"¿QUIÉN SE QUEDARÁ CON EL DURAZNO?" POSIBILIDADES DE UN CUENTO INFANTIL PARA FOMENTAR LA CULTURA ESTADÍSTICA

Edvonete Souza de Alencar
edvonetealencar@ufgd.edu.br
https://orcid.org/0000-0002-5813-8702
Universidade Federal da Grande Dourados
Dourados, Brasil.

José Ronaldo Alves Araújo
jronaldoaaraujo@gmail.com
https://orcid.org/0000-0002-5352-4137
Pontifícia Universidade Católica de São Paulo
São Paulo Brasil.

Danilo Díaz-Levicoy
dddiaz01@hotmail.com
https://orcid.org/0000-0001-8371-7899
Universidad Católica del Maule
Talca, Chile.

Resumen

Este artículo discute la idea de promover recursos para el desarrollo de la cultura estadística desde los primeros años de escolaridad. El objetivo era investigar las posibles potencialidades de un libro de literatura infantil para fomentar habilidades relacionadas con la cultura estadística. El libro "¿Quién se quedará con el durazno?" fue elegido y analizado por medio de la técnica del análisis de contenido. Los resultados de este análisis mostraron el potencial del libro en los primeros años de escolaridad, especialmente en lo que respecta a la lectura y análisis de información y la promoción de cuestionamientos relacionados con la reflexión y la criticidad, aspectos que se entrelazan con lo que concebimos como cultura estadística. En este sentido, la trama se muestra potencialmente propicia a un proceso de validación de criterios de recolección de datos, análisis de la información presente en la trama y toma de decisiones. En un sentido amplio, consideramos que estos resultados son de interés para la organización del proceso de enseñanza y de aprendizaje de la matemática y la estadística para los estudiantes en los primeros años de la Educación Primaria. Conjeturamos que el estudio permite al maestro reflexionar sobre su trabajo en el aula, especialmente cuando se utilizan obras de literatura infantil.
Palabras clave: Cultura estadística. Educación infantil. Literatura infantil. Análisis de contenido.

Edvonete Souza de Alencar, José Ronaldo Alves Araújo & Danilo Díaz-Levicoy

"QUEM VAI FICAR COM O PÊSSEGO?"
POSSIBILIDADES DE UMA HISTÓRIA INFANTIL PARA FOMENTAR O
LETRAMENTO ESTATÍSTICO

Resumo

Este artigo problematiza na direção da promoção de meios para o desenvolvimento do letramento estatístico, desde os primeiros anos de escolaridade. O objetivo foi investigar possíveis potencialidades de um livro da literatura infantil para o fomento de habilidades relativas ao letramento estatístico. O livro "Quem vai ficar com o pêssego?" foi escolhido e analisado sob o ponto de vista dos recursos metodológicos da análise de conteúdo. Os resultados dessa análise mostraram a potencialidade do livro nos primeiros anos de escolaridade, especialmente, quanto à leitura e análise das informações e à promoção de questionamentos ligados à reflexão e para a criticidade, aspectos imbricados ao que concebemos como letramento estatístico. Nesse sentido, o enredo se mostra potencialmente condutor para um processo de validação de critérios de coleta de dados, de análises das informações presente no enredo e de tomada de decisões. Em sentido amplo, consideramos que esses resultados são de interesse para a organização do processo de ensino e aprendizagem da matemática e da estatística para os alunos dos anos iniciais do Ensino Fundamental. Conjecturamos que o estudo possa permitir que o professor reflita sobre seu trabalho na sala de aula, especialmente ao utilizar obras de literatura infantil.
Palavras-chave: Letramento estatístico. Anos iniciais do Ensino Fundamental. Literatura infantil. Análise de conteúdo.

"¿WHO'S GOING TO KEEP THE PEACH?"
POSSIBILITIES OF A CHILDREN'S STORY TO FOSTER
STATISTICAL LITERACY

Abstract

This article discusses the directions for the promotion of means for the development of statistical literacy, since the first years of schooling. The objective was to investigate possible potentialities of the children's literature book to foster skills related to statistical literacy. The book "Who's going to keep the peach?" was chosen and analyzed from the point of view of the methodological resources of the content analysis. The results of this analysis showed the potential of the book in the first years of schooling, especially regarding the reading and analysis of information and the promotion of questioning related to reflection and criticality, aspects that are intertwined with what we conceive as statistical literacy. In this sense, the plot proves to be potentially conducive to a process of validating data collection criteria, analyzing the information present in the plot and making decisions. In a broad sense, we consider that these results are of interest to the organization of the teaching and learning process of mathematics and statistics for students in the early years of elementary school. We conjecture that the study may allow the teacher to reflect on his work in the classroom, especially when using works of children's literature.
Keywords: Statistical literacy. Early years of elementary school. Children's literature. Content analysis.

Introduction

There was a big ripe peach
Which smelled really good
And it looked delicious.
Who will keep the peach?
(AH-HAE & HYE-WON, 2006)

We started this article with an excerpt from the book for children 'Who's going to keep the peach?'. In addition to the enchantment provided by the story's plot, there are elements that might be stimulated by questions that, with a certain intentionality, could be used in the teaching and learning process.

We know that children's literature is a resource that makes mathematics more accessible and pleasurable, allowing stories to relate to emotions, imagination, and mathematical content. Internationally, we have identified some research that reaffirms its importance for teaching activities, such as Hong (1996), Zazkis & Liljedahl (2009), Toor & Mgombelo (2015), and Lemonidis & Kaiafa (2019). It should be noted that, as we have more international investigations with this specificity, here in this article we quote only the main ones that would contemplate our research objective and the most recent publications to reiterate its importance and base our choices.

Hong (1996) considers that students' activities using children's stories for teaching mathematics allow them to dedicate more time to study and become more interested in the subjects covered in class. In addition to the studies by Hong (1996), the authors Zazkis & Liljedahl (2009), in their book consider the essential literature on the subject and present the main perspectives on the subject, corroborating the importance of using literature for teaching mathematics. However, it was necessary to seek more recent investigations to identify which new aspects were being presented in them.

We consider pertinent the studies by Toor & Mgombelo (2015) that mention research with teachers and how they are important mediators and must be aware of the relationships that the use of children's stories and the relationships that they allow with language for the teaching of mathematics can awakening beyond mathematical knowledge, also attitudinal knowledge for human formation.

We highlight the reflections of Lemonidis & Kaiafa (2019) that consider the use of children's stories can be beneficial for students with learning difficulties in mathematics.

In general, the investigations corroborate that the use of children's literature in teaching

activities arouses interest, helps memory, and reduces students' anxiety. In addition to promoting a good relationship between the teacher and the student. In this context, it is inferred that the mathematical knowledge addressed is understood by students with the proposition of relationships between different situations of daily life and children's imagination.

We also reiterate that, in Brazil, there are few investigations that work with the perspective of using children's literature for the teaching of Mathematics. We have some studies such as: Smole et al. (1998), Zacarias & Moro (2005), Souza & Passos (2017), Alencar & Silva (2017), Oliveira & Alencar (2019). Both investigations deal with the analysis of books for the teaching of Mathematics and the investigations of Alencar (2019) reveal its use for teacher training.

Thus, in this article, we present the analysis of work present in the list of books of the Literacy Pact at the Right Age (PNAIC), in which it was initially oriented to the study of measures, however when analyzing the history we observed that its use can be expanded also for teaching statistics, in view of the plot and characteristics of some illustrations. We emphasize that exploring different possibilities of using children's books is beneficial because it allows its use in different perspectives. In this sense, we present a new look at the pedagogical use in statistics of this work.

According to the work we chose to analyze in this study, it was observed that as a series of other works, the book '*Who's going to keep the peach?',* by Ah-Hae & Hye-Won (2006) was brought into schools through the National Pact for Literacy at Right Age (PNAIC)[1], a program implemented by the Brazilian federal government. It's main objective was to promote the integral education of students from the beginning of the schooling process.

It initially met the Portuguese Language demands in 2013 and added Mathematics to the program in 2014. In 2015 the program expanded the approach to other areas of study. It should be noted that this program's funding ended in 2018. We observed that, in this same period, the National Core Curriculum (BNCC)[2] was implemented and had already been endorsed in 2017 for early Childhood Education and Elementary School.

The BNCC has a normative standard and should be followed by all the federal states of Brazil, advocating the establishment of policies that promote the development of knowledge,

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[1] Translation of the term National Pact for Literacy at Right Age - Pacto de Alfabetização na Idade Certa (PNAIC) - in Portuguese

[2] Translation of the term - National Core Curriculum - Base Nacional Comum Curricular (BNCC) in Portuguese

skills and abilities which are seen as necessary for all students throughout basic education. Additionally, those which concern the desire for an integral human development and for the construction of a just, democratic and inclusive society (Brasil, 2017, p. 7).

It should be noted that the teachers who received the training and resources available by PNAIC still work at the schools and there is nothing to prevent the use of these materials, as long as they contribute to students' process of developing knowledge, skills and abilities.

We do not intend to discuss teacher education in this text, but we acknowledge that this is always a relevant issue. It is somewhat laudable when a program meets this demand, as is the case with PNAIC. There was evidence of this need for teaching statistics according to Gouvêa (2011). These are studies which highlighted the fragility of teacher education for the early years of Elementary School on this topic. The studies also criticized textbooks, which are one of the most utilized resources by educators and which should propose activities that promote critical and investigative senses, leading to reflections on how the teacher can develop more meaningful activities.

The author advocates for the need of teacher education to favor "greater mastery over the topic, gaining autonomy, detaching more from the textbook and creating methodological strategies that can improve the teaching and learning process of statistical concepts" (Gouvêa, 2011, p. 88).

When Votto et al. (2017) refer to the need for training, they assert the existence of a distancing which is always present in curricular proposals regarding the teachers' pedagogical practice in the early years of Elementary School, even with the BNCC implementation. According to the authors, teachers should have the possibility to contribute to a "quality education for students, developing abilities related to their critical thinking, autonomy and reflection upon their social reality" (Votto et al., 2017, p. 156).

To this end, as we have mentioned before, we will not discuss teacher education, however, according to the aforementioned studies, we raise the need to look for strategies that favor statistical studies from the early years of Elementary School.

However, when we turn to the current curriculum in Brazil, statistics and probability are found together as one of the domains of Elementary School. We will not diverge into a deeper BNCC analysis, but note that authors such as Cazorla et al. (2017) indicate that work with statistics, from the early years of Primary School, contribute to the students' critical

thinking and development of curiosity and that the exploration of such characteristics could be beneficial to the learning of this content.

This perspective coincides with the current curriculum and even suggests what was once noted in Brasil (2014) and sustains the discussion raised by Gouvêa (2011) and Votto et al. (2017), within the teaching statistics context which we have discussed.

Therefore, we determine that the objective of this article is to identify the potential of a book which can contribute to Statistical Literacy in the early years of Elementary Schools. We reaffirm that this article aims at contributing to answering the question:

"*What is the potential in using stories for children to develop of the Statistical Literacy?*"

It is clear that we do not have the intention of fully answering this question through this study, nor is it possible. Our study, within which we do a content analysis, acts as an important part of the path to a possible answer. As part of this methodological contribution, we have selected the work taking into consideration the established objective.

Research Paths

The methodology used in this study was the content analysis. We did not present a dense description of this methodology, but rather, we have shown the aspects that contribute to the development of the work, in order to achieve our objective.

It should be noted that the result of this investigation is an integral part of the project *Creating Children's Literature for Teaching Mathematics*, which was financed by Instituto Serrapilheira from 2018 until 2019. This stage of the project analysed the existing works of Children's Literature and their potential for teaching mathematics.

This methodical approach, according to Moraes (1999), is used to describe and interpret the content of all types of documents and texts, provided it is conducted by systematic, qualitative or quantitative descriptions, this analysis [...] "helps to reinterpret messages and achieve an understanding of their meanings at a level that goes beyond an average reading" (Moraes,1999, p. 2). In this study we considered the five stages proposed by Moraes (1999):

Preparing the information: this stage is related to identifying different samples of information to be used. According to the author, the documents included in the samples must be representative and relevant to the analysis objectives which, through a process of coding, enables the identification of each element of the document that is to be analysed (Moraes, 1999, p. 4).

Turning the content into units: this stage consists of re-reading the materials with aims toward defining units of analysis, which as a "unit element to be submitted later to classification [...] needs to be defined by the researcher" (Moraes, 1999, p. 4). It is the researcher's duty to re-read the materials and identify the units of analysis. Separately, these units have to be classified in order to represent sets of information. As Moraes (1999) sees it, as a reference to the unit of analysis, it is common to define context units which, while characteristically broader, usually contain several units of analysis and their choices are justified by the fact that, "a message can be divided into units of independent meaning, although the units of analysis will always lose their meanings in this process" (MORAES, 1999, p. 4).

Categorizing or classifying the units into categories: Using similarities or analogies, this step is "a procedure of grouping data considering the common part existing between them, [...] according to criteria previously established or defined in the process" (Moraes, 1999, p. 4).

> [...] however, it is an operation of classification of the elements within a message by following some established criteria. It facilitates information analysis, but it has to be based on an accurate definition of the problem, objectives and elements used in the content analysis (Moraes, 1999, p. 4).

According to the author, reducing the communication data, which in general requires a small number of valid, relevant and appropriate categories, is the basic objective of content analysis.

Describing the data: As a first step to communication of a work, the description occurs, given the defined categories and the material that constitutes them. For a qualitative approach, this stage consists of production of syntheses "in which the set of meanings present in the various units of analysis included in each of them is expressed" (Moraes, 1999, p. 8), the categories. As a moment to express the meanings captured and intuited in the analysed messages, according to the author, it is through the text produced as a result of the analysis, that it is possible to perceive the research validation and it's results.

Interpreting the data: as an essential step for the content analysis, in this stage "it is important to try to go further, to reach a deeper understanding of the content of the messages through inference and interpretation" (Moraes, 1999, p. 9). This interpretation is not only about the content expressed by the authors, but also about the hidden ones, whether they are concealed consciously or unconsciously by their writers. According to the author, this

interpretation process can occur under two strands, one based on a theoretical foundation clearly explained previously or another, in which, based on the data and the categories of analysis, the theory is constructed.

The selected story is part of one of the books contained in the PNAIC collection for the first grade of the Elementary School, which consists of twenty-five works of Children's Literature, '*Who's going to keep the peach?',* presented in Figure 1 (Ah-Hae & Hye-Won, 2006) by Editora Callis. It should be noted that this book is aimed at children who are between six and seven years old, a reference for the first grade of Elementary School. Hence, we consider that there might be potential in the story to develop ideas related to Statistical Literacy in this stage of the early years of Elementary School. As the work is written in Portuguese, for the sake of accessibility to the total content that is analyzed in this manuscript, each time an image contains information, in addition to the illustration of the work, the subsequent paragraph willpresent the translation of that information.

As shown in the previous figure, which presents the title of the book, "Who will keep the peach?" (Ah-Hae & Hye-Won, 2006), we emphasize that the selection of the work has to do with the perception we had from reading it in its entirety. We got interested in the book as, in addition to it's indications on the cover and on the final pages for working with units of measures, order and classification, the plot inspired us in regards to the proposed possibility for work in the early years of Elementary School. Especially, because the analysis of measures, order, and the classification of data implicitly brings the possibility for the proposition of questions about these aspects, which we conjecture to lead to the mobilization of skills related to Statistical Literacy.

Figure 1– Who's going to keep the peach?

Source: Ah-Hae & Hye-Won (2006, n.p.)

In this text, besides observing from the illustrations of the book and their relations to the plot, we have also discussed some evidence, especially in excerpts, in which, we understand that there is the possibility of fostering Statistical Literacy.

In order to understand the specificities of Statistical Literacy in the early years of Elementary Education, we have presented, in the following section, a theoretical discussion to support our analysis in relation to the theme.

Statistical Literacy and Teaching Statistics in the Early Years of Elementary School

From the problem that inspired this study, we approached Statistical Literacy, that according to Ferligoj (2015), there are several definitions for the term, but that, however, its origins have as reference the idea of Wallman (1993).

> "Statistical Literacy" is the ability to understand and critically evaluate statistical results that permeate our daily lives-coupled with the ability to appreciate the contributions that statistical thinking can make in public and private, professional and personal decisions (Wallman, 1993, p.1).

It was understood as a social demand (Pietropaolo et al., *2017*), according to Goulart & Coutinho (2015, p. 2-3) "statistical literacy is people's proficiency to critically interpret and evaluate statistical information, thus discussing and/or communicating their ideas on such statistical information". This concept originates from Gal (2002) studies.

> […] statistical literacy refers broadly to two interrelated components, primarily (a) people's ability to interpret and critically evaluate statistical information, data-related arguments, or stochastic phenomena, which they may encounter in diverse contexts, and when relevant (b) their ability to discuss or communicate their reactions

> to such statistical information, such as their understanding of the meaning of the information, their opinions about the implications of this information, or their concerns regarding the acceptability of given conclusions (Gal, 2002, p. 49).

Gal (2002) highlights that individuals who are statistically literate need to be capable of interpreting results and be aware of possible biases or limitations in generalizations that can be taken from data, which implies being able to ask critical and reflective questions about the arguments that refer to statistics or data.

Regarding statistics and the aspects related to it's teaching, the concept alluded to by Alsina (2017), referring to Batanero & Godino (2004), accepts statistics as a science of *data* and *data analysis*, that deals with knowledge related to data and it's analysis. From this point of view, we consider the possibility of promoting Statistical Literacy, since, in the classroom context, students should be able to interpret results from studies and media reports, be able to pose critical and reflective questions about those reports and communicate reactions where required (Sharma, 2017, p. 120). And to encourage the teaching and learning of Statistics since the early years is due to the fact that it is useful for life, in addition to the student's school life (Alsina, 2017).

Accordingly, Batanero (2000) identified that, generally, statistics have been added to the mathematical curricula in basic education. According to the author, this is due to the frequent use of data and statistical concepts in everyday life. In addition to its applications in other subjects, the need for basic statistical knowledge has been identified for many professions (Alsina, 2017; Batanero, 2000).

Despite the authors having undertaken their studies from the perspective of another context, those statements from the Spanish study, by Batanero (2000), apply to the curricular proposals in Brazil, as we observed in Giordano et al. (2019). According to them, the BNCC provides progress regarding the concern on statistics learning.

However, in the studies of Giordano et al. (2019), we have not identified indications pointing to this concern in the early years of Elementary School. Nonetheless, when we assume the perspective of Statistical Literacy, based on Alsina (2017), we observed a possibility. As the researcher points out, in this teaching level it is possible to focus on data collection; data organization (classifying and ordering); the representation through objects, drawings and graphs; and it's interpretation, exactly what we initially conjectured when

accessing the work of Ah-Hae & Hye-Won (2006).

According to the specifics of the analysis material of this study, we focused our analysis from the concept of Statistical Literacy, which was presented in this session, while taking into account what Alsina suggests, the teaching of statistics to students who are between five and six years old (Chart 1).

Chart 1 - Knowledge of Statistics

Identify, define and/or recognize	Relating
Identify increasingly complex data (for example, each child's shoe size).	Compare increasingly complex data (for example, order students according to the number of pockets in their clothes).
Data representation in simple graphs and diagrams (bar diagrams).	Data comparison in simple bar diagrams.

Source: Adapted by Alsina (2017, p. 9)

According to the author, the proposal is to start from data that surrounds them, proposed by the teacher or even by the students, and progressively, the representation of this data, with concrete representations through drawings and objects, will be favored. This action allows them to make correspondences between each unit and element represented, and later, with more conventional representations through tables and bar diagrams, representations that relate each case to a unit.

Who's going to keep the peach? Analysis

In order to meet the first stage of content analysis, preparing the information: we begin from the selected story's plot, which starts by presenting the peach and explaining how it was ripe and delicious. Throughout the story, the following question arises: '*Who's going to keep the peach*?' It is this question that gives rise to the story.

All the animals in the forest (a giraffe, crocodile, rhino, monkey, rabbit and caterpillar) where the peach is found, want to own it. This starts a dispute between the animals and they create some criteria to identify who deserves to eat the peach. The established criteria were: height, weight, who is the biggest, the smallest, as well as length and height. In the end, the caterpillar declares that it is unfair that the winner is the animal that has the highest criteria and suggests that the winner should be the one that has the lowest criteria. With that, the caterpillar presents itself as the winner because in all criteria it would have the lowest height, weight, the smallest mouth and smallest ears and would be the lowest number in all cases. Therefore, the peach is claimed by the caterpillar.

Figure 2 - Context and problem introduction

Havia um grande pêssego maduro
que tinha um cheiro muito gostoso
e parecia delicioso.
Quem vai ficar com o pêssego?

Source: Ah-Hae & Hye-Won (2006, n.p)

As the story presents a context and question, as Figure 2 shows, in the excerpt, "There was a big ripe peach that smelled very tasty and looked delicious. Who will keep the peach?" (Ah-Hae & Hye-Won, 2006, n.p.), interpreting and critically evaluating the information, as well as some discussion and/or communication of ideas about such information might be a possibility.

By knowing the story's plot, in the second stage, it's possible to analyse the content, turn the content into units and define the units of analysis. These units were established as: height, weight, biggest, smallest, length and height, elements considered possible for analysis, regarding the problem of this study.

The relationship that the units of analysis have with the possibility of addressing some aspect of statistics is that, objectively, we aim at characterizing the units of analysis, which is the third stage of content analysis. We extend to the fourth stage of content analysis, describing the data.

In this stage, as it is presented below, in each excerpt of the plot, we looked for elements that indicate the possibility of discussing aspects related to statistics, and that may favor the development of Statistical Literacy, considering the units of analysis and the characteristics that have to do with our problem.

Figure 3 – Criteria for analysis

Source: Ah-Hae & Hye-Won (2006, n.p)

Within the presented problem (Figure 2), "The tall giraffe, the big-mouthed crocodile, the heavy rhino, the smart monkey, the bouncing rabbit, and the restless caterpillar, all wanted to eat the peach" (Ah-Hae & Hye-Won, 2006, n.p.), it is natural that the context It is natural that the context allows the subjects involved to be identified, that criteria are established to seek to solve the problem (Figure 3).These criteria guide data collection, the organization and their respective analysis, indicating characteristics that favor decision making. That's what we introduced in the description.

Before what is known from the context of the introduced problem, with a basis on the criteria established in the plot, our units of analysis, we started to seek the solution to our problem.

In the text, it is the giraffe that suggests the use of a certain characteristic of data as an analysis criterion, using the height as a characteristic, and with that it is necessary to organize this data according to a unit of analysis, the height, as seen in Figure 4.

Figure 4 - Organizing data
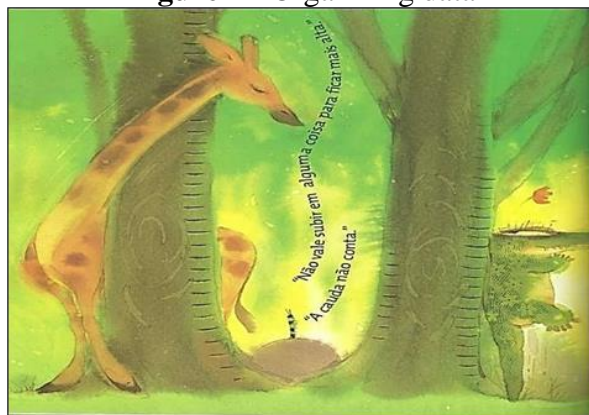
Source: Ah-Hae & Hye-Won (2006, n.p)

The illustration in Figure 4 represent the trial according to the established height, our unit of analysis. It is still possible to observe in the text information "the tail is not worth" [...] "it is not worth being on tiptoe" (Ah-Hae & Hye-Won, 2006, n.p.). The conditions imposed for it's validity are excerpts that delimit and suggest certain validity for the experiment.

As for the Statistical Literacy, such imposed conditions might lead the children to reflect upon the study's validity, which could foster an opinion on the results observed. These impositions may characterize a possibility of interpreting and critically evaluating information or even reflecting on the implications of the information or concerns regarding the acceptability of certain conclusions.

Although the text did not mention it, it was possible to note that in the illustrations the trees make it possible to identify a unit of measurement. Considering Alsina's teaching proposal (2017), a graphic representation of the situation would be possible if these units of measurement present in the trees were taken into account. Depending on the data, although it is possible to measure some result with a simple and superficial analysis of the illustration or as we suggested, by means of a graphic representation, another way of organizing the data, for example, by ordering, may favor a more assertive analysis (Figure 5).

As observed in the previous figure, how the transcription of the information shows: "Do you see? I am the tallest, so the peach must stay for me. [...] But as soon as the giraffe bent down to eat the big ripe peach ..." (Ah-Hae & Hye-Won, 2006, n.p.), the giraffe, based on the organized data and the criteria selected, presents it's decision. We considered relevant the means by which the data is displayed (ordered from the biggest to the smallest) which favors decision making. These aspects raised, are intertwined with the suggestions of (Alsina, 2017),

regarding the level of discussions that we can develop with the children.

Figure 5 – Ordering the data
Source: Ah-Hae & Hye-Won (2006, n.p)

However, something which is characteristic in Statistical Literacy is their critical nature, which makes it possible to question decisions and propose other ways to solve a problem (Alsina, 2017; Sharma, 2017), that is what the rhino does, proposing that to solve the problem weight should be considered as a parameter.

When changing strategies to solve a problem, it is common that the way by which we solve a problem also changes, and that is what happens to the caterpillar when it asks the rhino about the method to carry out the trial and organize the data according to the analysis criteria. We noted that the method for organizing the data requires that subjects are submitted for evaluation, as demonstrated, for example, in Figure 6.

From the illustration such as in Figure 6, we observed that it is possible to relate the weight criterion, one of our units of analysis, to the counting of stones.

Figure 6 – Organizing the data
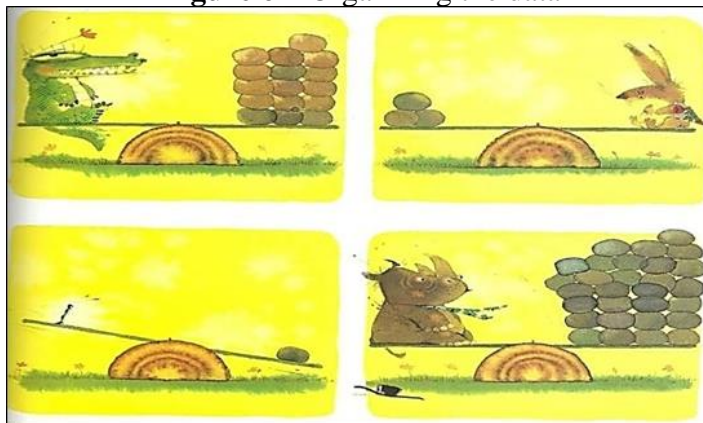
Source: Ah-Hae & Hye-Won (2006, n.p)

According to the rhino's perspective, the problem is solved when the stones are counted. It was noted that a knowledge of counting appears as a way of organizing the data information, which is later interpreted in the illustration of the ordered subjects, according to the criterion adopted (Figure 7). In addition to the possibility of asking about the strategies adopted to represent the data, regarding Statistical Literacy, the weight of the stones should also be questioned, thus assuming a real weight for each animal. Evidently, as observed in the figure below, a more explicit solution is gained through ordering.

Figure 7 – Ordering the data
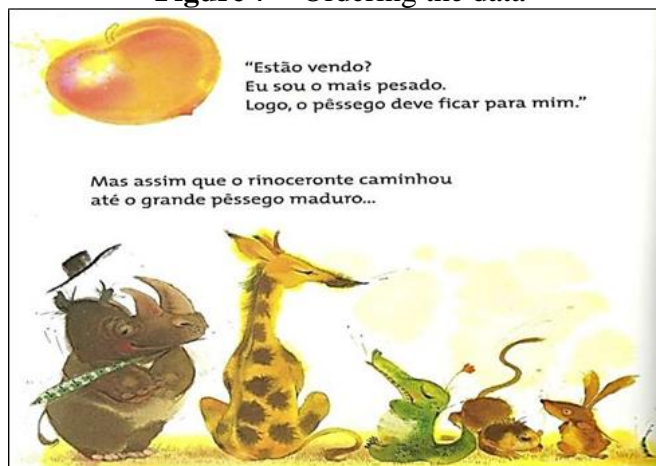
Source: Ah-Hae & Hye-Won (2006, n.p)

We observed that the illustration of Figure 7, the present information indicates: "Do you see? I am heavier. Soon, the peach must stay for me. [...] But as soon as the rhino walked to the large ripe peach ..." (Ah-Hae & Hye-Won, 2006, n.p.), the first excerpt corroborates our assertion of the possibility of explaining a problematization from the representation of the

ordered data that, in the plot, is followed by a request that suggests taking another analysis criteria into account.

In this one, the alligator suggests solving the problem with the size of the animals' mouths, size being one of our units of analysis. And from the criterion laid out by the alligator, another organization of the subjects is performed, since the results change when the suggested method is adopted.

In this excerpt, the plot indicates that all of them measured their mouths, however, it was not explicitly noted what unit of measurement nor the method of how this might have been achieved. It should be possible to question it. Discussing units of measurement, such as units of weight, which were previously discussed in regard to each stone being used to measure the weight of each animal, could be a focus to be addressed.

Nevertheless, following our descriptive stage, regarding the size of the mouth of each animal, only by visual representation, when organizing the data, utilizing this criterion, which we can observe the notion of implicit measure, which modifies the organization of the data and, consequently, the answer.

What is relevant to observe so far and which has to do with the problem of this study, is that the work in question portrays an organization of the data always ordered according to the criterion, as Figure 8 has also been presented. When relating this representation with the characteristics of our units of analysis, we raise the possibility for the transposition of the information to a graphic representation, provided that, in the case of Figure 8, a unit of measurement has been established for an analysis of the result obtained, following this criterion.

From the ordered data, as the excerpt described in the previous figure shows, "Do you see? I have the biggest mouth. Soon, the peach must have stayed for me, [...] But as soon as the big-mouthed crocodile opened its big mouth to eat the big ripe peach ..." (Ah-Hae & Hye-Won, 2006, np), especially in the first part, we see that the alligator reaches a decision. The argument to justify the decision is clearly represented in Figure 8.

Figure 8 – Ordering the data

"Estão vendo?
Eu tenho a maior boca.
Logo, o pêssego deve ficar para mim."

Mas assim que o crocodilo de boca grande abria sua
grande boca para comer o grande pêssego maduro...

Source: Ah-Hae & Hye-Won (2006, n.p.)

However, the analysis criteria, a characteristic of Statistical Literacy, from the point of view of the interpretation and critical evaluation of the information (Goulart & Coutinho, 2015), does not appear to have been defined. Indeed, it's within this characteristic that variables that may influence the result should be considered. It's that the rabbit does, by suggesting that the length of the ears should be considered and thus solve the problem that should be left with the peach.

With the suggestion of the rabbit, It was observed that it is a new configuration of the result, that just like in other criteria, as with all which were submitted, the rabbit was the one that did better, as shown in Figure 9. However, we observed that not all animals appear in the illustration and as our discussion about Statistical Literacy suggested a critical and reflective position, one could question the validity of this criterion, since not all animals have ears. Thus, the criterion used to solve the problem would not meet universality, on the contrary, within the plot context, it would exclude both the caterpillar and the crocodile.

**Figure 9** – Length, data analysis

Source: Ah-Hae & Hye-Won (2006)

As shown in Figure 9, "This time, all friends measured their ears to see who had the longest. The rabbit, climbing the long neck of the giraffe, showed its long ears to everyone (Ah-Hae & Hye-Won, 2006, n.p.), however, even before the rabbit decided the problem to be solved, the monkey was immediately reluctant, identifying another criterion to consider solving the dilemma, a common movement when looking for solutions to a problem. This has to do with the criticality recommended as a relevant aspect to Statistical Literacy. And of the criterion proposed by the monkey, one of our units of analysis, the length of the tail, which he had total control over it.

Aspects such as inaccuracies or bias can interfere with the results of a statistical study, in turn, making it flawed, discredited or even misleading. As we see, in the adopted criteria, the imprecision was present in the plot that, from the point of view of Statistical Literacy, maybe a possibility to raise some questions and encourage analyzes and reflections, more and more critical. In this sense, imprecision is a relevant aspect of the plot of the work.

We identified inaccuracy in data information, is possible to see them from a different perspective and, evidently, be able to arrive at those results and understand them differently from those already observed, as the caterpillar did when suggesting the use of all the criterio previously adopted.

Figure 10 – Organizing data from a different perspective
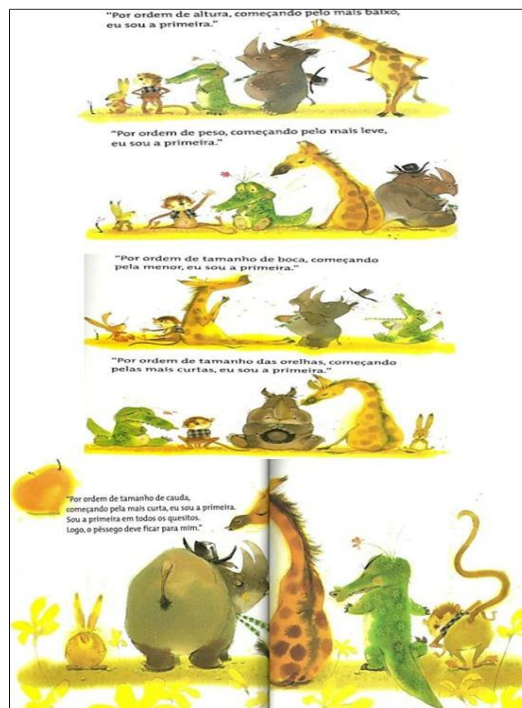
In fact, the caterpillar refers to the problem from a different perspective, questioning the approach of each criterion, our units of analysis. Regarding what we conceive for Statistical Literacy, in this book described we identify some possibilities of discussions that possibly, may favor the development of Statistical Literacy skills. Before we approach our theoretical contributions, in these last descriptions of the book, as we see in the Figure 10.

The previous illustration, in addition to the ordering of the subjects, according to each parameter, presents all the arguments that allowed to give an outcome to the plot.

Below we compile the caterpillar's arguments:

> In order of height, starting with the lowest, I am the first.
> In order of weight, starting with the lightest, I am the first.
> In order of mouth size, starting with the smallest, I am the first.
> In order of ear sizes, starting with the shortest ones,
> I am the first. In order of the syrup size, starting with the shortest, I am the first.
> I am the first in all the questions, so the peach must stay for me. (Ah-Hae & Hye-Won, 2006, n.p.).

From the perspective brought forth by the caterpillar to solve the problem and in relation to all other animals, which also establish their criteria for deciding who will keep the peach, we can conclude the fourth stage of the methodological approach adopted, the description. Although we have already made notes during the description, it is from the perspectives and criteria

adopted by each character, which has to do with our units of analysis, that we can bring forth the fifth stage of content analysis, the interpretation.

The units of analysis that we established: height, weight, the biggest, the smallest, length and height, even though they are not clearly stated, are related to some objects of study in the field of mathematics, such as the knowledge of ordering, units and measurements, which we encounter with Gal (2002) and Goulart & Coutinho (2015) discussion of Statistical Literacy. The current characters act like critics, reflecting and questioning the results presented. It should be noted that each character proposes a certain criterion, which has a bias that might favor the proponent.

Being consistent with the propositions by Alsina (2017), the criteria that each character establishes could lead the students to relate the characteristics of each character to these criteria. Thus, according to Alsina (2017), we observed that in all criteria, information is dealt with objects, for example, the stones to calculate the weight of each one and as proposed in the description. It is possible to broaden this discussion for units of weight for each stone.

We identified that, in most criteria, the story makes use of ordered data according to it's classification and demonstrates a possible representation of the result under the criterion adopted.

Taking into consideration that Alsina (2017) suggests that students must relate from increasingly complex examples, the ordered classification of characters, can be a possibility to lead students to build graphic representations, capable of transmitting the information presented in the story and in the direction of Statistical Literacy, analysing this represented information.

The comprehension of representations, the classification order of each animal, is linked to the existence of a unit that each one represents, depending on the criterion, an aspect that Alsina (2017) considers necessary to develope. We can suppose that, when establishing these units of measurement, a possible piece of work from the story could be done with activities like the construction and use of graphics for analysis and, consequently, propose questions that foster Statistical Literacy.

In order to highlight the possibility of developing Statistical Literacy, we return to the perspective of the caterpillar in the illustrations about the processes adopted to answer who is going to keep the peach.

The caterpillar is shown as being capable of interpreting the results from the previous criteria adopted. In it's speech, critical and reflective questions point to biases, as well as to the limitations that each criterion has in relation to the data. We emphasized this when the rabbit proposed the criterion of the size of the ears. Although proposing another perspective, which should be reflected on within the plot context, the caterpillar's discourse seems to have arguments sufficiently capable of sustaining the outcome of the plot in the illustrations.

Final Considerations

By analyzing the illustrations and the story's plot, we can demonstrate potential possibilities to teach statistics with the book '*Who's going to keep the peach?'.* We identified some aspects of the Statistical Literacy based upon the analysis units which were linked to a succession of criteria established in the plot. Initially, the decision- making was a crucial element in the context of the work that follows a series of analysis. These analyses concern the criteria adopted, in relation to the legality of these criteria, the validity of the results obtained, among other factors, which require the competence to interpret and critically evaluate the information.

Thus, there exists the possibility of discussing ideas which were built based on such information, even pointing out possible biases or limitations, asking critical and reflective questions about the arguments, as proposed by Gal (2002) and the different perspectives on data analysis highlighted by Alsina (2017).

Through the story's analysis, we highlighted the illustrations and the plot, relating them to to possibilities of promoting Statistical Literacy. Besides leading to critical reflections, we observed the possibility of transferring certain information from the illustrations to graphical representations. Especially those graphical representations that could transfer the information presented, and in an orderly manner, the results obtained from each adopted criterion.

We concluded that aspects, such as the ones mentioned above, could help teachers in planning and reflecting upon their pedagogical activities. Thereby, we observed through the analysis of this story, the importance of other methodological resources for teaching, as noted by Alencar & Silva (2017), who consider books of children's stories a resource to be explored.

References

AH-HAE, Y., & HYE-WON, Y. (2006). *Quem vai ficar com o pêssego?* Callis.

ALENCAR, E. S. (2019). *Literatura infantil para o ensino de Matemática como recurso para a formação de professores*. Twee.

ALENCAR, E. S., & SILVA, R. J. (2017). A Literatura Infantil na Educação Matemática inclusiva. *Educação Matemática em Revista-RS, 3*(18), 68-74.

ALSINA, A. (2012). La estadística y la probabilidad en Educación Infantil conocimientos disciplinares, didácticos y experienciales. *Didácticas Específicas, 7*, 4-22.

BATANERO, C. (2000). Significado y comprensión de las medidas y posición central. *UNO, 25*, 41-58.

BATANERO, C., & GODINO, J. D. (2004). Didáctica de la estadística y probabilidad para maestros. En J. D. Godino (Ed.), *Didáctica de las matemáticas para maestros* (pp. 405-455). Universidad de Granada.

BRASIL (1998). *Parâmetros Curriculares Nacionais. Matemática*. MEC/SEF.

BRASIL (2014). *Programa Nacional Alfabetização na idade certa PNAIC. Caderno de estatística*. Ministério da Educação.

BRASIL (2017). *Base Nacional Comum Curricular*. Ministério da Educação.

CARZOLA, I., MAGINA, S., GITIRANA, V., & GUIMARÃES, G. (2017). *Estatística para os anos iniciais do ensino fundamental*. Sociedade Brasileira de Educação Matemática.

FERLIGOJ, A. (2015). How to improve statistical literacy. *Metodološki Zvezki, 12*(1), 1-10.

GAL, I. (2002). Adults' statistical literacy: Meanings, components, responsibilities. *International Statistical Review, 70*(1), 1-25.

GIORDANO, C., ARAÚJO, J. R. A., & COUTINHO, C. (2019). Educação Estatística e a Base Nacional Comum Curricular: o incentivo aos projetos. *Revista Eletrônica de Educação Matemática, 14*, 1-20.

GOUVÊA, J. S. V. (2014). *O ensino de estatística nas séries iniciais do ensino fundamental nas escolas municipais na cidade de Boa Vista-RR* (Dissertação de mestrado). Universidade Luterana do Brasil, Canoas – RS.

HONG, H. (1996). Effects of mathematics learning through children's literature on math achievement and dispositional outcomes. *Early Childhood Research Quarterly, 11*(4), 477-494.

MORAES, R. (1999). Análise de conteúdo. *Revista Educação, 22*(37), 7-32.

PIETROPAOLO, R.C., SILVA, A.D.F.G., PRADO, M.E.B.B., & GALVÃO, M.E.E.L. (2017). Letramento estatístico na formação continuada de professores dos anos iniciais com foco nas representações gráficas. *Revista de Ensino, Educação e Ciências Humanas, 18*(4), 341-346.

SHARMA, S. (2017). Definitions and models of statistical literacy: a literatura review. *Open Review of Educational Research, 4*(1), 118-133.

SILVA, J.R., ALMEIDA, C.D., & GUINDANI, J.F. (2009). Pesquisa documental: pistas teóricas e metodológicas. *Rev. Bras. de História & Ciências Sociais, 1*(1), 1-15.

SMOLE, C., CÂNDIDO P., & STANCANELLI, R. (1998). *Matemática e literatura infantil*. Lê.

TOOR, A., & MGOMBELO J. (2017). Teaching mathematics through storytelling: Engaging the 'being' of a student in mathematics. In K. Krainer, & N. Vondrová (Eds.), *Proceedings of the Ninth Congress of the European Society for Research in Mathematics Education* (pp. 3276-3282). ERME.

VOTTO, T., SCHREIBER, K. P., & PORCIÚNCULA, M. (2018). Educação estatística nos anos iniciais do Ensino Fundamental. *Cadernos de Pesquisa, 24*(esp.), 143-158.

WALLMAN, K. K. (1993). Enhancing statistical literacy: Enriching our society. *Journal of the American Statistical Association, 88(*421), 1-8.

ZACARIAS, E., & MORO M.L.F. (2005). A Matemática das crianças jovens e literatura infantil. *Educar Curitiba, 25*, 275-299.

ZAZKIS, R., & LILJEDAHL, P. (2009). *Teaching mathematics as storytelling.* Sense publishers.

Edvonete Souza de Alencar

Professora Adjunta da Universidade Federal da Grande Dourados (UFGD) Mestrado em Educação Matemática (Uniban) Doutora em Educação Matemática (PUC-SP).
Professora do mestrado em ensino de ciências e Matemática UFGD
Línea de Investigación: Formação de professores para o ensino de ciências e matemática.
Orcid: http://orcid.org/0000-0002-5813-8702; Email: edvonetealencar@ufgd.edu.br

José Ronaldo Alves Araújo

Mestre em Educação Matemática (PUC-SP).
Estudante de Doutorado em Educação Matemática do Programa de Estudos Pós-Graduados em Educação Matemática, Pontifícia Universidade Católica de São Paulo.
Línea de Investigación: Tecnologias da Informação e Educação Matemática.
Orcid: https://orcid.org/0000-0002-5352-4137; Email: jronaldoaaraujo@gmail.com

Danilo Díaz-Levicoy

Profesor de Matemática y Computación (ULAGOS). Máster en Didáctica de la Matemática (UGR). Doctor en Ciencias de la Educación (UGR).
Académico de la Facultad de Ciencias Básicas, Universidad Católica del Maule.
Línea de Investigación: Didáctica de la Matemática y de la Estadística.
Orcid: https://orcid.org/0000-0001-8371-7899
Email: dddiaz01@hotmail.com