THE PLACE OF LITERATURE IN THE TEACHING AND LEARNING OF MATHEMATICS IN THE CONTEXT OF INITIAL TEACHER TRAINING

O LUGAR DA LITERATURA NO ENSINO-APRENDIZAGEM DA MATEMÁTICA NO CONTEXTO DA FORMAÇÃO INICIAL DOCENTE

EL LUGAR DE LA LITERATURA EN LA ENSEÑANZA - APRENDIZAJE DE LAS MATEMÁTICAS EN EL CONTEXTO DE LA FORMACIÓN INICIAL DOCENTE

Meire Nadja Meira de SOUZA[1]
e-mail: meire.nadja@gmail.com

Ana Tereza Ramos de Jesus FERREIRA[2]
e-mail: anaramos75@gmail.com

Geraldo Eustáquio MOREIRA[3]
e-mail: geust2007@gmail.com

How to reference this article:

SOUZA, M. N. M. de.; FERREIRA, A. T. R. de J.; MOREIRA, G. E. The place of literature in the teaching and learning of mathematics in the context of initial teacher training. **Revista Ibero-Americana de Estudos em Educação**, Araraquara, v. 19, n. 00, e024031, 2024. e-ISSN: 1982-5587. DOI: https://doi.org/10.21723/riaee.v19i00.18508

| **Submitted**: 25/09/2023
| **Revisions required**: 06/11/2023
| **Approved**: 11/01/2024
| **Published**: 13/03/2024

[1] State Department of Education of the Federal District (SEEDF), Brasília – DF – Brazil. Basic Education Teacher. PhD student in Mathematics Education at the University of Brasília (UnB).
[2] State Department of Education of the Federal District (SEEDF), Brasília – DF – Brazil. Basic Education Teacher. PhD student in Developmental and School Psychology at the University of Brasília (UnB).
[3] University of Brasília (UnB), Brasília – DF – Brazil. Adjunct Professor at the Faculty of Education.

ABSTRACT: This article seeks to investigate the place of literature in the teaching and learning of Mathematics in initial teacher training, with a qualitative design of exploratory type, through participant observation and the use of questionnaires, photos and videos. This investigation took place in the context of a pedagogical training for undergraduate students of Pedagogy and Mathematics, with an approach to literature to teach Mathematics, during the 2nd academic semester of 2022, at the Faculty of Education of the University of Brasília. It was evidenced: the favoring of the resolution of problem-situations based on literature, as a challenging material that instigates mathematical thinking; the attribution of the teaching and learning of Mathematics only to the use of numbers to the detriment of interdisciplinarity, highlighting the need to overcome fragmented teaching; the importance of initial teacher training based on experiences that contribute to their work and the continuation of the process through continuing education.

KEYWORDS: Mathematics education. Teaching-learning. Initial teacher training. Interdisciplinarity. Literature.

RESUMO: *Esse artigo busca investigar o lugar da literatura no ensino-aprendizagem da Matemática na formação inicial docente, com delineamento qualitativo de tipo exploratório, por meio da observação participante e utilização de questionários, fotos e vídeos. Essa investigação ocorreu no contexto de uma formação pedagógica para graduandos de Pedagogia e Matemática, com abordagem da literatura para ensinar Matemática, durante o 2º semestre letivo de 2022, na Faculdade de Educação da Universidade de Brasília. Evidenciou-se: o favorecimento da resolução de situações-problema partindo da literatura, enquanto material desafiador que instiga o pensamento matemático; a atribuição ao ensino-aprendizagem da Matemática apenas à utilização de números em detrimento da interdisciplinaridade, destacando a necessária superação do ensino fragmentado; a importância da formação inicial do professor a partir de experiências que contribuam para o seu trabalho e prosseguimento do processo mediante a formação continuada.*

PALAVRAS-CHAVE: *Educação matemática. Ensino-aprendizagem. Formação inicial docente. Interdisciplinaridade. Literatura.*

RESUMEN: *Este artículo busca indagar el lugar de la literatura en la enseñanza - aprendizaje de las Matemáticas en la formación inicial docente, con un diseño exploratorio cualitativo, a través de la observación participante y el uso de cuestionarios, fotos y videos. Esta investigación se realizó en el contexto de una formación pedagógica para estudiantes de graduación de Pedagogía y Matemática, con abordaje de la literatura para la enseñanza de la Matemática, durante el 2º semestre académico de 2022, en la Facultad de Educación de la Universidad de Brasilia. Se evidenció: el favorecimiento de la resolución de situaciones-problema a partir de la literatura, como material desafiante que instiga el pensamiento matemático; la atribución de la enseñanza y el aprendizaje de la Matemática únicamente al uso de los números en detrimento de la interdisciplinariedad, destacando la necesidad de superar la enseñanza fragmentada; la importancia de la formación inicial docente a partir de experiencias que aporten a su trabajo y a la continuación del proceso a través de la educación continua.*

PALABRAS CLAVE: *Educación matemática. Enseñanza-aprendizaje. Formación inicial docente. Interdisciplinariedad. Literatura.*

Introduction

Children's literature is a resource widely used in literacy and literacy in children's mother tongue, awakening enchantment and fantasy. This resource also stimulates curiosity when it challenges children to solve problem situations, with a view to proposing problems outside the traditional patterns that consist of identifying and solving the Mathematical operation, with data generally explicit in the text, and giving an answer in the form of a sentence. Another very common characteristic is the use of the same algorithms and a single response, limiting creativity and reflection on the diversity of possibilities that occur when you dare to go beyond the conventional.

From this perspective, the resolution of problem situations occurs daily and very naturally in everyone's lives, whether when playing, arranging furniture in their home, preparing a recipe, or shopping at the supermarket. However, the school still presents Mathematics from the perspective of an adult who has mastered it and has greater competence to teach it (Schliemann; Carraher; Carraher, 1995).

Thinking about giving new meaning to the way Mathematics is presented to children in Early Childhood Education became one of the objectives of the work developed by the Dzeta Investigations in Mathematics Education (DIEM) group from the Mathematics Education research line of the Postgraduate Program at the Faculty of Education of University of Brasilia. One of the group's lines of action is to promote pedagogical training for undergraduate students, future teachers, during the subject Mathematics Education.

The training is offered by members of the group over the course of 15 meetings and this article is an excerpt from this work that also forms part of the doctoral research of two researchers from the group, one in Mathematics Education and the other in School Development Psychology.

This work aimed to investigate the place of literature in the teaching-learning process of Mathematics in initial teacher training. This process defended here constitutes a formative and procedural act so that teaching occurs as a mechanism with teaching intentionality and in an organized way to achieve learning (Ausubel, 2003; Coll; Marchesi; Palácios, 2004). In agreement with Freire (2021, p. 26, our translation) for those who “teaching does not exist without learning and vice versa [...]”, the terms teaching-learning will be used from the perspective that they are interdependent.

The study has a qualitative, exploratory design, through participant observation whose research instruments used were the questionnaire, the extra-class activity requested from students, photos and videos of the training.

This investigation took place based on pedagogical training focusing on the use of literature in teaching Mathematics for Pedagogy and Mathematics undergraduates during the 2nd academic semester of 2022 at the Faculty of Education of the University of Brasília.

In these considerations, this study is organized into four sections, the first being a brief introduction; the second, the presentation of the theoretical framework, with the main exponents being D' Ambrosio (2011), Nacarato (2004-2005), Smole (2000) and Vigotski (2003); in the third, we present the path taken to develop the research; in the fourth, the results and discussions; and, finally, we present our final remarks.

Mathematics and Early Childhood Education

Talking about Early Childhood Education (EI) presupposes a conceptual understanding of what this stage of basic education is. Early Childhood Education, in Brazil, was recognized, for the first time, as a right of children from zero to six years of age, as a duty of the State and an option of the family by the Federal Constitution of 1988 (Brazil, 1998), however, it was only recognized as the first stage of basic education in 1996 by the National Education Guidelines and Bases Law (LDB) (Brazil, 1996), that is, eight years later.

Early Childhood Education, today, is constituted as a service aimed at children between 0 and 5 years old, since Law 11,274, of February 6, 2006 (Brazil, 2006), expanded elementary education from eight to nine years. In this way, at six years of age, children should already be attending the first stage of Elementary School, beginning their literacy process, as recommended by the BNCC (Brasil, 2017, p. 89, emphasis added), when stating that "although, since birth and in Early Childhood Education, the child is surrounded and participates in different literacy practices, **it is in the initial years (1st and 2nd years) of Elementary School that they are expected to become literate**." Therefore, observing the Education scenario Children, we emphasize that it is not the role of Early Childhood Education to teach literacy [4]!

[4] It is essential to associate literacy and literacy considering that in current psychological, linguistic and psycholinguistic conceptions of reading and writing, the subject enters the world of writing through these two processes simultaneously. Literacy involves learning the conventional writing system while literacy encompasses the development of skills in using this system in reading and writing activities. inserted in social practices that involve written language. These processes are interdependent and inseparable: literacy occurs in the context of social practices of reading and writing, that is, through literacy, and literacy, in turn, can only develop when there is learning of the relationships between sounds and letters, in other words, it depends on literacy (Soares, 2004).

In these considerations, the EI is structured as follows:

> Art. 29. Early childhood education, the first stage of basic education, aims at the integral development of children up to 5 (five) years of age, in their physical, psychological, intellectual and social aspects, complementing the action of the family and the community.
> Art. 30. Early childhood education will be offered in:
> I - daycare centers, or equivalent entities, for children up to three years of age;
> II - preschools, for children aged 4 (four) to 5 (five) years of age (Brazil, 1996, our translation).

In view of this, this stage is of great importance, since it constitutes, for a significant portion, the child's first contact with the world outside the family, their first reference to the world, in addition to their first contact with knowledge in a formal way. That said, when they are enrolled in EI, they are not called students or students but rather children, since "[...] the way they are perceived and understood interferes, directly and indirectly, in the organization of the pedagogical work at be carried out in early childhood educational institutions" (Distrito Federal, 2018, p. 21, our translation). Therefore, when seeing the target audience of Early Childhood Education as children, this necessarily implies organizing pedagogical work thinking about strategies and procedures aimed at this audience.

Seeking to expand this concept, when defending the term child in Early Childhood Education, we also defend their right to be treated as such, a historical, developing, cultural and diverse being with rights, whose main source of development is playing (Vygotski, 2008; Leontiev, 1988). Delving deeper into this issue, Santos (2018), based on the ideas of Sacristán (2005), corroborates our statement by making a distinction between the terms: student and child. The first is linked to the traditional concept of class, one sitting behind the other, in silence, passive, without autonomy. When using the term child in Early Childhood Education, we are referring to boys and girls with autonomy, participants in their teaching-learning process and "it is from this perspective that the Sociology of Childhood warns of the need for us, adults, to teachers and researchers of young children, to always look at the child beyond their role as a student" (Santos, 2018, p. 39, our translation).

In this sense, the National Curricular Reference for Early Childhood Education (RCNEI) argues in favor of social interaction, in different situations of children's daily lives, as it is one of the most important strategies to be used by teachers to promote learning (Brazil, 1998).

For these reasons, the National Common Curricular Base (Brazil, 2017, p. 25, our translation) establishes play and interactions as the structuring axes of EI and, in the same line of reasoning, defines the skills and competencies to be worked on in this field of experience:

> Considering the rights to learning and development, the BNCC establishes five fields of experiences in which children can learn and develop. In each field of experience, learning objectives are defined [...] The self, the other and the us; Body, gestures and movements; Traces, sounds, colors and shapes; Listening, speaking, thinking and imagining; Spaces, times, quantities, relations and transformations.

The fields of experience address different areas of knowledge, such as Language, Mathematics, History, Science, Art, Geography, among others, but in an integrated way, leading the child to understand that knowledge is not fragmented, divided into disciplines, therefore, the Work with interdisciplinarity begins in Early Childhood Education. From this perspective, the professional who works in this area must observe this when developing their planning, seek strategies that offer full experiences to children, experiences that give them the opportunity to get to know their bodies, others, diversity, different cultures, in short,

> Play daily in different ways, in different spaces and times, with different partners (children and adults), expanding and diversifying their access to cultural productions, their knowledge, their imagination, their creativity, their emotional, bodily, sensory, expressive, cognitive experiences, social and relational (Brasil, 2017, p. 36, our translation).

This context reveals the need for a very well-prepared professional, who is aware that their work involves research, reflection and the constant search for knowledge, as Freire (2021) and Gadotti (2011) are unanimous in stating. Going deeper into the issue, Martinho (2020) warns that Mathematics teachers must constantly search for knowledge to ensure their students' learning. Therefore, the teacher's initial and continuing training constitutes one of the conditions to guarantee quality education for all, in the sense defended by Souza (2014), that is, an education that involves interdisciplinary, multidimensional work, which is flexible, that the needs of those involved are satisfied and contextualized.

In this process, the teacher working in Early Childhood Education, in relation to mathematical knowledge, needs to understand the field of spaces, times, quantities, relationships and transformations. It is this field that privileges experiences where "[...] children also frequently encounter mathematical knowledge (counting, ordering, relationships between

quantities, dimensions, measurements, comparison of weights and lengths, evaluation of distances, recognition of forms [...]" (Brazil, 2017, p. 43, our translation).

However, the work must be in a problematization context, as previously mentioned, focused on getting children to look for different solutions to the same problem, exploring different types of materials, using their body to count, music to learn different rhythms, measures and cultures. Mathematics in Early Childhood Education demands creativity, availability, engagement, and training from the teacher, in order to become a mediator of experiences (Vygotski, 2003) that can trigger children's development.

Mathematics and literature

In his studies, Abrantes (1989) argues that the Mathematics class should not address problem solving, but rather that problem solving should be the class itself, that is, at all times the student, in this specific case the children would be exposed to problems. In this way, it would become natural for them to understand that in Mathematics, as in life, "[...] we are faced with problems for which we cannot know the solution in advance and, often, we do not even know if that solution exists. Now, this is a type of situation that should inspire learning activities within the scope of school Mathematics" (p. 6, our translation).

From this perspective, problem solving favors the articulation between the child's informal knowledge and the formal knowledge, institutionalized in the school, based on the EI curriculum, associating the fields of experience that include both Mathematics and Literature. Thus, it is common that during children's stories questions arise from the teacher or children, about the characters, the place where the narrative takes place and, to answer them, it is not necessary to make calculations on paper with the concern of which operation math use. Several answers arise, with different paths to solution and, in these moments, children mobilize, with creativity and autonomy, the concepts they already have, either to use them, or to learn new concepts and, in an interactive way, evolve in their learning.

According to Vygotski (1998, p. 104, our translation), a concept goes beyond mental habit, "it is a real and complex act of thought that cannot be taught through training [...]" and, therefore, it is impossible to transfer to apprentice. Skovsmose (2008) warns us about the need to break with the paradigm of exercises, in which the teacher makes a list for the children that, after being solved, they return to the teacher, in a logic between right and wrong and, also, from the perspective of the teacher as the sole holder of mathematical knowledge. And, in the same

understanding, Kamii (2005) points to the importance of autonomy in children as an engine that drives the construction of knowledge itself, as they become able to make decisions for themselves. However, teaching interventions are essential for the consolidation of this learning, considering that it is the teacher "[...] who creates opportunities for learning – whether in choosing meaningful and challenging activities for their students, or in classroom management class: in the interesting questions he asks and that mobilize students to think, to question" (Nacarato; Mengali; Passos, 2009, p. 35, our translation).

Children's literature also encourages debate, interaction and imagination, which are so important in resolving and producing problem situations. Furthermore, it provides dialogue as a powerful tool to ensure that children do not remain invisible and mute in the classroom. Cândido (2001, p. 15, our translation), warns that silence has predominated in Mathematics classes, with mechanical calculations and an emphasis on resolution procedures prevailing. However, she states that if learners "are encouraged to communicate mathematically [...], they will have the opportunity to explore, organize, connect their thoughts, new knowledge and different points of view on the same subject".

Thus, interdisciplinary teaching work favors the exchange of opinions between children and contributes to their progressive decentralization, considering that "it is in interpersonal situations that they feel obliged to be coherent. [...] in a group, in front of other people, you will feel the need to think about what you will say, what you will do, so that it can be understood" (Smole; Diniz; Candido, 2007, p. 13, our translation).

For children to achieve autonomy of thought, they need to be encouraged to reflect and criticize during their oral expression, always following the path of respect, solidarity and cooperation with others. The child's achievement of autonomy must be supported by a set of principles that are transcultural and transdisciplinary (D' Ambrosio, 2009), bearing in mind the school's mission to conduct education as a creation whose core is to qualify for life, with a focus on in the human being (Mészaros, 2008) and, even more so, that the teacher, during his teaching training, is also encouraged to criticize, speak out and express his ideas, with freedom to diverge (Souza, 2019).

Thus, from EI, the intrinsic relationship between the mother tongue and mathematical language is perceived, considering that the decoding of letters and numbers, by the child, without due understanding or application in their daily life, is not enough for the understanding and construction of mathematical concepts, since

> [...] to stimulate creative expression at school, at work or in another context, it is necessary to prepare the individual to think and act creatively, as well as plan interventions in these contexts in order to establish favorable conditions for the development of creativity (Alencar; Fleith, 2003, our translation).

Dialogue and interaction are essential for explaining the child's creative processes which, according to Vergnaud (2009), are only partially revealed through mathematical records which, under the understanding defended here, can also be manifested in the form of drawings, role-playing, trial, and error.

The practices described seek to move away from repetitions and mechanization to seek learning from social practice, with the establishment of relationships and the development of meaningful activities. Acting as a teacher, however, implies professional knowledge that includes many other types of knowledge, in addition to didactic knowledge.

> - Knowledge of mathematical content. It is impossible to teach what you do not have conceptual knowledge about;
> - Pedagogical knowledge of mathematical content. It is necessary to know, for example, how to work with mathematical content from different fields: arithmetic, quantities and measurements, space and form or information processing. Know how to relate these different fields to each other and to other disciplines, as well as to create favorable environments for student learning;
> - Curricular knowledge. It is important to be clear about which resources can be used, which materials are available and where to find them; have knowledge and understanding of curriculum documents; and, mainly, being a critical consumer of these materials, especially the textbook (Nacarato; Mengali; Passos, 2009, p. 35-36, our translation).

Therefore, initial teacher training is a challenge: in addition to learning Mathematics, the future teacher needs to learn how to teach this science which, as part of our lives, goes far beyond calculations and algorithms that have no meaning for children. In EI, this component integrates the field of spaces, times, quantities, relationships and transformations, in which the child is encouraged to expand their abilities to analyze, compare, make decisions, propose, and solve problems.

Methodology

In the trajectory of this research, we set out to investigate the place of literature in the teaching and learning of Mathematics in initial teacher training in Early Childhood Education, based on an exploratory qualitative design. Information was collected through an evaluative questionnaire given to students at the end, containing eight questions, four objective and four

subjective, prepared by the researchers. In addition to the task asked of students, to develop an activity to apply in Early Childhood Education involving games and games.

The studies by Marconi and Lakatos (2017, p. 227, our translation) reveal that participant observation "consists of the researcher's real participation in the community or group. He incorporates himself into the group, blends in with it. It is as close to the community as a member of the group that is studying and participates in its normal activities". Therefore, this research technique allowed researchers to offer training and, simultaneously, collect information to compose this study.

Throughout the activity, the researchers took turns recording photos and videos, observing the dynamics applied to carry out the work, interspersing moments of dialogue, with theoretical notes and moments of telling and reading stories and suggestions on how to explore them.

The training is part of the work developed by the *Dzeta* Investigations in Mathematics Education (DIEM) group of the Mathematics Education research line of the Postgraduate Program at the Faculty of Education of the University of Brasília. The group aims to develop work and research related to the teaching and learning of Mathematics, based on the theoretical and methodological assumptions of Mathematics Education and to investigate, in a broad way, issues related to teaching and learning in Mathematics and, more specifically, to develop research work related to the training of teachers who teach Mathematics; teaching practices; specific Mathematics teachings and mathematical learning.

In this context, although it was not submitted to the Research Ethics Committee, the investigation respected ethics during the research, with activities offered during the intervention that offered the minimum of risks, according to Shaughnessy, Zechmeister, and Zechmeister (2012). However, throughout the training, the researchers informed the participants that, in the event that harm occurred to the participant, despite protective care, support would be provided with the necessary assistance. Furthermore, throughout the training, the researchers respected the participants' wishes, presenting them with the Free and Informed Consent Form. It is important to clarify that the proposed interventions were part of the syllabus of the Mathematics Education discipline offered by the Faculty of Education, in the optional modality, for undergraduate students at the University of Brasília.

The research on screen is an excerpt from the work developed by the group in the subject of Mathematics Education 1 during the 2nd academic semester of 2022, at the Faculty of Education of the University of Brasília (FE/UnB). This investigation took place in the context

of pedagogical training for 29 Pedagogy and Mathematics undergraduates. The group was made up of 12 men and 17 women, aged between 19 and 26 years old. Around 14 of the participants already worked in schools, one of them in Early Childhood Education. The training lasted three hours. For this moment, four books were selected that tell different stories about the three little pigs, namely:

- The True Story of the Three Little Pigs by A. Lobo - Jon Scieszka;
- The Evil of the Big Bad Wolf - Claudio Fragata;
- The Three Naughty Little Pigs and the Good Wolf - Liz Pichon; and
- The three little pigs - Paulo Moura.

The books *The Evil of the Big Bad Wolf* and *The Three Little Pigs* were presented to the group and *The Three Naughty Little Pigs and the Good Wolf* ; and *The true story of the three little pigs by A. Lobo* was told to the group using two different techniques: the first was told by the character The Mouse personified by one of the researchers, properly characterized and using objects such as straw, toothpicks and scenographic cheese. The second book was read by another researcher with different intonations of voice, seeking to instill the pleasure of listening to a story, that is, a "Delightful Reading"[5]!

Figure 1 – Moment of telling the first story

Source: Prepared by the authors

[5] It is understood that Reading Delight can enable children to access different texts, and, in particular, literary ones. To this end, the teacher has a fundamental role in mediating the student's dialogue with the texts, in order to motivate them to this moment of pleasure and enjoyment, without it being a rigid practice of simply reading the book and following a pre-established routine (Barros, Leite, Magalhães, 2020, p. 9).

It is important to clarify that this study is part of two ongoing doctoral research studies at the Faculty of Education and the Department of Developmental and School Psychology at the University of Brasília, involving the themes of play, Human Rights, material resources for learning Mathematics and teacher training.

In the next section of this work, through the theory of Historical-Cultural Psychology (Fonseca; Negreiros, 2019; Freitas, 2007) we will proceed to understand and interpret the information collected throughout the training and after reading the assessments.

According to the assumptions of this theory, information must be studied by observing its genesis, the historical context in which it was constructed. To this end, we followed three steps: "[...] of this research method: i) the analysis of processes instead of the analysis of objects; ii) the explanation of the phenomenon rather than its description; and, iii) the problem of fossilized behavior" (Fonseca; Negreiros, 2019, p. 265, our translation) which must be understood throughout its formation process and not the final product, seeking to reveal all the factors that contributed to the production of meaning, that is,

> the historical-cultural approach points to another way of producing knowledge involving the art of description complemented by explanation, emphasizing the understanding of phenomena based on their historical occurrence, in which the particular is considered an instance of the social totality (Freitas, 2007, p. 5, our translation).

Therefore, through this theory, we seek not only to describe the information, but to explain it, leading the reader to learn from each of the phenomena presented.

Results and discussions

There is a lot of debate nowadays about the need to overcome traditional teaching, still very present in our schools (Nicolau; Dias, 2003), especially with regard to the teaching of Mathematics, since, when worked in an erroneous way, In the classroom, this can become the school "bogeyman", leading students to be afraid of the discipline, as we saw in the record of one of the training participants. She gave the following report when evaluating our work:

> *Absolutely! My basic education in Mathematics was traumatic and in this class I saw a light to heal me from this.*

This record is from a future teacher who will work in the classroom and this negative relationship she had with Mathematics could influence her work, because, as Freire (2021)

states, we are unfinished beings in a constant process of construction and we are not exempt the influence of social forces. In the same direction, Gualtieri and Lugli (2012, p. 69, our translation), when analyzing teacher training, conclude that "[...] when the very nature of teaching shows its challenges, the teacher resorts to a repertoire of initiatives that are not always passes through the levels of consciousness [...]", and, thus, upon entering the classroom, this future teacher could transmit to her students the trauma she experienced, considering that "teaching training begins from the earliest years of schooling" (Nacarato; Mengali; Passos, 2009, p. 23, our translation).

Seeking to expand this concept, in his studies, Vigotski (2003) argues that learning must be mediated by experiences, as for the author our development is conditioned by personal experiences. Therefore, when we propose the activity to undergraduates, we give them the opportunity to experience storytelling from the perspective of new Mathematics teaching practices. In relation to this, we have the following evaluative record:

> *I loved the way the stories were told. I find it incredible how these stories engage even adults.* ***I reflected*** *on the issue of [sic] the body being mathematics and the importance of play in education as well.*

We emphasize the word reflect, since Freire (2021), Gadotti (2011) and Imbernón (2011) have a similar stance when dealing with the importance of the teacher investigating their practice, evaluating their strategies, contextualizing learning, promoting meaningful experiences, remain in constant training and create new relational and participatory models with the child. In this context, Nacarato (2004-2005) supports the importance of the work carried out by teachers who teach mathematics using manipulative materials. Such work will only make sense if the teacher knows how to explore the material in question, which demands knowledge, reflection and willingness to change:

> *I'm sure it influenced it; I learned a lot. I was stuck teaching just numbers.*

Based on the above, the expectation that one can have is that initial and continuing training courses are theoretical, methodological and encourage teachers to investigate and reflect on their practice and, as a result of this, generate changes in their pedagogical action.

Another important aspect to be considered, as the research by Danyluk (2015) and Machado (1993) points out, is the fact that Mathematics, like the mother tongue, is a language

> [...] of complete abstraction. Like any linguistic system, mathematical science uses signs to communicate mathematical meanings. Thus, reading

> mathematical language occurs from the understanding and interpretation of the signs and relationships implicit in what is said about mathematics (Danyluk, 2015, p. 25, our translation).

Still according to Machado (1993, p. 165), the two languages, Mathematics and the mother tongue, are intertwined, since Mathematics, in order to "exist" in the world of oral speech, depends on the mother tongue.

In this case, the oral language also assumes fundamental importance in the teaching of mathematics, and as mathematical writing does not include orality, it must be borrowed from the Mother Tongue. The great and immediate practical consequence of considering Mathematics as a representation system is, then, this absolute need for rapprochement with the mother tongue, which lends it the support of meanings represented by speech.

Within the scope of the concepts presented, the use of literature in teaching and learning Mathematics should be something quite natural, as the story allows interaction between the teller and the listener, contemplating the second structuring axis of Early Childhood Education. The process of telling the story, depending on the teller, can be a game, thus covering the first axis of EI provided for in the BNCC (Brazil, 2017). In these speaking turns, employees demonstrated that they understood this when they stated

> *It made me see that working in the classroom doesn't have to be monotonous, it can be fun, creative and exciting.*
>
> *Many ways I would never have imagined to work on mathematics with children.*
>
> *Certainly. It was extremely enriching as it presented us with different and unconventional ways of teaching.*

The stories told *The three naughty little pigs and the Good Wolf* ; and *The true story of the three little pigs by A. Lobo* using different techniques were explored with the participants regarding the different possibilities of working from them: shopping list, flat and spatial geometric figures, textual genre, monetary unit, fractions, measures and quantities, problem solving, notions of addition, multiplication, division and subtraction, incidental reading of labels, transformation, mixtures, among others. Everything being worked on in a contextualized way.

It was suggested to the group the possibility of researching each family's cake recipes, noting that the second story involves a cake recipe, and, in this way, taking advantage of each child's story, the customs of each family, the different ways of making a cake, the uses and

customs of each family to thus constitute a socio-ethnocultural agent, as proposed by Santos, Ferreira and Moreira (2023, p. 8, our translation)

> In this sense, we understand that the socio-ethnocultural agent, different from that teacher teaching classes (Moreira, 2012), this subject, is the one who teaches without neutrality, his practice is political, critical and reflective, he does not transmit, on the contrary, he becomes if mediator, a path leading to learning, where the purpose is the dialogue between the object of knowledge and the student.

It is worth remembering that the authors are talking about Quilombola School Education. However, any educational proposal must be centered on its object, in this case, the child.

It is important to consider that learning any language involves levels of abstraction, and as Danyluk (2015) explains, learning Mathematics demands understanding signs and establishing relationships between signs and meanings. In view of this, working with literature in the teaching and learning of Mathematics promotes the development of abstract thinking since it works on imagination, fantasy, through symbolic experiences. In the speech below, the employee shows that he understands this when he states

> *Storytelling, which showed the importance of encouraging imagination to understand mathematics; it was possible to identify several fields that involve mathematics, directly and indirectly. In addition to the games that brought many ideas to be worked on.*

It demonstrates overcoming the fragmentation of different areas of knowledge. In this study, we defend and encourage the use of literature, but not as something occasional and sporadic, but integrated into teaching pedagogical action, just as printed activities, textbooks and many other instruments that are part of everyday pedagogical practice are adopted.

To understand the importance and scope of working with literature in Early Childhood Education in the teaching and learning of Mathematics, we need to address Law nº Law n. 11,645 of 2008 which amends the LDB, making the teaching of Afro-Brazilian and Indigenous history and culture mandatory. From the stories, the teacher can discuss with the children that every story has different points of view and that knowing them is essential to make a conscious choice. Another possibility to work on the theme was presented by two students in the proposed work: instead of making a game, they created a didactic sequence based on the story of Maracatu do baque virado, and established an objective:

> *Maracatu de Baque Virado is a cultural event with strong links to African religions. Recognized as Brazil's intangible cultural heritage, it is also called Maracatu Nation and most of the groups are located in the Northeast, especially in Recife.*
> *[....] expand children's knowledge and experiences, so that they have the opportunity to experience the multiculturalism that is part of Brazil's identity and non-hegemonic cultural practices. In addition to the cultural aspect, we also intend to highlight how percussion promotes the understanding of rhythm, the notion of time, the interval between one hit and another, and body understanding through movements.*

They demonstrated that they understand that teaching work must be interdisciplinary, that through literature it is possible to work on Afro-Brazilian and Indigenous culture, not being restricted only to commemorative dates, April 19th and November 20th; that work with these themes needs to be deeper and more complex; and that mathematical knowledge involves much more than numbers, after all it is in everything!

In the same process, it is worth highlighting the work of another duo who created a sensory activity, with the aim of serving children with disabilities and those with Autism Spectrum Disorder (ASD), as development occurs in different ways. Therefore, a teacher can have foreign, black, quilombola, indigenous children, children with ASD, disabilities or Functional Disorders (TF) in their classroom and they all have the right to a quality education, they all have the right to learn Mathematics, since what

> Mathematics is also learned in social relationships, exchanging ideas with colleagues, observing parents' activities at home or at work, going to school or going for a walk, observing things in nature and the place where one lives in the city, in the countryside or on the beach, both in leisure activities and playing sports, playing games, **reading a storybook** or even paying attention to the news you hear on the radio or see on television (Brasil, 2014, p. 33, emphasis added, our translation).

Teaching Mathematics through literature is creating possibilities for **EVERYONE** to learn. For this reason, we agree with Tacca (2008) when she states that this is one of the teacher's challenges: accepting development as diverse and, from this, creating dialogic channels, in the sense of listening and listening to others, in understanding thinking and the actions of others, in short, their needs to fully develop, promoting the cognition/affect unity. And we understand and defend that literature constitutes one of these channels for teaching and learning Mathematics, since

> Integrating literature into mathematics classes represents a substantial change in traditional mathematics teaching because, in activities of this type, students do not first learn mathematics and then apply it to history, but explore

> mathematics and history at the same time (Smole; Cândido; Stancanelli, 1999, p. 12, our translation).

Due to the facts mentioned, the evaluations allowed us to realize that the students understood this concept and advanced in some points when they listed the contents that could be worked on in each story or making the relationship between them:

> *Storytelling (theater); Songs; Doll with geometric figures;*
>
> *Storytelling and the way it was introduced; Reflection: the body is mathematics; Theoretical introduction;*
>
> *The true story of the big bad wolf; The body is mathematics; Rhythm through music.*
>
> ***The initial scare;*** *the participation and, most importantly,* ***the cake.***

In the records above we have, in bold, the speech about the initial scare, as the story telling by the character Ratinha was planned to surprise the group. We ended the activity by offering a cupcake to each participant, alluding to an activity that could be carried out together with the class and, finally, Delight Reading to end our meeting, which was also recorded by one of the participants as one of the significant moments of training. Vigotski (2003), in his research, emphasizes the importance of student participation in their educational process and that this participation must be organized by the teacher through experiences, since the basis of the educational process must be the child's activities, their experiences, their hypotheses, their reflections.

Final remarks

In this research, we intend to investigate the place of literature in the teaching and learning of Mathematics in the initial teacher training of Pedagogy and Mathematics students in a subject offered in the evening. We realized that the training facilitated the resolution of problem situations based on literature, which is challenging material that instigates mathematical thinking, language, logical reasoning, imagination and fantasy.

We provide moments to demystify the attribution of Mathematics teaching and learning solely to the use of numbers to the detriment of interdisciplinarity, by some undergraduates, highlighting the necessary overcoming of fragmented teaching, without context and meaning for children. Another point was the role of Early Childhood Education as a space for building

children's autonomy, developing concepts and skills, building identity and relationships through interactions and games.

Another important aspect addressed was the importance of working with Ethnic-Racial Relations, since there are so many "daily confrontations that, most of the time, we are only concerned with teaching, with our class itself, without being able to worry about other issues that permeate the social and intellectual formation of our students" (Moreira; Almeida, 2014, p. 406, our translation).

Regarding the date of November 20th, Moreira and Almeida (2014, p. 405, our translation) highlight that one day is not enough for an anti-racist agenda and that,

> Currently, Brazilian social movements and the black community have been debating different topics that affect the daily lives of populations, especially those of black origin, during Black Awareness Day, which has recently been extended to Black Awareness Week, gaining repercussion and highlighted in the media and in school spaces. Topics such as insertion of black people in the job market, university quotas, quotas in public competitions, discrimination, identification of ethnicities, black fashion and beauty, are some examples of actions and debates carried out in schools, in cultural spaces and in solemn sections, showing and valuing Afro-Brazilian culture.

In order to build a fair society, with space for everyone and that respects diversity, we need qualified, engaged and properly trained teachers. This achievement necessarily permeates initial teacher training, especially for professionals working in Early Childhood Education. With formal knowledge, this teacher will be responsible for the child's first experiences, especially with Mathematics, which have the power to transform the once bogeyman of many adults into the child's best friend.

ACKNOWLEDGMENTS: To the *Dzeta* Research Group Investigations in Mathematics Education (DIEM); to the Federal District Research Support Foundation (FAPDF, Notices 03/2021 – Induced Demand, 12/2022 - FAPDF *Learning Program, 03/2023 Fap Publica*); to the Coordination for the Improvement of Higher Education Personnel (Capes, Financing Code 001); to the Postgraduate Program in Education of the Faculty of Education of the University of Brasília (PPGE/UnB – Academic and Professional), Postgraduate Program in Developmental and School Psychology (PPGPDE) and the State Department of Education of the Federal District (SEEDF).

REFERENCES

ALENCAR, E. M. L. S. de; FLEITH, D. S. **Criatividade:** múltiplas perspectivas. 3. ed. Brasília: Ed. Universidade de Brasília, 2003. Não paginado.

AUSUBEL, D. P. **Aquisição e retenção de conhecimentos:** uma perspectiva cognitiva. Tradução Lígia Teopisto. Lisboa, Portugal: Plátano Edições Técnicas, 2003.

ABRANTES, P. Um (bom) problema (não) é (só)... **Educação e Matemática**, v. 8, p. 7-10-35, 1989. Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.esev.ipv.pt/mat1ciclo/COORDENADORES/Materiais%20Coordenad/Textos/Abrantes%201989.pdf. Access: 05 Apr. 2023.

BARROS, M. C.; LEITE, E. P.; MAGALHÃES, E. M. Leitura Deleite: o que Pensam os Professores do Ciclo Básico de Alfabetização. **Rev. Ens. Educ. Cienc. Human.**, v. 21, n. 1, p.8-13, 2020. Available at: https://revistaensinoeeducacao.pgsskroton.com.br/article/view/7291. Access: 07 abr. 2023. DOI: https://doi.org/10.17921/2447-8733.2020v21n1p8-13. Access: 05 Apr. 2023.

BRASIL. **Constituição Federal de 1988**. Promulgada em 5 de outubro de 1988. Available at: https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm Access: 21 July 2022.

BRASIL. **Lei n. 9.394, de 20 de dezembro de 1996.** Lei de Diretrizes e Bases da Educação Nacional. Estabelece as diretrizes e bases da educação nacional. Available at: http://www.planalto.gov.br/ccivil_03/leis/l9394.htm. Access: 21 July 2022.

BRASIL. Ministério da Educação e do Desporto. Secretaria de Educação Fundamental. **Referencial Curricular Nacional para a Educação Infantil**. Brasília: MEC/SEF, 1998.

BRASIL. **Lei n. 11.274, de 6 de fevereiro de 2006**. Altera a redação dos arts. 29, 30, 32 e 87 da Lei nº 9.394, de 20 de dezembro de 1996, que estabelece as diretrizes e bases da educação nacional, dispondo sobre a duração de 9 (nove) anos para o ensino fundamental, com matrícula obrigatória a partir dos 6 (seis) anos de idade. Brasília, DF: Presidência da República, 2006. Available at: https://www.planalto.gov.br/ccivil_03/_ato2004-2006/2006/lei/l11274.htm. Access: 06 Apr. 2023.

BRASIL. **Lei n. 11.645, de 10 de março de 2008**. Altera a lei n. 9.394, de 20 de dezembro de 1996, modificada pela lei n. 10.639, de 9 de janeiro de 2003, que estabelece as diretrizes e bases da educação nacional, para incluir no currículo oficial da rede de ensino a obrigatoriedade da temática "História e Cultura Afro-Brasileira e Indígena". Brasília, DF: Presidência da República, 11 mar. 2008. Available at: https://www.planalto.gov.br/ccivil_03/_ato2007-2010/2008/lei/l11645.htm. Access: 07 Feb. 2023.

BRASIL. Ministério da Educação. Secretaria de Educação Básica. **Pacto Nacional pela Alfabetização na Idade Certa**: Apresentação. Brasília, DF: MEC, SEB, 2014. Available at:

https://wp.ufpel.edu.br/obeducpacto/files/2019/08/Caderno-de-Apresentacao-1.pdf. Access: 07 Apr. 2023.

BRASIL. Ministério da Educação. Secretaria de Educação Básica. **Base Nacional Curricular Comum** – **BNCC**. CNE/CP n° 2, de 22 de dezembro de 2017. Institui e orienta a implantação da Base Nacional Comum Curricular, a ser respeitada obrigatoriamente ao longo das etapas e respectivas modalidades no âmbito da Educação Básica. Brasília, DF: MEC, SEB, 2017. Available at: http://basenacionalcomum.mec.gov.br/abase/#infantil. Access: 08 Jan. 2021.

CÂNDIDO, P. T. Comunicação em Matemática. *In*: SMOLE, K. C. S.; DINIZ, M. I. S. V. (org.). **Ler, escrever e resolver problemas**: habilidades básicas para aprender matemática. Porto Alegre: Artmed, 2001. p. 16-28.

COLL, C.; MARCHESI, A.; PALÁCIOS, J. **Desenvolvimento psicológico e educação**: psicologia da educação escolar. 2. ed. Porto Alegre: Artmed, 2004. v. 2.

DANYLUK, O. S. **Alfabetização matemática**: as primeiras manifestações da escrita infantil. 5. ed. Passo Fundo, RS: Ed. Universidade de Passo Fundo, 2015.

D'AMBROSIO, U. Filosofia, Matemática e a formação de professores. *In*: FÁVERO, M. H. CUNHA, C. (org.). **Psicologia do conhecimento**: o diálogo entre as ciências e a cidadania. Brasília, DF: UNESCO, Instituto de Psicologia da Universidade de Brasília, Liber Livro Editora, 2009. p. 85-100.

D'AMBROSIO, U. **Etnomatemática**: Elo entre as tradições e a modernidade. 4. ed. Belo Horizonte: Autêntica Editora, 2011.

DISTRITO FEDERAL. **Guia da VI Plenarinha da Educação Infantil**. Universo do Brincar: A criança do Distrito Federal e o Direito do Brincar. Brasília, DF: SEEDF, 2018.

FONSECA, T. S.; NEGREIROS, F. Como elaborar uma pesquisa em Psicologia Escolar fundamentada no Método Histórico-Cultural? *In*: NEGREIROS, F.; CARDOSO, J. R. **Psicologia e educação**: conexões Brasil – Portugal. Teresina, PI: EDUFPI, 2019. p. 460-483.

FRAGATA, C. **O mal do Lobo Mau**. 1. ed. Positivo, 2009.

FREIRE, P. **Pedagogia da autonomia**: saberes necessários à prática educativa. 71. ed. São Paulo: Paz e Terra, 2021.

FREITAS, M. T. A. A pesquisa qualitativa de abordagem histórico-cultural: fundamentos e estratégias metodológicas. *In*: REUNIÃO ANUAL DA ANPED, 30., 2007, Caxambu. **Anais** [...]. Caxambu, MG: Anped, 2007. Available at: http://www.anped.org.br/reunioes/30ra/minicursos/ementa%20do%20minicurso%20do%20gt20%20.pdf. Access: 17 Mar. 2023.

GADOTTI, M. **Boniteza de um sonho:** ensinar e aprender com sentido. 2. ed. São Paulo: Editora e Livraria Instituto Paulo Freire, 2011.

GUALTIERI, R. C. E.; LUGLI, R. G. **A escola e o fracasso Escolar**. São Paulo: Cortez, 2012.

IMBERNÓN, F. **Formação docente e profissional**: formar-se para a mudança e a incerteza. 9. ed. São Paulo: Cortez, 2011.

LEONTIEV, A. Os princípios psicológicos da brincadeira pré-escolar. *In*: LEONTIEV, A.; LURIA, A. R.; VIGOTSKI, L. S. **Linguagem, desenvolvimento e aprendizagem**. São Paulo: Ícone: Editora da Universidade de São Paulo, 1988.

MACHADO, N. J. **Matemática e língua materna**: análise de uma impregnação mútua. 3. Ed. São Paulo: Cortez, 1993.

MARCONI, M. de A.; LAKATOS, E. M. **Metodologia do trabalho científico**. 8. ed. São Paulo: Atlas, 2017.

MARTINHO, M. H. Prefácio. *In:* MOREIRA, G. E. (org.). **Práticas de Ensino de Matemática em Cursos de Licenciatura em Pedagogia**: Oficinas como instrumentos de aprendizagem. São Paulo: Editora Livraria da Física, 2020.

MÉSZAROS, I. **A educação para além do capital**. Tradução de Isa Tavares. 2. ed. São Paulo: Boitempo, 2008.

MOREIRA, G. E.; ALMEIDA, L. E. S. Como enfrentar o racismo em escolas públicas: conquistas e desafios. **Revista EDaPECI: Educação a Distância e Práticas Educativas Comunicacionais e Interculturais**, São Cristóvão, SE, v. 14, p. 403-419, 2014. Available at: https://seer.ufs.br/index.php/edapeci/article/view/1872. Access: 15 Mar. 2023.

MOURA, P. **Os três porquinhos**. 1. ed. [*S. l.*]: Pé da letra, 2019. (Clássico das virtudes amizade).

NACARATO, A. M. Eu trabalho primeiro no concreto. **Revista de Educação Matemática**, ano 9, n. 9-10, p. 1-6, 2004-2005. ©Sociedade Brasileira de Educação Matemática. Available at: https://pactuando.files.wordpress.com/2014/08/eu-trabalho-primeiro-no-concreto.pdf. Acesso: 28 Feb. 2022.

NACARATO, A. M.; MENGALI, B. L. S.; PASSOS, C. L. B. **A matemática nos anos iniciais do ensino fundamental**: tecendo fios do ensinar e do aprender. Belo Horizonte: Autêntica Editora, 2009.

NICOLAU, M. L. M., DIAS, M. C. M. (org.). **Oficinas de sonho e realidade:** na formação do educador da infância. Campinas, SP: Papirus, 2003.

PICHON, L. **Os três porquinhos malcriados e o Lobo Bom**. [*S. l.*]: Ciranda Cultural, 2010.

SACRISTÁN, G. J. **O aluno como invenção.** Porto Alegre: Artmed, 2005.

SANTOS, H. R.; FERREIRA, A. T. R. J.; MOREIRA, G. E. O Papel do Agente Socioetnocultural Frente a Educação Escolar Quilombola e o Ensino de Matemática. *In:* **Revista Eletrônica de Educação Matemática – REVEMAT**, Floranópolis, p. 01-21, 2023. DOI: 10.5007/1981-1322.2023.e91061. Available at: https://periodicos.ufsc.br/index.php/revemat/article/view/91061/52697. Access: 28 Feb. 2022.

SANTOS, P. O. **Brinquedos, Culturas Infantis E Diversidade De Gênero**: Uma Análise Sobre A 'Sexta-Feira: Dia Do Brinquedo' Na Educação Infantil. 2018. 160 f. Dissertação (Mestrado em Educação) – Universidade Federal de São Paulo Escola de Filosofia, Letras e Ciências Humanas, Guarulhos, SP, 2018. Available at: https://repositorio.unifesp.br/handle/11600/52670. Access: 07 Apr. 2023.

SCHLIEMANN, A. D.; CARRAHER, D. W.; CARRAHER, T. N. **Na vida dez, na escola zero.** 10. ed. São Paulo: Cortez, 1995.

SCIESZKA, J. **A verdadeira história dos três porquinhos por A. Lobo**. 1. ed. [*S. l.*]: Companhia das Letrinhas, 1993.

SHAUGHNESSY, J. J.; ZECHMEISTER, E. B.; ZECHMEISTER, J. S. **Metodologia de pesquisa em Psicologia**. 9. ed. [*S. l.*]: McGraw-Hill, 2012.

SKOVSMOSE, O. **Desafios de reflexão em Educação Matemática Crítica**. [*S. l.*]: Papirus, 2008.

SMOLE, K. C. S. **A Matemática na educação infantil:** a teoria das inteligências múltiplas na prática escolar. Porto Alegre: Artes Médicas, 2000.

SMOLE, K. C. S.; CANDIDO, P.; STANCANELLI, R. **Matemática e literatura infantil**. 4. ed. Belo Horizonte, MG: Ed. Lê, 1999.

SMOLE, K. C. S.; DINIZ, M. I. S. V.; CÂNDIDO, P. T. **Jogos de matemática de 1º a 5º ano.** Porto Alegre: Artmed, 2007. (Série Cadernos do Mathema. Ensino Fundamental).

SOARES, M. Letramento e alfabetização: as muitas facetas. **Revista Brasileira de Educação**, n. 25. Jan./fev./mar./abr. 2004.

SOUZA, M. F. G. Aprendizagem, desenvolvimento e trabalho pedagógico na Educação Infantil: significados e desafios da qualidade. *In:* TACCA, M. C. V. R. (org.). **Aprendizagem e Trabalho Pedagógico**. Campinas, SP: Editora Alínea, 2014. p. 87-130.

SOUZA, M. N. M. de. **Avaliação formativa em Matemática no contexto de jogos**: a interação entre pares, a autorregulação das aprendizagens e a construção de conceitos. 2019. Dissertação (Mestrado em Educação) – Universidade de Brasília, Brasília, DF, 2019.

TACCA, M. C. V. R. Processos de aprendizagem e perspectiva histórico-cultural: concepções e possibilidades em torno do movimento de inclusão. *In:* GALVÃO, A.; SANTOS, G. L. dos. **Educação, arte e mídias, gênero, raça/etnia e juventude, educação, ambiental, diversidade e inclusão**. Brasília, DF: Líber Livro: Anped, 2008. p. 131-146.

VERGNAUD, G. O que é aprender? *In:* MUNIZ, C. A.; BITTAR, M. (org.). **A aprendizagem matemática na perspectiva da Teoria dos Campos Conceituais**. 1. ed. Curitiba: Editora CRV, 2009. v. 1, p. 1-93.

VIGOTSKI, L. S. A brincadeira e o seu papel no desenvolvimento psíquico da criança. **Revista Virtual de Gestão e Iniciativas Sociais**, Rio de Janeiro, n. 8, 2008. Available at: https://atividart.files.wordpress.com/2016/05/a-brincadeira-e-seu-papel-no-desenvolvimento-psiquico-da-crianc3a7a.pdf Access: 02 May 2022.

VIGOTSKI, L. S. **Psicologia Pedagógica**. Porto Alegre: Artmed, 2003.

VIGOTSKI, L. S. **Pensamento e linguagem**. Tradução de Jefferson Luiz Camargo. 2. ed. São Paulo: Martins Fontes, 1998.

CRediT Author Statement

- **Recognitions**: Participants of the Research Group *Dzeta* Investigations in Mathematics Education (DIEM) and Postgraduate Program in Education at the Faculty of Education of the University of Brasília (PPGE/UnB – Academic and Professional), Postgraduate Program in Developmental Psychology and School (PPGPDE) and the State Department of Education of the Federal District.
- **Financing**: Yes. FapDF Notices 03/2021 – Induced Demand; 12/2022 FapDF *Learning* and 03/2023 - FapDF Publica.
- **Conflicts of interest**: No conflicts of interest were identified in the development of this research.
- **Ethical approval**: The work respected ethics during the research and, although it did not go through the Research Ethics Committee, the activities offered in the intervention, which gave rise to this work, offered minimal risks, according to guidelines proposed by Shaughnessy *et al*. (2012). It is important to consider that, throughout the workshop, the researchers informed their collaborators that in the event that harm occurred to the participant, despite the protective care to which the researchers committed, support would be provided with the necessary assistance. The wishes of all collaborators were respected and a consent form was requested to participate in our study and informed that they could withdraw at any time. Furthermore, the intervention was part of the syllabus of the Mathematics Education discipline offered by the Faculty of Education, in the optional modality, for undergraduates at the University of Brasília.
- **Availability of data and material**: Not applicable.
- **Author contributions**: Meire Nadja Meira de Souza: development of the workshop, conception, investigation, construction of data, writing, review and editing of the article; Ana Tereza Ramos de Jesus Ferreira: development of the workshop, conception and design of the article, investigation, data construction, writing and review; Geraldo Eustáquio Moreira: workshop development, study design, planning guidance, methodology, data construction, writing, and review of the text.

Processing and editing: Editora Ibero-Americana de Educação.
Review, formatting, standardization, and translation.