely on the Portuguese teacher. Once mathematical language is understood as a human construction, subjective beliefs formed during basic education can be critically examined to develop a more conscious and consistent approach to teaching mathematics.

It is important to avoid a limited and romanticized view of teaching mathematics, which is often present in continuing education programs. Pedagogy courses and their students often try to distance themselves from mathematics, which is a weakness that needs to be addressed.

Multipurpose teachers require professional development on different fronts, both in initial and continuing education, to encourage them to approach mathematics as a tool for denser conceptual appropriation. This will enable them to learn mathematics to teach it. According to Tardif (2012), knowledge processes are plural and heterogeneous, originating from various sources such as training institutions, professional training, curricula, and everyday practice. These processes are socially constituted and involve a relationship between social and individual aspects.

These aspects can be interpreted in the teachers' biographies and can influence new understandings of learning and teaching mathematics. It is important to be aware of the conditioning factors, context, and conditions for producing work and teaching knowledge.

Teacher Rose and the other participants indicate that programs like PNAIC contribute to fostering professional training knowledge, disciplinary knowledge, curricular knowledge, and experiential knowledge. These elements are essential to pedagogical practice, which is in constant development. By expressing dissatisfaction with her current knowledge and acknowledging the effort required for training, the author emphasizes the importance of seeking support from the pedagogical coordination at school. Additionally, the author suggests that mathematics is not limited to counting and that acquiring new material can challenge and potentially alter one's beliefs.

[...] you had the experience; [...] it wasn't just theory [...], because if you've played, you've seen how it works, what difficulties you had [...] even putting together a Tangram. [...] Mathematics is really enjoyable [...], it's not a magical transformation, there's always something new to learn, that's why the training was important. (Interview and biogram of teacher Rose).

Many elements of the training could be organized and identified in the different biograms, as exemplified in Rose's biogram.

From a narrative perspective, considering the process of authorship, the different devices - biogram, interviews, and document analysis -, the production and interpretation of the data from the research as a whole, we move towards the defense of teachers' learning rights, to guarantee students' learning rights, which requires material and immaterial conditions, including the social and financial appreciation of teaching.

These aspects are explored in depth and discussed in Silva's thesis (2022), emphasizing the meanings and contributions of continuing teacher training projects - such as PNAIC - for learning to teach mathematics. We summarize by indicating that the material conditions are related to the policies and the training program, with materials and resources sent or built for the students. They are also related to the stipend for literacy teachers, linked to the immaterial conditions of a training program that allowed relationships and subjectivities to be established between teachers, between teachers and pedagogical coordinators, and between managers and trainers. These were very significant

conditions that allowed theory and practice to come closer together, between the university and basic education schools, as well as other aspects. Some of these elements can be found in Rose's biography, as she chose to become a different teacher from those who live in her memories of mathematical literacy.

Faced with such potential for producing and organizing data and motivated by the construction of the participants' biograms, we began to explore and organize, based on their structure, a biogram that could tell a little about PNAIC, represent its chronotopography, i.e., its times and spaces, its characteristics and its valuation, aspects found in the guiding documents, as well as some meanings shared by the participants. This organization made it possible to understand a set of facts in their evolution over time (diachronically), which led to an a posteriori reconstruction from the perspective of the present and the trajectory of PNAIC, both in the guiding documents and in the valuation informed by the participants. The institutional biogram (Silva, 2022) was combined and articulated with the individual biograms, strengthening the meaning of the research in defense of teachers' learning rights.

Final considerations

This excerpt from a doctoral research project discusses the possibilities and limitations of using the biogram in educational research. The discussion is based on the announcement of teachers' rights to learn and teach mathematics in the early years of elementary school.

Regarding the limitations, it was found that creating a biogram from interview transcripts is a challenging task. It requires identifying the most relevant data to include in the device to prevent it from becoming too lengthy. Additionally, it is crucial to accurately represent the content of the interviews and avoid misinterpretation of the participants' statements. Feedback is crucial for ensuring that the researcher's interpretation aligns with the participant's intended meaning during the interview.

The biogram has potential for reflecting on professional development trajectories and training programs that serve as milestones for the development of new beliefs, classroom practices, teaching knowledge etc.

By considering the input of teachers and pedagogical coordinators, as demonstrated in Rose's biogram, we emphasize their role in the research process. This contributes to the return of interviews from a self-formative perspective for both the researcher and the participant. It allows for the valuation of conversations in a time and space triggered by the present lived and narrated experiences. From this perspective, we understand this document as a device for producing data.

The organization and repeated readings of the interviews and biograms provided evidence that the acts of "[...] revisiting and retracing the collection of our memories can result in different approaches, new points of view, encouragement and boldness [...] they can hide shame and regrets" (Placco; Souza, 2006, p. 31). They can also tell us a lot about ourselves and the processes of composing being and being a teacher, because we position ourselves as "[...] accomplices of the world we study. To be in that world, we need

to remake ourselves, as well as offer the research understandings that can lead to a better world” (Clandinin; Connelly, 2015, p. 97).

This is what we tried to present in our research, with insights that can lead to a more meaningful teaching and learning process in the area of mathematical literacy and a sense of belonging from a more inclusive perspective.

We point to the PNAIC in Mathematics as a necessary policy for continuing education, and we open the discussion with the expansion of students’ learning rights as well as the learning rights of teaching, because, as teacher Rose told us, training programs alone and on a one-off basis “don’t make a magical transformation.” In this way, we believe that the biogram is a powerful device for producing data, insofar as it makes it possible to provide relevant information for the researcher and the participants, to systematize and value the data present, for example, in the interview.

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