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Educação Matemática Debate

Stories and Problem Solving in Mathematics: a path to the development of children's creative thinking in Preschool

Abstract: The research analyzed the development of creative thinking and the understanding of mathematical notions through practices that explore solving mathematical problems related to a children's story. The study is part of a qualitative research of the action-research type; presents discussions on creativity and the use of children's stories and problem-solving for its development. It also describes and analyzes a practice carried out with children in Prescchool. The data collection instruments used were: the records of the teacher-researcher and the children, as well as images. The analyses indicated that activities of this type stimulate children to seek out different strategies and resolutions, characteristics of creative thinking, and allow them to internalize the mathematical notions explored.

Keywords: Creative Thinking. Creativity. Educational Practice. Problem Solving. Children's Story.

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Article

Historias y Resolución de Problemas Matemáticos: un camino para el desarrollo del pensamiento creativo de los niños en Preescolar

Resumen: La investigación analiza el desarrollo del pensamiento creativo y la comprensión de nociones matemáticas en prácticas que exploran la resolución de problemas matemáticos relacionados con una historia infantil. El estudio forma parte de una investigación cualitativa de tipo investigación-acción; presenta discusiones sobre la creatividad y el uso de historias infantiles y resolución de problemas para su desarrollo. También se describe y analiza una práctica realizada con niños y niñas de Educación Infantil. Como instrumentos de elaboración de datos se utilizaron: los registros de la profesora-investigadora, de los niños y las imágenes. Los análisis señalaron que actividades de este tipo estimulan a los niños a buscar estrategias y resoluciones diferenciadas, características del pensamiento creativo, y les permiten apropiarse de las nociones matemáticas exploradas.

Palabras clave: Pensamiento Creativo. Creatividad. Práctica Educativa. Resolución de Problemas. Historia Infantil.

Histórias Infantis e Resolução de Problemas Matemáticos: um caminho para o desenvolvimento do pensamento criativo das crianças na Pré-escola

Resumo: A pesquisa analisou o desenvolvimento do pensamento criativo e a compreensão de noções matemáticas por meio de práticas que exploram a resolução de problemas matemáticos relacionados a uma história infantil. O estudo é parte de uma pesquisa qualitativa do tipo pesquisa-ação; apresenta discussões sobre a criatividade, o uso de histórias infantis e a resolução de problemas para seu desenvolvimento, além de descrever e analisar uma prática realizada com crianças de uma pré-escola. Para a coleta de dados, utilizaram-se os registros da professora-pesquisadora, das crianças e imagens. As análises apontaram que esse tipo de atividade estimula as crianças a desenvolver estratégias e resoluções diferenciadas, características do pensamento criativo, além de possibilitar a apropriação das noções matemáticas exploradas.

Palavras-chave: Pensamento Criativo. Criatividade. Prática Educativa. Resolução de Problema. História Infantil.

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1 Introduction

In Brazil, Early Childhood Education serves children from zero to five years and eleven months, with the main objective of their integral development. To achieve this purpose, it is essential that practices are carried out based on the guiding axes of interaction and play, promoting learning that involves living together, playing, participating, exploring, expressing oneself and knowing oneself (Brasil, 2010). Therefore, it is important that teachers are clear that this learning happens constantly, whether through routine practices, free practices or intentional practices. This knowledge leads them to be attentive to all moments of the child, whether they are of care and/or education, seeking to observe reactions, interactions and discoveries.

Regarding the potential of intentional practices, when they are carried out with problematization and investigation, they can be immense, since, in order for children to solve and research something, they need to develop notions in the most diverse areas. This knowledge of the teacher enhances their practice and, consequently, the children's learning.

> [...] Early Childhood Education needs to promote experiences in which children can *make observations, manipulate objects, investigate and explore their surroundings, raise hypotheses and consult sources of information to seek answers* to their curiosities and questions. Thus, the school institution is creating opportunities for children to expand their knowledge of the physical and sociocultural world and to be able to use it in their daily lives (Brasil, 2017, p. 43, our emphasis).

In this context, Belo and Burak (2020, p. 7) state that, in Early Childhood Education, it is important that pedagogical practice be carried out "based on playful activities, such as games, music, children's stories, games and others that are of interest to children". In other words, it is essential to start from what is important to them, enabling the mobilization of their prior knowledge.

In addition, several researchers, such as Amarilha (1997), Coelho (1991) and Monteiro et al. (2020), have affirmed the relevance of children's stories and contact with books by children for their integral development. Faria et al. (2017, p. 31) assure that "it is in childhood that the first life experiences are constructed that will support the formation of character, personality and conscience. In this sense, children must be inserted into a culture that stimulates thinking, feeling, expressing and experiencing", which occurs when they have access to children's stories.

In turn, Coelho (1991) emphasizes the importance of children's books both in the area of literary arts and in pedagogical practices so that the child is surrounded by an environment in which entertainment and education occur simultaneously. Thinking about the development of mathematical notions and language, Arnold (2016) and Carcanholo and Duarte (2016) discuss, in their research, the potential of using the contexts explored in children's stories, their illustrations and even problematizations elaborated based on them.

Monteiro et al. (2020) state that, in the context of problematization, contact with children's stories stimulates *children's creative capacity*. This contact helps them create connections between elements and develop original resolutions to problems presented in the story, which can contribute to the understanding of concepts in various areas of knowledge.

Thus, it is believed that the integration between children's stories and the investigation or resolution of problems linked to them, children's learning and development can be enhanced in all areas, including mathematical notions and language. In this sense, Smole, Cândido and Stancanelli (1999, p. 20, emphasis added) state that "reading the text necessarily requires debate, dialogue, criticism and *creation*. Exploring problems in this context can help students

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transfer this process to other problem-solving situations".

The statements by Monteiro et al. (2020) and Smole, Cândido and Stancanelli (1999) indicate that, in addition to contributing to children's learning in relation to mathematical notions and language, children's stories and problem-solving contribute to the development of creativity. However, for this creativity to be observed, it is essential that the teacher understands how it manifests itself.

With a focus on promoting creativity and understanding mathematical notions and language, this study aims to discuss the meaning of creative thinking and its characteristics in practices that explore mathematical notions and language through problem-solving related to a children's story. To this end, it presents a theoretical framework on the topic, a description of a practice carried out with children in Early Childhood Education, and an analysis of creative thinking.

It is important to define what is meant by *understanding*, which, according to Van de Walle (2009, p. 45), corresponds to the "number of connections that an idea has with existing ones".

Initially, this study discusses the concept of creative thinking and creativity in Mathematics, as well as the cognitive activities that represent them. Next, a brief explanation is presented on the relevance of children's stories in Early Childhood Education and the practices that explore problem-solving based on these stories for understanding mathematical notions and language. Finally, the importance of working with problem-solving in Early Childhood Education is addressed, as well as the analysis of a practice carried out.

2 Creativity in Mathematics and practices involving children's stories and problem solving

Higher-order thinking, a uniquely human capacity, involves advanced cognitive abilites such as abstract reasoning, complex problem-solving, critical thinking, and *imagination*, which plays a crucial role in various spheres of life, including art, science, business, and innovation (Gontijo et al., 2019). In this study it is assumed that imagination is the basis for the development of creativity, so that it constitutes an intrinsically human ability, enabling the generation of original ideas, innovative resolutions, and the production of something new from the combination of information, experiences, and pre-existing knowledge.

Researchers who study the development of creativity, such as Bicer (2021) and Gontijo et al. (2019), state that it dates back to the beginnings of humanity, being understood in different ways: as something mystical, as a capacity related to genius, or as a human construction, depending on the evolution of studies on the subject. Below, a brief description of the meaning of each of these interpretations is presented.

2.1 Mystical conception

Gontijo et al. (2019) state that there is evidence that the first perceptions of creativity attributed a mystical character to it. From this perspective, people were affected by a *divine* being, which enabled them to have creative actions. Plato himself, in his writings, referred to an "inspiring muse of poets" (Gontijo et al., 2019, p. 19), which was not a real being.

2.2 Conception of genius

The conception of creativity as genius does not consider it a divine gift, but rather an innate ability of some people. Silver (1997) asserts that this conception presents creativity as a rare characteristic, which only a privileged few possess, so that, when they need it, creative ideas emerge without much effort. He adds that "the genius view of creativity suggests that it

is probably not strongly influenced by instruction and that creative work is more a matter of occasional bursts of insight than the kind of steady progression toward completion that tends to be valued in school" (Silver, 1997, p. 75).

Gontijo et al. (2019) present some examples of people who stood out for their creativity in various areas, being considered geniuses. In the arts, Leonardo da Vinci, Michelangelo and Raphael, who lived in the Renaissance period — between the 14th and 17th centuries — whose creations are considered masterpieces to this day. In the field of science, Galileo Galilei and Isaac Newton were some of the scientists who challenged traditional views and transformed our understanding of the natural world.

These examples illustrate people who stood out for their creativity. However, it is important to note that, according to this view, a person is either born creative or not. There is no possibility of developing it throughout life.

2.3 Conception of creativity as a human construct

Silver (1994, p. 75) states that, in this conception, "creativity is closely related to deep and flexible knowledge in content domains; and is often associated with long periods of work and reflection". Gontijo et al. (2019) complement this by stating that it is a human construct, which results from mental work, that is, it arises from a problem and develops based on intentionality, seeking new ways of solving or responding.

In this conception, creativity is constituted as a human capacity that can be developed, and education is responsible for promoting the implementation of practices that encourage children and young people to improve it. This view is believed and, for this reason, it is important to discuss how to stimulate it in pedagogical practices, more specifically in those involving mathematical notions.

According to the Base Nacional Comum Curricular [National Common Curriculum Base — BNCC] (Brasil, 2017), institutions that foster the expression of creativity among children contribute significantly to the development of research, hypothesis formulation and testing abilities. Additionally, they encourage the ability to generate solutions based on the accumulation of knowledge from different areas of knowledge.

By encouraging creativity, Early Childhood Education institutions show children the importance of seeking innovative approaches to the challenges they face. In addition, they promote the ability to deal more effectively with failures and frustrations in everyday school and personal life, helping them to see mistakes not as obstacles, but as learning opportunities. Fear of making mistakes, when not addressed, can cause embarrassment and inhibit a child's ability to venture out, explore and reason independently.

In the reference classrooms[1] of Early Childhood Education institutions, practices involving Mathematics invite the understanding of creativity as a fundamental ability for children's development. Although mathematics is often perceived as a domain of rigidity and precision, in which calculations follow exact rules and problems are solved through well-defined methods, there is a world of creative possibilities that challenges this conventional perception.

Creativity in Mathematics is an intriguing and multifaceted phenomenon, which reveals a fascinating intersection between logical rigor and imagination. It is important that teachers work with children to develop creative thinking in addition to mathematical understanding. According to Oliveira and Carneiro (2023, p. 15), creative thinking is an "inventive and

[1] According to Fochi (2015), reference classrooms are spaces of living and belonging, where children and teachers spend several hours a day together and carry out their daily routines.

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inquisitive mental action that provides the person solving a challenging task or problem with the opportunity to develop different innovative strategies in the process of formulating and solving the problem situation, thus stimulating creativity in Mathematics".

This process involves three cognitive activities, which Silver (1994) calls *fluency*, *flexibility*, and *novelty*. These activities are described below based on the author's definitions.

a) *Fluency*: refers to the ability to generate many ideas or answers in a short period of time. This ability demonstrates ease and speed of thought, allowing many solutions to be produced. The greater the number of ideas generated, the greater the chances of finding an innovative and effective solution to a problem. Thus, it constitutes an essential aspect of creativity, since it broadens the spectrum of available options to be explored.

b) *Flexibility:* is the ability to adapt to new situations, think in different ways and change approaches when necessary. In terms of creative thinking, flexibility allows us to see a problem from multiple perspectives and consider different alternatives. This is crucial for finding unconventional solutions, since it allows us to change our way of thinking and explore non-obvious paths, increasing the likelihood of arriving at unique and innovative answers.

c) *Novelty:* involves the production of original and unique ideas that stand out from the conventional. In the context of creativity, novelty represents innovation and the introduction of new ways of thinking or doing things. An idea is considered new if it is original and not a simple variation of something already existing. The search for novelty is what drives progress and innovation in various fields of knowledge, becoming a central pillar for any creative process.

In summary, *fluidity* generates a profusion of ideas, *flexibility* provides the ability to adapt and explore different paths, while *novelty* ensures originality. These three abilities, together, form the foundation of inventiveness, paving the way for the discovery of innovative and effective solutions in multiple scenarios.

Based on the above, it can be stated, following Bicer (2021), that creative capacity in learning Mathematics involves the generation of ideas, procedures or products related to mathematical patterns and models. As long as they are innovative for those who created them, even if they are already known by other people, these products contribute to developing mathematical thinking.

Stimulating creative thinking provides broad benefits, strengthening children's problem-solving abilities, confidence and autonomy. As they discover their creative potential and have confidence in their abilities, they become more able to face challenges with creativity and initiative. Thus, the development of creativity in Early Childhood Education is fundamental for the integral development of children. By offering a safe and stimulating environment to explore, ask questions, create and propose solutions, their curiosity is valued and cognitive flexibility, essential to their understanding of the world and their actions in it, is encouraged.

In view of this, it is up to teachers working in early childhood education institutions to develop intentional educational practices that develop creative thinking and, consequently, children's creativity. To this end, it is imperative to offer diverse experiences that promote analysis and synthesis, through problem-solving, the use of varied materials and the integration of various areas.

This proposal is based on the combination of practices that involve solving mathematical problems, linked to children's stories. In this context, work with children's stories was chosen because it is widely encouraged as a strategy to stimulate children's imagination, since

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> Listening to stories is very important for the development of any child, as it allows them to *foster children's imagination*, answer questions and create new ideas, feel emotions, stimulate intellectual capacity, discover the world, thus developing the child's full potential, leading them to think, question and doubt (Monteiro et al., 2020, p. 6, our emphasis).

Furthermore, as Coelho (1991) states, its pedagogical use makes it possible to explore issues related to children's stories in various areas. Regarding the exploration of mathematical notions and language, Smole, Cândido and Stancanelli (1999, p. 12) indicate that

> stories help students learn and do mathematics, as well as explore places, characteristics and events in the story, which allows mathematical and language abilities to develop together, while students read, write and talk about the mathematical ideas that appear throughout the reading.

Furthermore, the combination of reading children's stories with problematization makes children identify mathematical notions and language in different contexts, encouraging them to seek their prior knowledge to solve the proposed problem related to the story presented, in addition to stimulating them to reflect on the situation and use mathematical notions to solve it.

> This type of practice, where the student has the opportunity to communicate what they think and explain their reasoning, is quite natural when, upon listening to a story, the child is asked about what happened or is about to happen. This dialogue between teacher and student, in resuming what they heard or in trying to predict what will happen, is fundamental for solving a mathematical problem, as it allows the student to reflect on their hypotheses and, at times, reformulate them, arriving at a more elaborate knowledge (Montoito and Cunha, 2020, p. 173).

Working on mathematical concepts in Early Childhood Education helps children understand and interact better with the world around them. As Miranda and Sá (2020) point out, the goal at this stage is not to teach Mathematics in isolation, but to contribute to the child's development. After all, Mathematics, like other areas of knowledge, contributes to the construction of meanings about reality.

In this sense, problem-solving allows children to learn in a natural and engaging way, relating mathematical concepts to concrete situations. Smole, Candido and Stancanelli (1999, p. 20) point out that the relationship between children's stories and mathematical problems makes this process even more meaningful, since it encourages children's active participation in the search for solutions. They can use different resources, such as drawings, oral expression, dramatization and trial and error, making learning more dynamic and closer to their experience.

Exploring mathematical concepts and language in a playful and interactive universe, respecting children's different ways of thinking and expressing, creates an environment in which they not only understand what is being discussed, but also develop creativity.

In this context, it is important to present how to understand problem-solving work in Early Childhood Education. According to Allevato and Onuchic (2021), working with problem-solving means presenting a problem and, through its resolution, developing new knowledge. This problem, in Early Childhood Education, often takes the form of a challenge or a question to be solved by children. It is called a *generating problem*, since, according to the authors, it aims to explore new notions.

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Thus, the Teaching-Learning-Assessment methodology of Mathematics through Problem-Solving, presented by Allevato and Onuchic (2021), is followed, with adaptations. This adaptation is necessary, considering that these are children in Early Childhood Education who have not yet learned to read and write. However, the aim is to preserve the essential stages of this methodology, which are described below.

a) *Presentation of the problem-generating factor:* since problem-solving is linked to a children's story, the teacher begins by reading the book and, when the issue to be resolved arises, asks the children to think about it and seek a solution. According to Mandel, Silva and Possamai (2023, p. 56-57), "this is the moment when the child's curiosity about the story is aroused and can be carried out with materials that are related to it, based on questions that lead the child to interact".

b) *Problem-solving:* individually or in groups, the children discuss the proposed problem and seek to solve it, making records (often pictorial) of how they think about the solution. At this time, the teacher encourages and observes. According to Allevato and Onuchic (2021, p. 49), the teacher observes "the work of the students, encouraging them to use their prior knowledge and [...] to exchange ideas".

c) *Children present their solutions:* at this point, children show their records and explain to their peers what they did. The teacher encourages them, through questions, seeking to explore the knowledge involved. It is important to encourage them to present and pay attention, in order to explore the various possibilities of reaching the solution (Allevato and Onuchic, 2021).

d) *Knowledge is formalized:* in Early Childhood Education, formalization consists of exploring children's understandings and, in discussions, leading them to understand the mathematical notions involved.

There is no formalization of knowledge per se, as the objective of this stage of Basic Education is not about teaching a specific subject, such as Mathematics, but to provide children with an understanding of the mathematical notions and language present in the practice carried out, contributing to the understanding of the context explored.

> Given that children reinterpret the world, it is no different with mathematical knowledge. In Early Childhood Education, they begin to have experiences linked to mathematical language and build reference parameters to "read" the world mathematically, through games and playful experiences proposed, intentionally, by teachers (Ciríaco, Miranda and Brasil, 2024, p. 5).

e) *Complementary problem-solving:* in Early Childhood Education, these problems aim to explore the same notion in different contexts or deepen knowledge about a certain concept.

These moments encourage children to seek new paths (flexibility), express their ideas (fluidity) and understand different forms of resolutions (novelty). In this way, as Costa and Gontijo (2023) point out, when the teacher gives children a voice and values their ideas, practices based on problem-solving become a path to promoting creativity.

3 Methodological approach

The research followed a qualitative approach of the action research type, since each stage occurred in a continuous process of planning, implementation, description and evaluation, aiming to improve both practice and research throughout the process (Tripp, 2005). Regarding the objectives, it is characterized as a descriptive study. This method allowed a detailed analysis

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of the interactions and strategies used by children when solving the problems presented, allowing the investigation of the development of creativity in this context.

The research was carried out in Preschool in Blumenau (SC, Brazil), involving 26 children, at the end of 2024. At that time, most of them already had knowledge about the number-quantity relationship up to 10 and understood the number-order relationship. As for writing, they recognized some letters and identified the spelling of some words, even without having learned to read and write.

This experience is part of a broader study, developed within the scope of a Professional Master's Degree, which researches the development of creativity and the understanding of mathematical notions and language. In this specific stage, only one of the practices carried out is described and analyzed, with a focus on the creativity that emerged in the process, its analysis and the mathematical understandings developed.

The intervention was conducted in the reference classrooms, which was properly organized so that the children could move around and discover freely. Barbosa (2010), when discussing practices to be carried out with babies, states that it is important to carefully consider the space in which children carry out their practices, so that they are safe and stimulating, allowing them to experience different experiences. This statement is extended to practices carried out with very young children and small children, since they also need care and freedom to develop fully.

The practice presented was based on the book *Os mistérios da Caixa: desvendando a Matemática por meio de Problemas* [The Mysteries of the Box: unraveling Mathematics through Problems], prepared specifically for this research by the authors of this article. The material was developed in the context of the professional master's degree, which is in the process of being finalized, carried out in the Postgraduate Program in Teaching Natural Sciences and Mathematics, of the Regional University of Blumenau. The problem analyzed corresponds to the second challenge solved by the children, the details of which will be presented in the description of the activity.

Data collection was performed using three complementary methods, providing a broader and more detailed analysis. The first method consisted of the teacher-researcher's records in her logbook; the second included audio recordings of the children's speeches; and the third method involved the analysis of images obtained through photographs of the practice and the children's written records. These three methods were used in a complementary manner, ensuring a more comprehensive view of the practice and enabling a detailed analysis of the children's interactions and learning throughout the process.

The analysis sought to verify whether the practice contributed to the development of the children's creativity. The intervention was conducted based on categories developed a priori, based on the theoretical framework. Thus, cognitive activities that constitute creative thinking were considered: fluency, flexibility and novelty, seeking to observe these characteristics as pointed out by Silver (1994).

a) Fluency: checking the understanding of mathematical notions and language explored.

b) Flexibility: observing the different strategies developed based on the instructions presented.

c) Novelty: analyzing the number of original answers and justifications for the problem.

The following is a complete description of the practice carried out, followed by the analysis based on the highlighted focuses.

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4 Description of the practice

The practice was carried out based on a children's book specifically designed to work with problem-solving involving mathematical notions, in order to explore these knowledge with children and stimulate their creativity.

The book contains five generating problems, each exploring a mathematical field: numerical, spatial, magnitudes and measurements, algebraic and statistical. In addition to these, there are five complementary problems, which consist of mathematical questions or challenges that accompany the generating problems, with the aim of expanding or diversifying the possibilities of resolution and deepening the mathematical notion explored a little more.

The problem presented and analyzed in this research was selected because it addresses the field of *Measurements*, a branch of Mathematics that allows the development of interdisciplinary practices and the exploration of concepts related to different mathematical areas.

The process took place weekly. It was agreed with the children that every Monday they would resume reading the book printed on A3 sheets, continuing the story. In addition, one child would be responsible for taking out the envelope containing the challenge — the name given to the problems — to be solved. The complementary problems would be solved on the same day or distributed on alternative days throughout the week.

On the day of this practice, the room was organized so that the children could sit in a circle and listen to the story, together with the teacher, who was holding the book in her hands. Since this was the second practice carried out with the children, involving the book, it began by recalling the beginning of the children's story. They showed interest and participated by talking about the characters, the context in which they found themselves and the problem solved the previous week. After this resumption, they expressed a desire to continue the story and discover the next challenge to be solved.

In the plot, the characters held a box containing mathematical challenges to be solved. As a way to encourage children to interact with them, the challenges were presented on cards, placed inside individual envelopes and attached to the boxes drawn on the pages of the book. Thus, in each practice, when a character took a card from the box, one of the children was invited to go to the book and take out the envelope with the question to be read.

The book was opened on the page where the envelope with the problem was, and one of the children was chosen to take it out and enable it to be read. The image presented in Figure 1 shows the page of the book and the problem to be solved in the digital version. In the physical copy used in the classroom, instead of the card with the problem, there was an envelope containing the letter.

The child held the letter, observed the drawings contained in it and interpreted that the problem would involve old things, animals and leaves, sharing this observation with his classmates. Next, the curiosity and the challenge were read aloud. Figure 2 presents the letter in detail, to facilitate its analysis.

The reading aroused the children’s curiosity, and they began to ask how these methods worked. They wondered how it was possible to measure using arms and feet. Taking advantage of the children’s involvement and interest, the challenge in the letter was proposed: *“Measure the table with your hand”*, leaving them free to interpret the request and carry out the activity as they wished, without the teacher’s guidance.

> For students to be able to present the different ways they use to solve problems, it is up to the teacher to provide a space for discussion in which they

can think about the problems they will solve, develop a strategy and record the solution found or the resources they used to reach the result (Cavalcanti, 2001, p. 122).

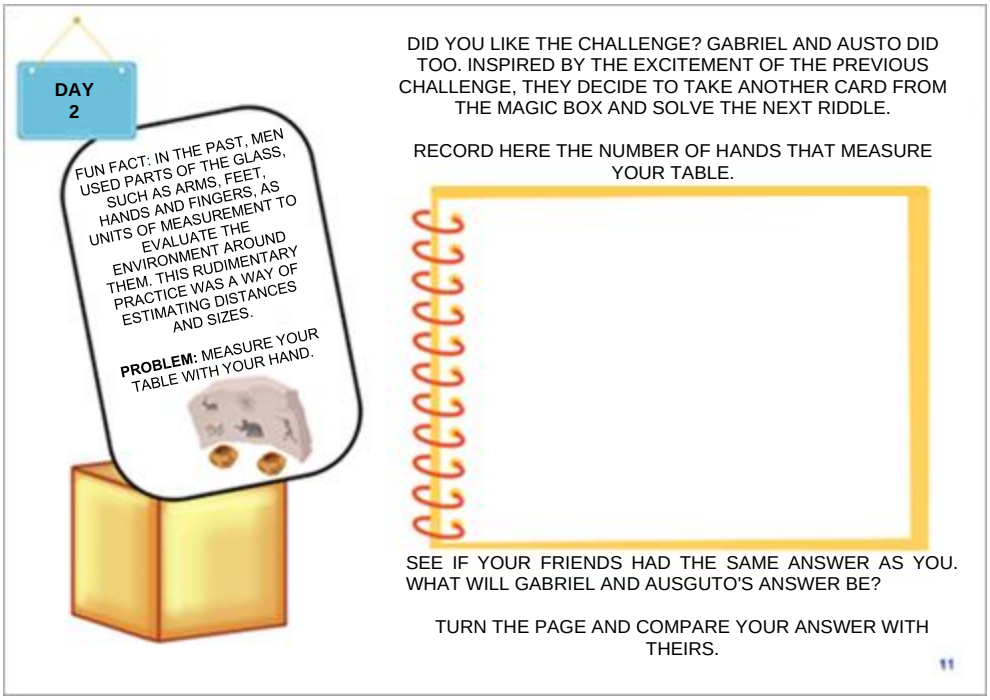

Figure 1: Page of the book with the problem presented to the children (Kraft and Silva, 2025, p. 11)

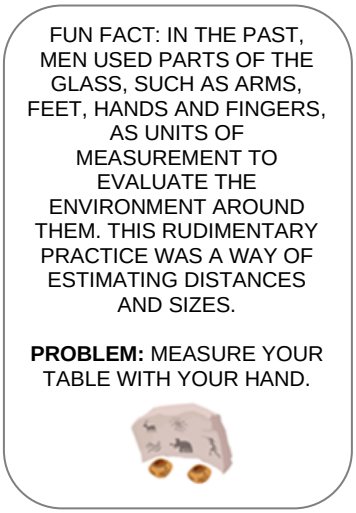

Figure 2: File with the problem to be solved (Kraft and Silva, 2025, p. 11)

Free to do the activity as they wished, some children measured the top of the table, while others chose to measure its height, that is, its feet. There were also those who measured the two non-parallel sides of the top. In total, about five different parts of the table were observed being measured. This demonstrates how hands-on learning, combined with children's natural curiosity, can make the experience more engaging.

It can be said that the diversity of perceptions about which part of the table should be measured highlights the fluency of ideas related to the proposed problem. According to Gontijo (2024, p. 197), this fluency "corresponds to the ability to present an abundance or large quantity of ideas on the same subject or possible answers to the same problem", which was clearly observed at this moment in the practice.

After the activity of measuring with their hands, the children wanted to present their resolutions. Socialization took place, in which all presented their strategies orally, while the others listened attentively.

Possamai and Allevato (2024) state, based on work carried out in Elementary School, that it is essential to consider students' involvement and willingness to explore new knowledge. When activities are playful and promote active participation, children demonstrate great interest and enthusiasm, which enhances learning.

It can be seen in this practice that, even though they are small and have a greater tendency to disperse, when involved in the practice, the children remain attentive and participate continuously.

In this stage of the process, they found that they performed measurements in different ways and obtained varied results. Table 1 presents the solutions of four children, selected to exemplify the diversity of strategies used. To differentiate them, they were identified by numbers.

Table 1: Description of the practice carried out by some children

Child	Part of the table measured	How the measurement was taken	Result
1	Table top and legs	Hand	13 hands
2	Table top	Palm of the hand	7 hands
3	Table top	Tip of the big finger to the wrist	4 hands
4	Table top	Palm of the hand	8 hands

Source: Own elaboration

Initially, the children only presented the results they had found, but they soon became curious to understand why the values were so different. Then, each one explained how they had performed the task.

Child 1 mentioned that he had measured the entire table, including the top and the legs. The others measured only the top, but in different ways. Child 2, when explaining his approach, revealed that he had not been careful to position his hands very close together. Child 3 used the distance from the tip of his biggest finger to his wrist, instead of the measurement between his thumb and little finger. Child 4, when presenting his resolution, showed that he had measured the two non-parallel sides of the top and stated that they were equal. None of the children considered measuring the area of the table top, only its length.

The children used different methods to measure the table, demonstrating the active construction of mathematical knowledge and the development of creative thinking. Van de Walle (2009) highlights that meaningful mathematical learning occurs when children are encouraged to explore different strategies and share their discoveries.

During the practice, it was possible to observe the children's involvement in the process of investigation and experimentation, testing different ways of measuring the table. Table 1 exemplifies the diversity of responses presented by the children. By freely exploring different strategies and comparing the results with each other, they begin to understand concepts such as variability in measurements and the importance of precision, which is a natural introduction to the notion of standards, units of measurement and consistency.

Allowing children to explore problems based on their own understandings, as highlighted by Possamai and Allevato (2024), is central to mathematical development, as it allows them, when articulating their discoveries, to build a deeper knowledge about Mathematics and the world around them. Thus, curiosity and the desire to investigate are

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catalysts for meaningful and lasting learning, encouraging them to formulate questions, test hypotheses and reflect on their practices. In this way, the development of critical thinking, creativity and abilities for solving problems in everyday life is promoted.

After measurement and socialization, each child received a sheet to record the practice carried out, considering that each one used a unique measurement method.

> [..] it is important to encourage them to record, even if it is through drawings, and ask them to explain how they thought to solve the problems. At this point, the teacher will be able to understand their reasoning and make the necessary intervention to correct mistakes, in order to contribute to the development of mathematical reasoning (Carvalho, 2014, p. 159).

The records of four other children were chosen to portray, in Figure 3, the different ways of representing the practice. These records reinforce the previous statement that, when presenting an open question, the children adopted different resolution strategies, arriving at different results. This fact allowed discussions and understanding about the mathematical field involved.

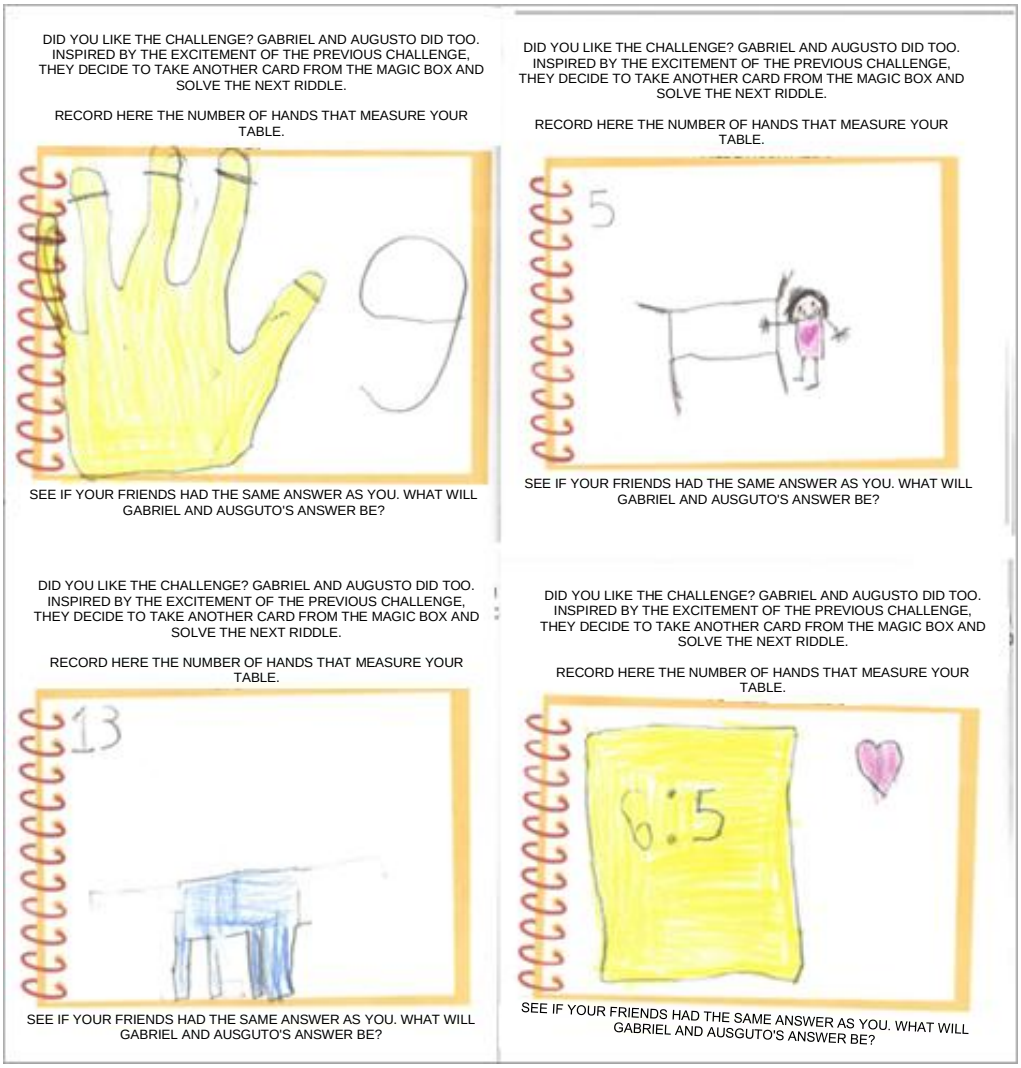

Figure 3: Research Archive

It was observed that the child who drew the picture in the upper left represented a hand, indicating that he had measured the table with it, and, next to it, he wrote the number nine,

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showing how many times this measurement was used. In the upper right drawing, the child depicted himself with his hand on the table, indicating that he had measured the side of the top, noting the number of hands used for this measurement.

In the lower left image, the child drew the entire table and the number 13. When questioned, he said that he had measured the top and the legs of the table. In the lower right drawing, the representation shows that the child measured the two non-parallel sides of the table top, verifying that one of them had five hands and the other, six.

The different ways of presenting the results demonstrate the development of cognitive activity associated with novelty (Gontijo, 2024), since Figure 3 exemplifies the originality of the children in their representations.

After the presentations, the children discussed why the values were different and concluded that this was due to the variation in hand size and the way they used to measure. Some used their hands closed, others open; some did not bother to position them together, while others measured using the distance between the largest finger and the wrist. The fact that they used more than five different ways of measuring influenced the divergence of the results.

At this point, the children demonstrated flexibility in their thinking, understanding that the different results were derived from the approaches to solving the problem or from the fact that the measuring instrument, the hand, was of different sizes (Silver, 1994). After reaching this conclusion, at the children's request, the page of the book was turned to show the results obtained by the characters in the story, and they realized that they had also found different values.

Continuing the activity, the next page was read (Figure 4), which presented a complementary problem. Observing the children, it was possible to notice their enthusiasm as they prepared to begin the next practice.

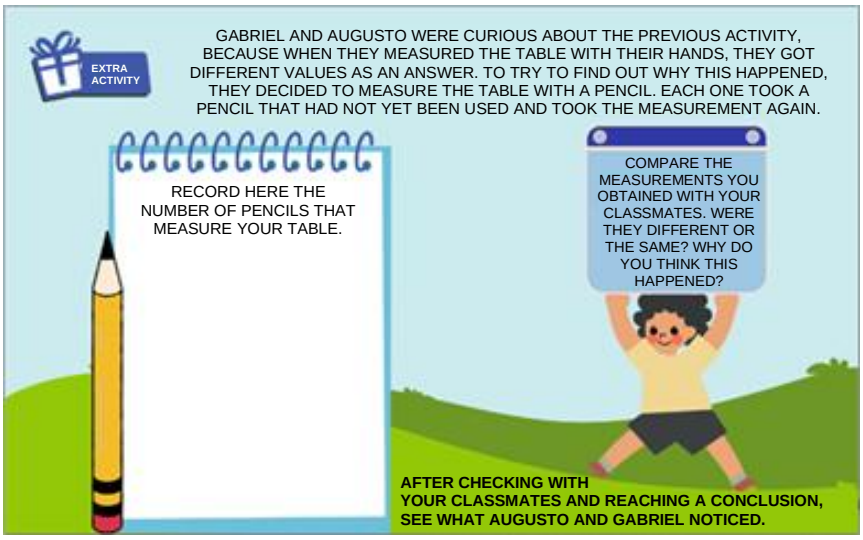

Figura 4: Problema Complementar (Kraft and Silva, 2025, p. 13)

After reading, the children took their pencils to measure the table and, this time, it was agreed that they should measure its width. However, when comparing the pencils with each other, they realized that they were of different sizes, which generated a discussion about the differences in measurement that could arise. According to Van de Walle (2009, p. 407), “a discussion about the need for a standard unit can be more meaningful after the groups in your class have measured the same objects with their own units and arrived at different answers”.

Given the understanding that the size of the pencils should be the same, new pencils were distributed, all the same size, instructing the children to use them as a standard

measurement, without introducing conventional units of measurement, such as centimeters or meters, at that moment.

After this new measurement, the sentence on the board that the character in the story was holding was read. The children began to compare their results with those of their classmates, and most obtained the same value, with only five presenting different measurements.

A boy, seeing the discussion among his classmates about the fact that the previous measurements were different and the current ones were the same, quickly explained why this happened: “Each hand has a measurement, because we are different and the pencil has the same measurement for everyone”. This comment generated collective curiosity, leading the children to confirm, by measuring one pencil with another, whether they were all really the same size. This fact demonstrates that “the appropriation of mathematical knowledge does not occur naturally or intuitively; but through the mediation of cultural instruments and signs, through relationships between human beings” (Miranda and Sá, 2020, p. 16). After the discussions and the conclusion presented by one of the children, most began to understand the process.

When they noticed this difference, the children went to the desks of their classmates who had obtained different results and repeated the process, verifying that, in fact, the measurements were the same as theirs. After this verification, they questioned their classmates about the procedure used. When analyzing the measurement process, they realized that some had not positioned the pencils one after the other correctly, but had partially overlapped one pencil over the next, which generated discrepancies in the results. The children discussed among themselves the best way to measure and understood why their values were different.

After the discussions, the page of the book was turned again, and everyone together checked the measurements of the characters in the story. They realized that, when using the pencil as a reference, they had also obtained the same measurements. This reinforced their understanding and confidence in their findings, showing that the measurement of an object is represented by a number and that, in order to find it correctly, a single reference instrument is necessary, allowing the comparison of its length with that of the measured object.

5 Final Considerations

The aim of this article was to discuss the meaning of creative thinking and its characteristics in practices that explore mathematical notions and language through problem-solving related to a children's story. To this end, the theoretical framework that explores the various conceptions of creativity was initially presented, positioning itself in relation to the one considered most pertinent.

Based on this positioning, the difference between creative thinking and creativity was addressed, highlighting the importance of stimulating the former in order to develop the latter, that is, encouraging creative thinking to become more creative.

Then, the cognitive activities that characterize creative thinking were presented — fluency, flexibility, and novelty —, which allow us to verify signs of creativity in the practices carried out by children. Finally, a practice carried out with five- and six-year-old children was analyzed, seeking to identify signs of the mental processes presented previously and their mathematical understandings.

As final considerations of this study, it is stated, based on the experience and analysis, that this practice allowed us to verify that the work related to a children's story led the children to get involved. They enjoyed following and listening to what happened to the characters and created scripts for the continuation of the narrative.

The exploration of this open problem, based on the story, allowed them to reflect on the situation presented, interpreting it according to their understanding and seeking their own strategy to solve it. This process demonstrated the fluency of ideas and the flexibility of thought in the search for measurement instruments. Furthermore, when analyzing the records, we observed the originality of the ways used by the children to represent the action performed and the result obtained.

It is important to mention that, after solving the proposed problem, the children showed great interest in returning to the story to check if the characters had performed the task in the same way, revealing the bond that was formed between them, the characters and the problems presented.

Regarding the knowledge associated with the field of Measurements, it was noted that, as the practice developed, the children began to understand some related notions, such as the need to clearly define what should be measured and the importance of using the same instrument to ensure that, when measuring the same object, the result obtained is consistent.

Therefore, it was believed that pedagogical practices that relate children's stories to problem-solving have great potential for the development of mathematical notions and language and creativity. When the teacher explores open problems and encourages children to think and seek their own strategies to solve them, in addition to creating spaces for socializing resolutions and results and exchanging experiences, he or she strengthens learning. In this process, the teacher's role should be that of a mediator, questioning the strategies adopted and the results obtained, consolidating correct understandings.

References

ALLEVATO, Norma Suely Gomes; ONUCHIC, Lourdes de la Rosa. Ensino-Aprendizagem-Avaliação de Matemática: por que Através da Resolução de Problemas? In: ONUCHIC, Lourdes de la Rosa; ALLEVATO, Norma Suely Gomes; NOGUTI, Fabiane Cristina Höpner; JUSTULIN, Andresa Maria. (Org.). *Resolução de Problemas:* teoria e prática. 2 ed. Jundiaí: Paco Editorial, 2021, p. 37-57.

AMARILHA, Marly. *Estão mortas as fadas?* Literatura infantil e prática pedagógica. Petrópolis: Vozes; Natal: EDUFRN, 1997.

ARNOLD, Denise Soares. *Matemáticas presentes em livros de leitura:* possibilidades para a Educação Infantil. 2016. 241f. Dissertação (Mestrado em Ensino de Matemática). Universidade Federal do Rio Grande do Sul. Porto Alegre.

BARBOSA, Maria Carmen. Especificidades da ação pedagógica com os bebês. *In: Anais do I Seminário Nacional: Currículo em Movimento*. Belo Horizonte, 2010. p. 1-17.

BELO, Cibelli Batista; BURAK, Dionísio. A Modelagem Matemática na Educação Infantil: uma experiência vivida. *Educação Matemática Debate*, v. 4, n. 10, p. 1-22, 2020. https://doi.org/10.24116/emd.e202016

BICER, Ali. A systematic literature review: discipline-specific and general instructional practices fostering the mathematical creativity of students. *International Journal of Education in Mathematics, Science, and Technology*, v. 9, n. 2, p. 252-281, 2021. https://doi.org/10.46328/ijemst.1254

BRASIL. Ministério da Educação. Secretaria de Educação Básica. *Base Nacional Comum Curricular:* Educação Infantil e Ensino Fundamental. Brasília: MEC/SEB, 2017.

BRASIL. Ministério da Educação. Secretaria de Educação Básica. *Diretrizes Curriculares Nacionais para a Educação Infantil*. Brasília: MEC/SEB, 2010.

CARCANHOLO, Flávia Pimenta de Souza; DUARTE, Maís Carolina Vieira. A contribuição da literatura infantil para a aprendizagem da Matemática com crianças. *In*: *Anais do IV Seminário de Escritas e Leituras em Educação Matemática*. Natal, 2016. p. 114-123.

CARVALHO. Mercedes. Aprender a contar e a resolver problemas matemáticos na Educação Infantil. In: CARVALHO, Mercedes; BAIRRAL, Marcelo de Almeida. (Org.). *Matemática e Educação Infantil:* investigações e possibilidades de práticas pedagógicas. Petrópolis: Vozes, 2014, p. 145-161.

CAVALCANTI, Claudia. Diferentes formas de Resolver Problemas. In: SMOLE, Kátia Smole; DINIZ, Maria Ignez. (Org.). *Ler, escrever e resolver problemas:* habilidades básicas para aprender Matemática. Porto Alegre: Artmed, 2001, p. 121-149.

CIRÍACO, Klinger Teodoro; MIRANDA, Rebeca Souza; BRASIL, Thais. "Lúcia já vou indo"... e a Matemática também! *Revemop* v. 6. p. 1-16. 2024. https://doi.org/10.33532/revemop.e2024027

COELHO, Nelly Novaes. *Literatura infantil*: teoria, análise, didática. 5. ed. rev. São Paulo: Ática, 1991.

COSTA, Ildenice Lima; GONTIJO, Cleyton Hércules. Pensamento crítico e criativo em Matemática e avaliação formativa: limitações e potencialidades. *Zetetiké*, v. 31, 2023, p. 1-19. https://doi.org/10.20396/zet.v31i00.8672206

FARIA, Inglide Graciele; FLAVIANO, Sebastiana de Lourdes Lopes; GUIMARÃES, Maria Severina Batista; FALEIRO, Wender. A influência da contação de histórias na Educação Infantil. *Mediação*, v. 12, n. 1, p. 30-48, jan.- dez. 2017.

FOCHI, Paulo. *Afinal, o que os bebês fazem no berçário?*. Porto Alegre: Penso, 2015.

GONTIJO, Cleyton Hércules. O problema dos quatro quatros e o pensamento criativo em Matemática: a arte de brincar com os números. *Farol*, v. 31, p. 190-203, 2024.

GONTIJO, Cleyton Hércules; CARVALHO, Alexandre Tolentino de; FONSECA, Mateus Gianni; FARIAS, Mateus Pinheiro de. *Criatividade em Matemática*: conceitos, metodologias e avaliação. Brasília: Editora UnB, 2019.

KRAFT, Ana Luiza Candido; SILVA, Viviane Clotilde. *Os Mistérios da Caixa*: desvendando a Matemática por meio de problemas. 2025. Produto Educacional (Mestrado em Ensino de Ciências Naturais e Matemática). Universidade Regional de Blumenau. Blumenau.

MANDEL, Graciele Zagel; SILVA, Viviane Clotilde; POSSAMAI, Janaína Poffo. Resolução de Problemas a partir de histórias infantis: desenvolvimento de noções matemáticas. *Revista Paranaense de Educação Matemática*, v.12, n. 27, p. 50-75, jan./abr. 2023. https://doi.org/10.33871/22385800.2023.12.27.50-75

MIRANDA, Maria Auristela Barbosa Alves; SÁ, Antônio Villar Marques. Apropriação de conceitos matemáticos na Educação Infantil. *Educação Matemática Debate*, v. 4, n.10, p. 1-23, 2020. https://doi.org/10.46551/emd.e202049

MONTEIRO Solange Aparecida de Souza; FERNANDES, Andreza de Souza; RIBEIRO, Paulo Rennes Marçal; MELO, Heitor Messias Reimão; SANTOS, Pollyana Moreno; BORGES, Marilurdes Cruz. A importância da formação do professor para a contação de histórias na Educação Infantil nos dias atuais. *In*: MONTEIRO, Solange Aparecida de Souza. (Org.) *Formação inicial e continuada de professores*: da teoria à prática. 2. Ponta Grossa: Atenas Editora, 2020. p. 1-11.

MONTOITO, Rafael; CUNHA, Aline Vieira. Era uma vez, um, dois, três: estudos sobre como a literatura infantil pode auxiliar no ensino da construção do conceito de número. *Educação Matemática Pesquisa*, v. 22, n. 1, p. 160-184, jan./abr. 2020. https://doi.org/10.23925/1983-3156.2020v22i1p160-184

OLIVEIRA, Sandra Alves; CARNEIRO, Reginaldo Fernando. Significados e sentidos sobre pensamento criativo e criatividade em Matemática: uma revisão sistemática. *Zetetiké*, v. 31, p. 1-27, 2023. https://doi.org/10.20396/zet.v31i00.8672205

POSSAMAI, Janaína Poffo; ALLEVATO, Norma Sueli Gomes. Proposição de problemas: entendimentos. *Bolema*. v. 38, p. 1-27, 2024. https://doi.org/10.1590/1980-4415v38a2300421

SILVER, Edward. Fostering creativity through instruction rich in mathematical problem solving and problem posing. *ZDM Mathematics Education*, v. 29, n. 3, p. 75-80, jun. 1997. https://doi.org/10.1007/s11858-997-0003-x

SMOLE, Kátia Cristina Smole; CÂNDIDO, Patrícia Terezinha; STANCANELLI, Renata. *Matemática e Literatura Infantil.* Belo Horizonte: Editora Lê, 1999.

TRIPP, David. Pesquisa-ação: uma introdução metodológica. *Educação e Pesquisa*, v. 31, n. 3, p. 443-466, set./dez. 2005. https://doi.org/10.1590/S1517-97022005000300009

VAN DE WALLE, John Arthur. *Matemática no Ensino Fundamental:* formação de professores e aplicações em sala de aula. Tradução de Paulo Henrique Colonese. 6. ed. Porto Alegre: Artmed, 2009.