The exploration of probabilistic language through children's literature in the Early Years of Elementary School[1]

Emilly Rayane Moura Diniz Santos[2]

ABSTRACT

This research investigates the potential of children's literature for the mobilization of probabilistic language, developing an exploratory study of a qualitative nature, with six students of the 5th year of the initial years of Elementary School, in which Piagetian Clinical interviews were carried out through storytelling. The results show that students mobilize different languages in their justifications, such as verbal, numerical and symbolic language, presenting understandings from the most intuitive to the most complex about the different cognitive demands, in addition to a qualitative advance in the mobilization of verbal and numerical expressions, applying these expressions appropriately. We conclude that the use of children's literature facilitated the mobilization of various aspects of probabilistic language and cognitive demands, as it is necessary to become familiar with the language, through the use of different types of expressions to find meaning in what you read and write.

KEYWORDS: Probability; Probability Teaching; Probabilistic language; Children's literature; Elementary School.

---

[1] English version by Carla Maria Leoncio da Silva. *E-mail*: carlamaria.freitas@gmail.com.
[2] Doutoranda em Educação Matemática e Tecnológica. Universidade Federal de Pernambuco, Recife, Pernambuco, Brasil. Orcid: https://orcid.org/0000-0002-7042-3020. *E-mail*: emilly.diniz@ufpe.br.

A exploração da linguagem probabilística por meio da literatura infantil nos Anos Iniciais Ensino Fundamental

RESUMO

Esta pesquisa investiga o potencial da literatura infantil para a mobilização da linguagem probabilística, desenvolvendo um estudo exploratório de caráter qualitativo, com seis estudantes do 5º ano dos anos iniciais do Ensino Fundamental, no qual foram realizadas entrevistas Clínicas Piagetianas por meio da contação de histórias. Os resultados demonstram que os estudantes mobilizam diferentes linguagens em suas justificativas, como a linguagem verbal, numérica e simbólica, apresentando compreensões das mais intuitivas às mais complexas acerca das diferentes demandas cognitivas, além de um avanço qualitativo da mobilização das expressões verbais e numéricas, aplicando de forma adequada essas expressões. Concluímos que o uso da literatura infantil facilitou a mobilização de variados aspectos da linguagem probabilística e das demandas cognitivas, na medida em que se faz necessário familiarizar-se com a linguagem, pelo uso de diversos tipos de expressões para encontrar sentidos no que lê e escreve.

PALAVRAS-CHAVE: Probabilidade; Ensino de Probabilidade; Linguagem Probabilística; Literatura infantil; Ensino Fundamental.

La exploración del lenguaje probabilístico a través de la literatura infantil en los primeros años de la escuela primaria

RESUMEN

Esta investigación investiga el potencial de la literatura infantil para la movilización del lenguaje probabilístico, desarrollando un estudio exploratorio de carácter cualitativo, con seis alumnos del 5º año de los años iniciales de la Enseñanza Fundamental, en el que se realizaron entrevistas Clínica Piagetiana a través de la narración de cuentos. Los resultados muestran que los estudiantes movilizan diferentes lenguajes en sus justificaciones, como el lenguaje verbal, numérico y simbólico, presentando comprensiones desde las más intuitivas hasta las más complejas sobre las diferentes demandas cognitivas, además de un avance cualitativo en la movilización de verbal. y expresiones numéricas, aplicando estas expresiones apropiadamente. Concluimos que el uso de la literatura

infantil facilitó la movilización de diversos aspectos del lenguaje probabilístico y demandas cognitivas, ya que es necesario familiarizarse con el lenguaje, a través del uso de diferentes tipos de expresiones para encontrar significado en lo que se lee y escribe.

PALABRAS CLAVE: Probabilidad; Enseñanza de la probabilidad; Lenguaje probabilístico; Literatura infantil; Enseñanza fundamental.

* * *

Introduction

Random events are a common part of our lives; many of the experiences we go through are random, present in everyday situations, such as flipping a coin to decide who starts a soccer game, using dice in board games to determine the number of spaces to move forward, or even analyzing the weather forecast, among other predictable or unpredictable situations.

Considering this, we emphasize the importance of developing a probabilistic language early on, starting from everyday language, bridging the informal language used by students to the appropriate probabilistic language. This process also allows for the correction of misconceptions about the concept of Probability, in addition to supporting the process of probabilistic literacy, which involves the ability to interpret and communicate information and ideas related to probability, effectively applying the requirements of functions and tasks involving uncertainty and risk in the real world (Gal, 2012).

This research is an excerpt from a larger study conducted during the master's course. In this article, we seek to investigate the potential of children's literature in mobilizing probabilistic language in the early years of elementary education. This is justified by the importance of understanding probabilistic language for the significant development of the concept of Probability, as well as the scarcity of studies reflecting on the appropriate acquisition of probabilistic language and its development in the elementary school classroom (Vasquez; Alsina, 2017).

In this regard, we conducted an exploratory qualitative research based on the Piagetian Clinical method. The interviews are based on storytelling from the book "O Clubinho" (The Little Club), an original creation of this study, with students in the 5th grade of elementary school as subjects. The analysis carried out through the interviews aims to reflect on the probabilistic language employed by the students (Vasquez; Alsina, 2017) related to cognitive demands (Bryant; Nunes, 2012).

The following section discusses the theoretical assumptions that underlie this study, reflecting on the teaching of Probability in the early years and the presence of probabilistic language in this context, as well as the contributions of the use of children's literature in mathematics classes, considering its interdisciplinary role.

Teaching probability in the early years: probabilistic language in childhood

Children also experience random situations in their daily lives, present in games and activities such as Rock-Paper-Scissors, heads or tails, and even or odd. For this reason, official documents that guide the curricula of the early years of elementary school have emphasized the relevance of teaching Probability in schools from an early age, understanding the need for children to learn to judge, analyze, conclude, and make decisions in situations involving various probabilistic elements, based on real-world contexts.

The National Common Curricular Base (BNCC) (Brasil, 2018) is the main guide for current Brazilian school curricula, presenting knowledge objects and skills necessary for learning Probability from the 1st year of elementary school, pointing out uncertainty as the object of study of understandings about Probability in the early years of elementary school.

The BNCC lists competencies for the five years that make up the early years, emphasizing that "At this stage, it is important for students to

verbalize, in events involving chance, the results that could have happened as opposed to what actually happened" (Brasil, 2018, p. 274). Table 1 presents the knowledge objects and skills present in the BNCC for the early years of elementary school:

TABLE 1 - Knowledge objects and skills of the thematic unit Probability, present in the BNCC

Year	Knowledge Objects	Skills
1st year	Notion of chance	(EF01MA20) Classify chance events, such as "will happen for sure," "may happen," and "impossible to happen," in everyday situations.
2nd year	Analysis of the idea of randomness in everyday situations	(EF02MA21) Classify results of random everyday events as "unlikely," "very likely," "unlikely," and "impossible."
3rd year	Analysis of the idea of chance in everyday situations: sample space	(EF03MA25) Identify, in familiar random events, all possible outcomes, estimating those with the highest or lowest chances of occurrence.
4th year	Analysis of chances of random events	(EF04MA26) Identify, among everyday random events, those that are most likely to occur, recognizing characteristics of more probable outcomes, without using fractions.
5th year	Sample space: analysis of chances of random events	(EF05MA22) Present all possible outcomes of a random experiment, estimating whether these results are equally probable or not.
	Calculation of probability of equiprobable events	(EF05MA23) Determine the probability of a result occurring in random events when all possible results have an equal chance of occurring (equiprobable).

Source: National Common Curricular Base (BRASIL, 2018, p. 278-295).

Regarding the probabilistic language used by children, various scholars (Bryant; Nunes, 2012; Campos; Carvalho, 2016; Vasquez; Alsina, 2017) point out the need to encourage children to develop a probabilistic language to describe random situations.

Regarding the development of probabilistic thinking, Bryant and Nunes (2012) believe it is important to investigate intuitive knowledge that serves as the basis for the development of this understanding. In this sense, Bryant and Nunes (2012) consider the concept of Probability as complex and emphasize the importance of exploring a set of notions to develop its

understanding, listing four basic cognitive demands for the development of this concept. They are as follows:

1. Randomness: understanding the nature of random experiments and phenomena; characteristics of different types of random events and the language to represent such events;

2. Sample Space: forming and classifying sample spaces, considering all possible events and sequences of events that can occur;

3. Quantification of Probabilities: comparing and quantifying probabilities;

4. Probabilistic Risk: understanding the notion of probabilistic risk for decision-making involving the relationship between variables.

The present study will explore three of the cognitive demands listed by Bryant and Nunes (2012) for the construction of the concept of Probability, namely: the understanding of randomness, the survey of the sample space, and the quantification of probabilities, as the fourth cognitive demand, the understanding of probabilistic risk, is not present in the curricular guidelines for teaching and learning in the early years of elementary school.

In agreement with Bryant and Nunes (2012), Vásquez and Alsina (2017) also consider Probability a complex concept, involving a high degree of abstraction. These authors also reflect on the need to develop a proper understanding of the specific language of Probability, indicating its role in the development of the various notions involving the concept of Probability.

Vasquez and Alsina (2017), based on the assumptions of Gal (2005) and the classification developed by Gómez, Ortiz, Batanero, and Contreras (2013), list five main focuses for the acquisition of probabilistic language, which are:

1) Verbal language: refers to the variety of terms and verbal expressions. Regarding this type of language, Shuard and Rothery (1984) distinguish three categories of expressions used in the teaching of mathematics, namely: specific verbal expressions of mathematics, verbal expressions related to mathematics, and common verbal expressions.

2) Numerical language: relates to the quantification of the likelihood of a particular event occurring and the comparison of probabilities.

3) Tabular language: refers to the use of tables for data representation, mainly used for the presentation of relative frequencies and the estimation of probabilities from them.

4) Graphic language: refers to the variety of graphic representations linked to probabilistic notions, presenting probability estimates, such as: pictograms, bar charts, and tree diagrams.

5) Symbolic language: refers to the use of symbols to communicate the probability of an event occurring, such as the use of symbols of equality, sum, inequality, approximation, letters as symbols, among others.

Considering the presence of different focuses of probabilistic language and the fact that students are exposed to a variety of probabilistic expressions in their daily lives, we emphasize the need to associate the specific language about probability with elements of these students' daily lives, especially in the early years of elementary school, allowing for qualitative advancement in the construction of the concept of Probability.

The following will discuss the association between linguistic and mathematical elements through children's literature, as well as its contributions to the teaching of mathematics.

Literature Educates: Children's Literature and Its Use in Teaching Contexts

Literature is present in our daily lives, in various situations and spaces, during class time, bedtime reading, recitals, book clubs, and in various social institutions, occupying shelves in libraries and bookstores, and even virtual environments.

Thinking of literature broadly, Souza (2010, p. 9) conceives that:

> Literature is, above all, an engineering of words. It is through spoken or written words that it is realized. Its field

is vast. It arises from the need of human beings, since the origins, to record and share their experiences, fantasies, and, more than that, values and teachings, transmitting them to future generations.

Regarding the conception of literature in the children's universe, there are two distinct views, one considering that the presence of pedagogical aspects in children's literature devalues the literary aspect, and the other, on the contrary, understanding that the presence of pedagogical characteristics in a book does not diminish its literary attributes. In this study, we consider that the presence of pedagogical aspects in children's books does not diminish or devalue the literary attributes, nor does it place them in the background, as we believe that the presence of literature in the development of learning in the classroom, as well as in math classes, enables the development of reading and comprehension skills and problem-solving strategies, developing language and mathematics simultaneously.

Several authors such as Zilberman and Silva (1990), Smole (2000), and Souza (2014), among other scholars, understand that children's books can bring knowledge without losing their literary aspect. Zilberman and Silva (1990) point out that the use of these stories in school aims to contextualize learning, bringing meaning to the process. The authors characterize children's and youth stories on three levels: the imaginary character, which allows the narrative to go beyond reality, enchanting and stimulating the children's imagination; drama, which through the use of the story reflects the children's universe, allowing the child to experience sensations, often identifying with the narrative, and thus paving the way for learning; and language, which needs to be accessible and appealing to the child, being an essential characteristic for the appreciation of the story. Thus, the authors understand that the literary text introduces a universe that allows the reader to reflect and incorporate new experiences.

Regarding the connection of pedagogy with literature, Souza (2014) states that when in contact with the literary universe, either through reading or listening, the child develops their affective, cognitive, and emotional functions, pointing out that literature proposes problems and challenges that enhance the child's imagination and intelligence. The author defends the formative function of literature, as she considers it humanizing, given that it favors the exercise of the mind and awakens the child's creativity, from a developmental process that must begin in childhood and occurs through various literary languages.

Regarding the relationship between language and mathematics, Smole (2000) indicates that they have a complementary relationship, in the sense of partnership. Mathematics borrows from language the orality that supports the meaning of learning mathematics. The author attributes two roles to language in relation to mathematics, namely: 1) the establishment of "relationships between thought and word" (p. 65), linking mathematical ideas to their representations; and 2) its application in mathematics, as the links of mathematical reasoning are supported by the syntactic organization and deductive power of the language.

Regarding ways to provide a connection between mathematics and language, Smole (2000) emphasizes that it can be done through the use of "activities that involve reading, writing, speaking, and listening about mathematics" (p. 67). She points out that among other ways to enhance the mathematics/language relationship, the connection with children's literature provides the child with "a fantasy very close to reality, a manifestation of feeling and knowledge, which allows them to invent, renew, and disagree" (p. 68). She understands that this approach allows the sharing of meanings, and believes that literature can be a challenging and playful way to develop mathematical notions.

The following section presents the methodology developed in this study, listing the methodological references, the subjects, and the research instrument applied.

Methodology

With the aim of investigating the potential of children's literature in promoting probabilistic language in the early years of elementary school, an exploratory study of a qualitative nature was developed, as it sought to comprehensively understand the object under investigation, observing it from the perspective of the subjects involved (Bogdan; Biklen, 1994). In this sense, Piagetian Clinical interviews were conducted, aiming to "understand how the subject thinks, how they analyze situations, how they solve problems, how they respond to the examiner's counter suggestions" (Carraher, 1983, p.06). Thus, we will investigate the understandings and meanings attributed by the students to the object, in this case, Probability.

The interviews are based on the storytelling of stories found in the book "O Clubinho" (The Little Club), as we understand that storytelling stimulates the holistic development of the student, imagination, curiosity, creativity, concentration, and language, besides being a source of varied knowledge. We believe that the act of listening to stories promotes the psychological, affective, and intellectual development of students, as listening to stories is a dialogue with the text, the author, and oneself; it is traveling in one's imagination and establishing emotional bonds.

The book used in this study tells stories about a group of friends, each with different personalities and routines, who create a club and experience adventures together, facing various problem situations present in everyday life that involve probabilistic understandings. The book presents 8 (eight) stories, with situations that encompass three of the cognitive demands pointed out by Bryant and Nunes (2012), namely randomness, sample space, and comparison/quantification of probabilities. This book was developed by the authors of this study and illustrated by Waleska Diniz. Figure 1 presents an example of a story from the book "O Clubinho" (The Little Club).

FIGURE 1 – "A festa de São João" (The Feast of Saint John) Story.

Na festa de São João da escola, vai ter uma quadrilha. Não é quadrilha de bandidos não. Esta quadrilha é uma dança típica do São João, dançada em pares, que seguem os comandos de um narrador, conhecido como o Marcador. O marcador fala um francês do nordeste, com palavras esquisitas, como alavantú, e todo mundo vai para frente, ou Anarriê e todo mundo vai para trás.

O clubinho vai participar da quadrilha, mas decidiram dançar entre si, e os pares têm que ser formados por uma menina e um menino. O clube tem sete crianças, sendo três meninos e quatro meninas. Edu, Guga, Jão, Lulu, Mila, Ema e Ju.

A dança começou e foi pisão no pé e rasteira nas pernas. Até que o marcador deu o comando de trocar de pares. Ele gritou: - Troca de damas!!! – Nesse comando os cavalheiros devem passar por todas as damas.

Quantos diferentes pares poderão ser formados para a quadrilha? Qual é a probabilidade de se ter pares cujos nomes começam com a mesma letra? Qual a probabilidade de se ter pares com a mesma cor de cabelo?

Source: DINIZ, CARVALHO (2021).

The table 2 presents the cognitive demands and the analysis of the probabilistic focuses involved in each story.

TABLE 2 - Cognitive Demands and Probabilistic Focuses in the Stories

Stories from the Book	Cognitive Demands	Probabilistic Focuses
O Clubinho (The Little Club)	Randomness	Fairness and Equiprobability
Os Lápis de Cor (The Colored Pencils)	Randomness	Different types of random events
A Caixa de Bombons (The Box of Chocolates)	Randomness	Independence of events
A Festa de São João (The Feast of Saint John)	Sample Space	Survey of possibilities
Par ou Ímpar (Even or Odd)	Sample Space	Survey of possibilities
A Caixa de Bijuterias (The Jewelry Box)	Quantification	Comparison of probabilities
O Bingo (The Bingo)	Quantification	Comparison of probabilities
Jogo de Trilha (Track Game)	Quantification	Calculation of simple probabilities

Source: The author.

The experience of storytelling from the book "O Clubinho" (The Little Club), was marked by comprehension questions (Brandão; Rosa, 2010). Brandão and Rosa (2010) point out that formulating good questions about

literary text ensures a conversation that expands the meanings constructed by the reader or listener, making them more competent in understanding and appreciating the texts. Brandão and Rosa (2010) propose five categories of comprehension questions that can be asked before, during, and after reading literary texts. These categories include: questions that activate prior knowledge, questions that predict the text, literal or objective questions, inferential questions, and subjective questions.

For the analysis of understandings about probabilistic aspects, only inferential comprehension questions will be analyzed, as they allow for going beyond the information present in the stories and establishing simple and complex relationships about the concepts. Table 3 includes the script of inferential questions specific to probabilistic concepts, related to cognitive demands and the stories present in the book "O Clubinho" (The Little Club), marked by characteristics of problem situations.

TABLE 3 – Question Script for the Interview

Stories from the Book	Cognitive Demands	Questions
O Clubinho	Randomness	Do all members of the club have the same chance of having their names drawn? Why?
Caixa de bombons	Randomness	Will Ema having drawn a brigadeiro every time and returning it influence the next time she takes a piece of candy?
Os Lápis de Cor	Randomness	Is it possible for Ju to pick a yellow pencil from the case? And a pink pencil?
Par ou Impar	Sample Space	Using only one hand, what are all the possible outcomes?
A Festa de São João	Sample Space	How many different pairs can be formed for the quadrille?
A Caixa de Bijuterias	Comparison/Quantification	Does Ema have a greater chance of picking a pink bracelet from the first or second box?
O Bingo	Comparison/Quantification	What is the probability of picking a pink bracelet from the first box? And from the second?
Jogo da Trilha	Quantification	Who is more likely to win the bingo, Edu or Ema? Why?

Source: The author.

The participants of this study are six 5th-grade students from the public education system. The choice of this grade level is justified by the need to investigate the different cognitive demands outlined by Bryant and Nunes (2012) for the development of probabilistic reasoning. The 5th grade of elementary school is proposed to establish the relationship between the three cognitive demands in the construction of the understanding of probability, as indicated by the National Common Curricular Base (BNCC) (BRASIL, 2018).

The interviews were conducted individually and in person, adhering to all safety protocols set by the health authorities due to the Covid-19 pandemic that began in Brazil in 2020. The participating students were selected using convenience or intentional sampling, as the schools in the state of Pernambuco, as well as the schools with which we had initial contact, were closed. Therefore, voluntary participation of the students was necessary for the research.

In the next section, we will proceed with the analysis of the probabilistic language used by the students, considering the main focuses of probabilistic language acquisition described by Vasquez and Alsina (2017), which include verbal, numerical, tabular, graphical, and symbolic language, related to cognitive demands (Bryant; Nunes, 2012).

Analysis and Results

In this section, we will present and analyze the data obtained from the completion of Piagetian clinical interviews. The analyses respect the students' statements in their entirety, reflecting on the students' justifications and arguments. To preserve the students' identities, we will use fictitious names of characters from children's books in the interview excerpts. In this context, the researcher will be referred to as the mediator, and Table 4 presents the fictitious names used and the characteristics of the interviewed students.

TABLE 4 - Fictitious Names and Characteristics of the Participants

Fictitious Names	Age
Alice	10 years old
Emília	10 years old
Tiana	12 years old
Magali	10 years old
Pippi	11 years old
Coraline	11 years old

Source: The author.

The analyses in this study are based on the focuses of probabilistic language, specifically verbal and numerical language, and three of the cognitive demands proposed by Bryant and Nunes (2012). These demands include randomness, sample space, and the comparison/quantification of probabilities.

Verbal language

We identified various verbal expressions related to the concept of Probability in the justifications of the interviewed students, which are related to the different probabilistic focuses present in the three cognitive demands addressed in this study, ranging from more intuitive to more complex understandings.

Considering this variety of verbal expressions, the identified terms will be categorized according to the classification developed by Shuard and Rothery (1984), which lists three categories of expressions used in the teaching of mathematics. These categories are as follows:

1) Specific mathematical verbal expressions: these are specific terms in mathematics that typically are not part of everyday language;

2) Mathematics-related verbal expressions: these are terms that appear in both mathematics and everyday language, although not always with the same meaning in both contexts;

3) Common verbal expressions: these are terms that have the same or very similar meanings in both contexts.

Table 5 presents the verbal expressions found in the justifications of the students classified according to the categories of Shuard and Rothery (1984) and related to the cognitive demands of Bryant and Nunes (2012).

TABLE 5 - Classification of expressions based on the categories of Shuard and Rothery (1984) and related to cognitive demands (Bryant; Nunes, 2012).

	Specific expressions	Related expressions	Common expressions
Randomness	Possible Randomly More likely	Fair Unfair Shuffled Mix Draw	Harder Easier Luck Anyone Without order
Sample space	Possibilities	Move	Equal Has more Has less Same amount Greater quantity
Comparison/ Quantification of probabilities	Probability Equal chance Different chance Higher probability	Hit Probably	Better Bigger Smaller Equal Many Few Small Big

Source: The author.

The analysis of the classification of expressions found in the justifications of the students demonstrates that the majority of the terms used fall into the category of common expressions, which encompasses words with the same or very similar meanings in both mathematical and everyday contexts. Meanwhile, the categories referring to specific mathematical expressions and related expressions present an equal number of words. However, it can be observed that while the expressions related to mathematics show a decrease in the number of terms in the demand for probability quantification, the specific mathematical expressions show an increase.

In this sense, it is noteworthy that there is a qualitative improvement in the vocabulary used by the students, as the category of expressions related

to mathematics includes words that appear in both contexts (mathematical and everyday), but not always with the same meanings, while the specific mathematical expressions encompass words that typically are not part of everyday vocabulary, including specific terms from mathematical vocabulary. Furthermore, considering that the demand for the quantification of probabilities involves more complex notions in relation to the demands of randomness and sample space.

Numerical Language

We have identified in the speech and written records of the students the frequent use of numerical language through the use of integers and proportions (whether in relation to part-whole or part-part) to express understandings about the three cognitive demands addressed in this study. Table 1 presents the frequency of the use of numerical language, classified into integers and proportions (part-whole and part-part relationships), related to the cognitive demands (Bryant; Nunes, 2012).

TABLE 6 - Frequency of numerical expressions relating to types and cognitive demands (Bryant; Nunes, 2012)

	Integers	Proportions (part-whole relationship)	Proportions (part-part relationship)	Total
Randomness	7	0	0	**7**
Sample space	113	0	0	**113**
Comparison/ Quantification	39	18	1	**58**
Total	**159**	**18**	**1**	**178**

Source: The author.

Regarding the frequency of the use of numerical expressions by the students, it is noticeable that the majority of the numerical language used involves the use of integers, being present in all three cognitive demands, but with the highest frequency in the sample space demand, followed by the

comparison/quantification of probabilities demand, and the least frequent being the randomness demand. Regarding the numerical expressions of the proportion type, whether in a part-whole relationship or a part-part relationship, they only appear in the comparison/quantification of probabilities demand, used to measure the likelihood of particular events.

The randomness demand shows the lowest frequency of numerical expressions, as observed in only seven instances, all in verbal form. The use of numerical language in this demand aims to support justifications regarding various notions related to randomness, such as different types of random events, possible, more likely, and less likely, equiprobability, among others. The highlighted speech excerpt illustrates some of these expressions:

> Mediator: What is the most likely color to come up?
> Alice: Red.
> Mediator: Why?
> Alice: Because there are 5 reds.
> Mediator: And the least likely?
> Alice: Blue.
> Mediator: Why?
> Alice: Because there are only 2.

The sample space demand shows the highest frequency of numerical expressions, observed in 113 instances, appearing in both verbal and written form. The use of numerical expressions in this cognitive demand aims to characterize the sample space of the problem situations and assist in the identification of the possibilities within it, reflecting on favorable events and possible events. The highlighted speech excerpts and written records show some numerical expressions and their use in various contexts:
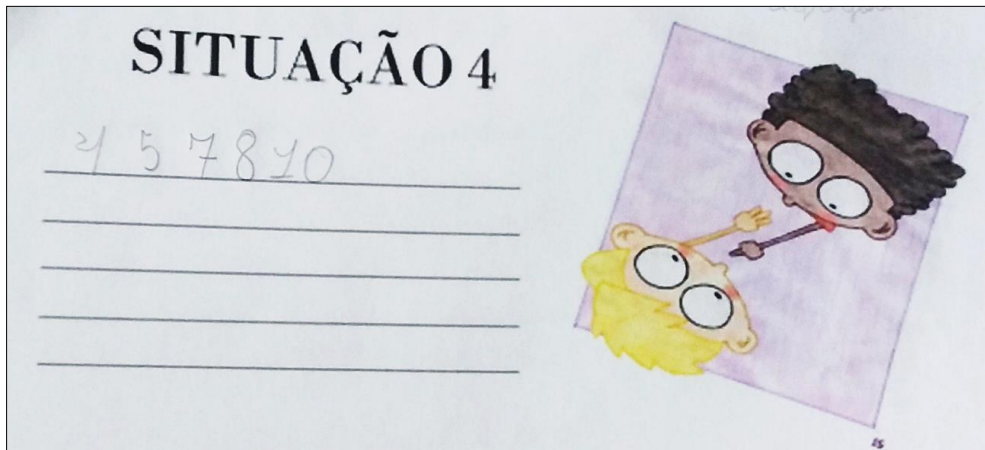
Mediator: What are the possible outcomes when rolling the die?

Emilia: Number 1, number 2, number 3, number 4, and number 5.

Mediator: Is there any other number?

Emilia: Number 6.

FIGURE 2 - Student Pippi's response to the problem situation in the story "Par ou ímpar" (Even or Odd)

Answer: 4 5 7 8 10

Source: The author.

The comparison/quantification of probabilities demand presents 58 situations in which the students use numerical expressions, involving three types: integers, with 39 expressions; proportions in the part-whole relationship, with 18 expressions; and proportions in the part-part relationship, with only one expression. The use of numerical expressions in this demand aims to quantify the chances of a particular event occurring. The highlighted speech excerpts illustrate some numerical expressions addressed by the students related to this cognitive demand:

TABLE 7 - Speech excerpts that use numerical expressions of three types regarding the cognitive demand of comparison/quantification of probability.

Type of numerical expression	Speech Excerpts
Integers	Mediator: Who is more likely to win the bingo, Edu or Ema? Alice: Edu. Mediator: Why? Alice: Because he only needs 1 more and Ema needs 2 more.
Proportions (part-whole relationship)	Mediator: What is the probability of rolling the number Edu needs to win? Coraline: 1 out of 46. Mediator: And for Ema? Coraline: 2 out of 46.
Proportions (part-part relationship)	Mediator: What is the probability of picking a pink bracelet from the second box? Pippi: 2 out of 6.

Source: The author.

Symbolic Language

Regarding symbolic language, the use of mathematical symbols was observed through the use of the addition and subtraction signs in two situations involving only the sample space demand. The use of symbolic expressions in these situations aims to characterize the sample space and assist in identifying the possibilities in a sample space with composite outcomes (arising from the combination of individual elements). The highlighted written records illustrate some symbolic expressions and their use in various contexts:

FIGURE 4 - Student Alice's response to the problem situation in the story "O Bingo" (The Bingo)
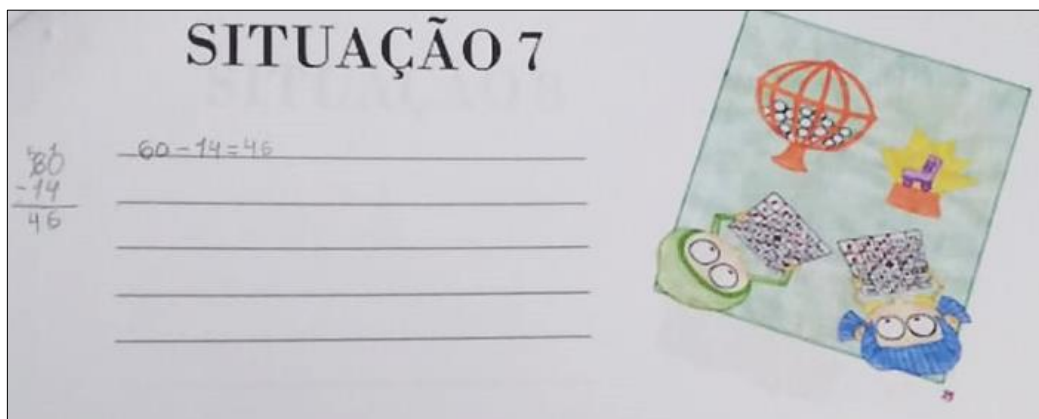
Source: The author.

FIGURE 5 - Student Emilia's response to the problem situation in the story "O Bingo" (The Bingo)
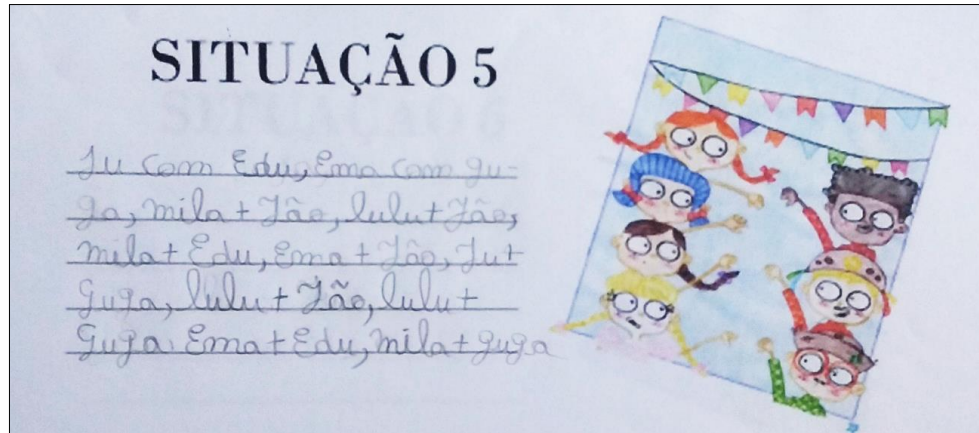
Answer: Ju with Edu, Ema with Guga, Mila + Jão, Lulu + Jão, Mila + Edu, Ema + Jão, Ju + Guga, Lulu + Jão, Lulu + Guga, Ema + Edu, Mila + Guga.
Source: The author.

Regarding tabular and graphic language, the use of any kind of graphical or tabular representation by the interviewed students was not observed.

About the exploration of probabilistic language through children's literature

As the mediator progresses through the interviews and storytelling, it becomes apparent that the students begin to express themselves using a specific language of Probability, applying specific verbal and numerical expressions related to the concept of Probability appropriately throughout the investigative process, without necessarily discussing the terms of this vocabulary.

The following are justifications from the students that demonstrate the appropriate use of probabilistic language:

> Mediator: Is it possible for Ju to pick a yellow pencil from the case?
> Coraline: It could be, but there's a small chance because there are more red ones.

Mediator: What is the probability of rolling a 6?

Coraline: 1 out of 6.

Mediator: Why?

Coraline: Because there are no repeated numbers. If there were repeated numbers, the probability would be different.

Mediator: What is the probability?

Pippi: 1.

Mediator: Why?

Pippi: Because there's only one chance. If, for example, he rolls a five, he won't be able to move forward.

Mediator: Can you mark the even and odd numbers?

Magali: There are 3 possibilities for both.

Mediator: Do they have the same chance or different chances?

Tiana: They have the same chance.

Mediator: Why?

Tiana: Because they are equal, there are 3 and 3. So they're equal.

Mediator: What is the probability of getting an even number?

Coraline: 3 out of 6, right.

Mediator: Why?

Coraline: Because the even numbers are 2, 4, 6.

Mediator: And an odd number?

Coraline: 3 out of 6.

Mediator: But you mentioned the probability is 3 out of 6. Why did you say six?

Coraline: Because, like, for even, there are 3, and for odd, there are 3.

In this sense, it is highlighted that the context in which this probabilistic language is explored, children's literature, was relevant for the exploration and mobilization of probabilistic language, allowing the development of meaningful language about the probabilistic concepts found in the book.

Conclusions

In this study, we sought to investigate the potential of children's literature to mobilize probabilistic language. Specifically, this study focuses on verbal, numerical, and symbolic language, referring to the diversity of terms and verbal and written expressions used to communicate notions related to the concept of Probability.

The book "O Clubinho" (The Little Club) contributes mainly to the exploration of probabilistic notions in contexts familiar to children, breaking away from an approach focused solely on the calculation procedures that marked the teaching of probability. All the stories in the book "O Clubinho" explore probabilistic language through the focuses of verbal and numerical language.

However, it is possible to observe that the students mobilize different languages in their justifications, such as verbal, numerical, and symbolic language, presenting understandings ranging from the most intuitive to the most complex regarding the different cognitive demands. In this sense, we highlight the qualitative advancement of the mobilization of verbal and numerical expressions during the interview through storytelling, in which the students began to apply these specific expressions of Probability appropriately.

Considering all the points already discussed here, we note that the results of this study allowed us to corroborate the constructs pointed out by Smole (2000) regarding the connection between language and mathematics through children's literature. Thus, Smole (2000) points out that among other

ways to enhance the mathematics/language relationship, the connection with children's literature allows for the sharing of meanings. It understands that language and mathematics have a complementary relationship, in that orality supports the meaning of mathematical concepts, as it allows the establishment of relationships between thought and word. In addition, the links of mathematical reasoning are supported by the syntactic organization and the deductive power of the language.

In this sense, we consider that reading the book and experiencing the stories facilitated the mobilization of various aspects of probabilistic language and cognitive demands, as well as the presence of illustrations that explore various signs to express ideas, supported various resolution strategies. Thus, we understand that it is necessary to become familiar with probabilistic language through various focuses on acquiring this language, using verbal, numerical, symbolic, tabular, and graphic expressions to find meaning in what is read and written in math classes. The language of children's literature, based fundamentally on orality, can enhance the meaning of these probabilistic notions.

References

BRANDÃO, A. C. P.; ROSA, E. C. de S. A leitura de textos literários na sala de aula: é conversando que a gente se entende. PAIVA, A.; MACIEL, F.; COSSON, R. (orgs.). *Coleção Explorando o Ensino* – Literatura/ Ensino Fundamental. Brasília: MEC/SEB, 2010. p. 69-88.

BOGDAN, R. C.; BIKLEN, S. K. *Investigação qualitativa em educação*: uma introdução à teoria e aos métodos. Portugal: Porto Editora, 1994.

BRASIL. Ministério da Educação. Secretaria da Educação Básica. *Base Nacional Comum Curricular*. Brasília, 2018.

BRYANT, Peter. NUNES, Terezinha. *Children's understanding of probability*: a literature review. Nuffield Foundation, 2012.

CAMPOS, T. M. M.; CARVALHO, J. I. F. Probabilidade nos anos iniciais da educação básica: contribuições de um programa de ensino. *Em Teia*, v. 7, n. 1, p. 1-18, 2016. DOI: https://doi.org/10.36397/emteia.v7i1.3884.

CARRAHER, T. N. *O método clínico*: usando os exames de Piaget. São Paulo: Cortez, 1983.

DINIZ, E.; CARVALHO, I. O clubinho [livro eletrônico] Ilustração: DINIZ, Waleska. São Lourenço da Mata, PE: Ed. dos Autores, 2021. Available at: https://edf7cdc6-d4c04836aade3d0a851e2465.filesusr.com/ugd/01ae26_f3aa12ff8b8247bbba176ec794439e67.pdf. Accessed on: 29 de October de 2023.

GAL, I. Towards 'probability literacy' for all citizens. In: JONES, G. (Ed.). *Exploring Probability in School*: challenges for teaching and learning. USA: Ed. Kluwer Academic Publishers, 2005. p. 43-71.

GAL, I. Developing probability literacy: needs and pressures stemming from frameworks of adult competencies and mathematics curricula. In: CHO, S. J. (Ed.). INTERNATIONAL CONGRESS ON MATHEMATICAL EDUCATION, 12., 2012, Korea. *Proceedings...* Seoul: 2012. p. 1-7.

GÓMEZ, E.; ORTIZ, J. J.; BATANERO, C.; CONTRERAS, J. M. El lenguaje de probabilidad en los libros de texto de Educación Primaria. *Unión*, n. 35, p. 75-91, 2013.

SHUARD, H.; ROTHERY, A. *Children Reading Mathematics*. 1era. ed. Londres: Murray, 1984.

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

SOUZA, A. P. G de. *Histórias infantis e matemática*: a mobilização de recursos, a apropriação de conhecimentos e a receptividade de alunos de 4ª série do ensino fundamental. 2008. 207 f. Dissertação (Mestrado) – Universidade Federal de São Carlos, CECH. Programa de Pós-Graduação em Educação, 2008.

SOUZA, C. O. Limites entre a função pedagógica da literatura e o pedagogismo. In: II Seminário Pesquisa e Extensão na Graduação. *Anais...*, Campos Belos, 2014. v. 1.

VÁSQUEZ, C. O.; ALSINA, A. Lenguaje probabilístico: un camino para el desarrollo de la alfabetización probabilística. Un estudio de caso en el aula de Educación Primaria. *Bolema*, Rio Claro (SP), v. 31, n. 57, p. 454 - 478, abr. 2017. DOI: https://doi.org/10.1590/1980-4415v31n57a22.

ZILBERMAN, R. SILVA, E. T. da. (orgs.). *Literatura e pedagogia*: Ponto e contraponto. Porto Alegre: Mercado Aberto, 1990.