

Análise dos conceitos estatísticos para crianças de 6 a 10 anos no livro digital "estatística para baixinhos: livro 1"

Analysis of statistical concepts for children aged 6 to 10 in the digital book "statistics for little ones: book 1"

Análisis de conceptos estadísticos para niños de 6 a 10 años en libro digital "estadística para los pequeños: libro 1"

Analyse concepts statistiques pour les enfants de 6 à 10 ans dans livre supplémentaire "statistiques pour les petits : livre 1"

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Abstract

This research analyzed the treatment of statistics in a sample composed of the editorial project (paradidactic book) published in electronic format in the Brazilian publishing market, the Amazon Kindle e-book called "Knowing Statistics – Statistics for Little Ones: Book 1". To this end, a qualitative methodology was carried out, of an exploratory and descriptive nature, specifically a content analysis. With this tool, aspects of teaching and learning statistics indicated by the National Common Curricular Base – BNCC as well as international documents for Brazilian students aged 6 to 10 were analyzed. The paradidactic book presents, through a fictional narrative, situations in which statistics are present in the daily life of the main character called Statistics, in addition to presenting the friend Graph and the friend Table through analogies with real-life situations, using playful language. With regard to teaching methods, it is proposed to develop the investigative cycle aiming at social and critical training, based

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on the BNCC. The presence of statistical content offers provocative elements for statistical literacy, however, there was a lack of better information to help teachers in their practice in the classroom, starting from the theoretical foundations of this literacy.

Keywords: Paradidactic book, Teaching statistics, Content analysis, Elementary school.

Resumen

Esta investigación analizó el tratamiento de la estadística en una muestra compuesta por el proyecto editorial (libro paradidactico) publicado en formato electrónico en el mercado editorial brasileño, el libro electrónico de Amazon Kindle titulado "Conociendo la Estadística - Estadística para los pequeños: Libro 1". Para ello, se llevó a cabo una metodología cualitativa de carácter exploratorio y descriptivo, específicamente un análisis de contenido. Con esta herramienta, se analizaron aspectos de la enseñanza y el aprendizaje de la estadística indicados por la Base Curricular Nacional Común (BNCC), así como documentos internacionales para estudiantes brasileños de 6 a 10 años. El libro paradidactico presenta, a través de una narrativa ficticia, situaciones en las que la estadística está presente en la vida cotidiana del personaje principal, llamado Estadística, además de presentar a los amigos Gráfico y Tabla, mediante analogías con situaciones de la vida real, utilizando un lenguaje lúdico. En cuanto a los métodos de enseñanza, se propone el desarrollo del ciclo investigativo, con el objetivo de una educación social y crítica, basada en la BNCC. La presencia de contenido estadístico ofrece elementos estimulantes para la alfabetización estadística. Sin embargo, se percibió una falta de mejor información para apoyar a los docentes en su práctica docente, basada en los fundamentos teóricos de esta alfabetización.

Palabras clave: Libro paradidactico, Enseñanza de la estadística, Análisis de contenido, Educación primaria.

Résumé

Cette recherche analyse le traitement des statistiques dans un échantillon composé du projet éditorial (manuel complémentaire) publié en format électronique sur le marché brésilien de l'édition, le livre numérique Amazon Kindle intitulé « Apprendre les statistiques – Les statistiques pour les petits : Livre 1 ». À cette fin, une méthodologie qualitative exploratoire et descriptive a été mise en œuvre, plus précisément une analyse de contenu. Cet outil a permis d'analyser les aspects de l'enseignement et de l'apprentissage des statistiques tels qu'indiqués par le Programme national commun

brésilien (PNCB), ainsi que par des documents internationaux destinés aux élèves brésiliens âgés de 6 à 10 ans. Le manuel complémentaire présente, à travers un récit fictif, des situations dans lesquelles les statistiques sont présentes dans le quotidien du personnage principal, nommé Statistiques. Il présente également les amis Graphique et Tableau, par le biais d'analogies avec des situations réelles, en utilisant un langage ludique. Concernant les méthodes pédagogiques, le développement du cycle d'investigation est proposé, visant une éducation sociale et critique, basée sur le PNCB. La présence de contenus statistiques offre des éléments stimulants pour la culture statistique. Toutefois, on constatait un manque d'informations plus pertinentes pour aider les enseignants dans leurs pratiques pédagogiques, fondées sur les principes théoriques de cette compétence.

Mots-clés : Manuel complémentaire, Enseignement des statistiques, Analyse de contenu, Enseignement primaire.

Resumo

Esta pesquisa analisou o tratamento da estatística em uma amostra composta pelo projeto editorial (livro paradidático) publicado em formato eletrônico no mercado editorial brasileiro, o *e-book kindle* Amazon denominado "Conhecendo a Estatística – Estatística para baixinhos: livro 1". Para tanto, foi realizada uma metodologia qualitativa, de natureza exploratória e descritiva, especificamente uma análise de conteúdo. Com essa ferramenta foram analisados aspectos do ensino e da aprendizagem de estatística indicados pela Base Nacional Comum Curricular – BNCC, bem como documentos internacionais para alunos brasileiros de 6 a 10 anos. O livro paradidático apresenta por meio de uma narrativa ficcional, situações em que a estatística está presente no dia a dia da personagem principal chamada Estatística, além de apresentar o amigo Gráfico e a amiga Tabela, por meio de analogias com situações da vida real, utilizando uma linguagem lúdica. No que diz respeito aos métodos de ensino, propõe-se o desenvolvimento do ciclo investigativo visando uma formação social e crítica, tomando como base a BNCC. A presença dos conteúdos estatísticos oferece elementos provocativos para o letramento estatístico, no entanto, sentiu-se a falta de melhores informações que auxiliem o professor em sua prática na sala de aula, partindo dos fundamentos teóricos desse letramento.

Palavras-chave: Livro paradidático, Ensino de estatística, Análise de conteúdo, Ensino fundamental.

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Introduction

The explosion of electronic information, coupled with technological and scientific development, has fostered the emergence of the electronic book. The low production cost of this new medium has been fundamental to the creation of digital editorial projects aimed at school, public, academic, specialized, and corporate libraries. Furthermore, in this context, students, researchers, and ordinary citizens can publish, copy, distribute, or search for a book from anywhere on the planet, provided they have internet access.

Moreover, according to Rei and Rosados (2016), following human evolution and the rise of new technologies, the book production process has shifted, culminating in digital publications that require adaptations to new formats. Thus, the e-book provides various possibilities and resources intrinsic to its format, being considered a promising medium for the dissemination and circulation of intellectual and cultural information.

However, it must be noted that, according to Rao (2005), the electronic book is not a new concept; since the inception of the internet, there has been a proliferation of electronic publications (equipped with multimedia resources, hyperlinks, and interactivity), as the digitization of books is one of the primary drivers of this market.

Nevertheless, the limits of the digital medium must be highlighted. According to Negroponte (1995), in the digital world, the problems of volume and depth disappear, as readers and authors can move with greater freedom between the general and the specific. These information systems are capable of maintaining an operational order independent of any hierarchy, subverting the linear way in which the world and the universe are understood.

Information is used, absorbed, assimilated, manipulated, transformed, produced, and disseminated in an interconnected world, as time and distance are reduced by the speed at which information is transmitted (Schwarzelmüller, 2004).

Specifically highlighting e-book readers, Maynard and Cene (2005) observed that these devices can influence creativity and motivate student learning. However, they recognize that several factors may limit this acceptance, including the difficulty schools

face in operationalizing the resource and the current limited availability of electronically published titles. It is possible that students more attuned to modernity, the "electronic generation", will easily adapt to multimedia teaching materials, as will professors and researchers, albeit in different proportions depending on the context and the particularities of scientific practice.

Focusing specifically on this work, we believe in the possibility of science learning through editorial projects (paradidactic book) in electronic format. These can serve as teaching materials that facilitate the teacher's work while helping students learn reflectively and critically, especially when the books feature stories related to their environment, life experiences, surroundings, and the teaching of statistics.

Furthermore, paradidactic books do not follow a linear progression in their content. According to Campello and Silva (2018), an initial discussion on a specific topic can generate different, subsequent themes; it is through this approach that scientific knowledge is introduced by supplementary books.

Oliveira Júnior et al. (2015) emphasize the necessity of including activities in Elementary Education that promote the construction of mathematical language through reading and writing in the classroom, highlighting the importance of developing paradidactic book for teaching statistics at this level.

According to Campos and Perin (2021), one way to work with the statistical concepts required by the National Common Curricular Base (BNCC) (Ministry of Education, 2018) is through the support of paradidactic books. In addition to providing more in-depth content, these books encourage reading and can foster a student's interest in statistics. A survey of academic works involving paradidactic statistics books in basic education was also conducted, alongside research into the quantity and types of books available on the market, their characteristics, and their purposes. Finally, they present a proposal for the development of a paradidactic statistics book for elementary education.

Lastly, Oliveira Júnior and Moraes (2026) mapped editorial projects in the Brazilian market, specifically paradidactic books aimed at teaching statistics in the early years of Elementary Education published between 1997 and 2022. They examined how these are characterized as teaching materials supporting teaching and learning. It was

observed that the approaches to statistical content are appropriate for the early years of Elementary Education, utilizing light, humorous, and attractive language for students aged 6 to 10, making it possible to consider the intervention potential that paradidactic books offer to statistics education.

Statistical concepts were analyzed in the electronic paradidactic book titled "*Conhecendo a Estatística – Estatística para baixinhos – volume 1*" [Knowing Statistics – Statistics for Little Ones – Book 1] (Braz, 2020). According to the author, this book was constructed through a narrative that develops statistical concepts and skills in an interactive and playful way for children from age 4, seeking to promote learning and present a broad worldview. The fictional narrative presents situations in which a character named "Statistics" introduces daily scenarios alongside her friends "Graph" and "Table".

Statistical approaches in the BNCC regarding Early Childhood Education (ages 4–5) and the early years of Elementary School (ages 6–10)

Initially, it is highlighted that the BNCC (National Common Curricular Base) addresses the importance of interactions and play as the structural axes of pedagogical practices in Early Childhood Education. Its organization presents six rights of learning and development for children, namely: coexisting, playing, participating, exploring, expressing, and knowing oneself. Based on these rights, the aim is to ensure challenging and meaningful learning conditions for children (Ministério da Educação, 2018).

Regarding statistical aspects in this educational cycle, the learning field "Spaces, times, quantities, relations, and transformations" is associated with mathematical knowledge that needs to be experienced. Among the objectives of this field, the following stands out: (EI02ET05) Classify objects, considering specific attributes such as size, weight, color, shape, etc. (Ministério da Educação, 2018, p. 51).

By mentioning the classification of objects, a concern with statistical concepts is evident, as classification is part of the process of organizing statistical data. In this sense, by considering classification as an important element of the child's experience, these guidelines may contribute to stimulating the development of statistical thinking.

For Chance (2002), statistical thinking involves thinking beyond what is presented in the problem, that is, the ability to view it globally and understand the investigative and statistical process. According to Campos et al. (2011), statistical thinking is the ability to relate quantitative data to concrete situations while acknowledging the presence of variability and uncertainty, choosing appropriate statistical tools, viewing the process globally, exploring data beyond what the texts prescribe, and spontaneously questioning data and results.

Another learning object within the same field in the BNCC states: (EI03ET08) Express measurements (weight, height, etc.) by constructing basic graphs (Ministério da Educação, 2018, p. 52). The implementation of activities involving statistics becomes clearer when it emphasizes the construction of graphs associated with students' personal characteristics.

The BNCC also presents a "Synthesis of Expected Learning" at the end of Early Childhood Education, providing teachers with elements that indicate the objectives to be explored within each field. In the field "Spaces, times, quantities, relations, and transformations," the following skill is highlighted: "Identify and register quantities through different forms of representation: counting, drawings, symbols, writing numbers, organizing basic graphs, etc." (Ministério da Educação, 2018, p. 55). Thus, there is a clear concern with including Statistical Education in Early Childhood Education.

In this perspective, statistical literacy is understood under the framework of Gal (2002) as the capacity to interact critically with data. For the author, developing this skill requires not only a technical mastery of mathematical concepts but also an investigative and analytical stance toward reality. Consequently, literacy constitutes an essential requirement for individuals to act autonomously and consciously amidst the growing complexity of contemporary information.

Starting from Gal's (2002) definition, Campos (2007) understands statistical literacy as the understanding of statistical language, its terminology, symbols, and terms, the ability to interpret graphs and tables, and the comprehension of statistical information provided in newspapers and other media.

For Lima and Giordano (2021), statistical literacy develops from a critical and investigative posture, through reading skills, basic knowledge of Statistics, Mathematics, and the mother tongue, as well as the investigated context. This development aims to empower citizenship, being a topic of interest and relevance for Brazilian education.

Furthermore, the BNCC (Ministério da Educação, 2018) highlights that the first steps involve working with data collection and organization from research of interest to students. Reading, interpreting, and constructing tables and graphs play a fundamental role in this process, as does the production of written texts for data communication.

Therefore, the BNCC (Ministério da Educação, 2018) emphasizes the importance of teaching statistics from the early years, intending to make students statistically literate and preparing them for research. This begins with the formulation of socially relevant questions, moves through the collection and organization of data in tables and graphs, and concludes with the presentation and dissemination of research results.

This process converges with the principles of the GAISE I and II reports (Franklin et al., 2005; Bargagliotti et al., 2020), which view statistical literacy as an individual development process, proposing a progressive framework in three levels: A (beginning), B (intermediate), and C (advanced). However, it is noted that there was no attempt to link these levels to specific educational stages. Although they can be observed progressively throughout schooling, these levels should not be understood as directly related to grade levels or student age. Each level is characterized by a set of specific skills to be achieved through a statistical investigation problem-solving process.

According to Bargagliotti et al. (2020), this process is characterized by four stages associated with the investigative statistical process: i) Formulate Questions: clarifying the problem and formulating questions that can be answered with data; ii) Collect Data: designing and implementing a plan to collect appropriate data; iii) Analyze Data: selecting and applying appropriate graphical and numerical methods to analyze the collected data; iv) Interpret Results: establishing a relationship with the original question(s).

Broadly speaking, at Level A of GAISE II according to Bargagliotti et al. (2020), students are expected to be able to understand when a statistical investigation is

appropriate, as well as to: (i) differentiate types of variables (qualitative or quantitative) in a data set; (ii) represent the variability of variables using appropriate visual resources such as tables or statistical graphs; and (iii) use statistical evidence from analyses to, under teacher guidance, answer investigative questions and communicate results through structured responses.

This study seeks to investigate how the BNCC (Ministério da Educação, 2018) statistical skills for students aged 6 to 10 relate to the characteristic skills of Level A statistical literacy according to GAISE II (Bargagliotti et al., 2020). It is understood that each BNCC skill for this age group can be mapped to the skills that distinguish Level A. This relational order is justified because BNCC skills have a broader configuration, whereas GAISE skills present a more fragmented structure, distinguishing specific technical aspects.

Methodological procedures

The objective of this research was to analyze a paradidactic book aimed at teaching Statistics to students aged 6 to 10, published in the Brazilian editorial market. The investigation employed a qualitative methodology with a descriptive approach, using content analysis of the materials identified in the introduction of each production found online and/or in the book itself.

According to Triviños (2008), descriptive research aims to meticulously describe the facts and phenomena of a given reality to obtain information regarding a predefined research problem.

Thus, the sample consisted of the paradidactic e-book (Amazon Kindle format) titled "*Conhecendo a Estatística – Estatística para baixinhos – Livro 1*" [Knowing Statistics – Statistics for Little Ones – Book 1] by Braz (2020).

The analytical framework was based on the content analysis technique proposed by Espina and Novo (2019), comprising seventeen categories organized into four dimensions: i) Description of the editorial project (paradidactic book); ii) Presence of Statistics; iii) Content addressed; iv) Planning and management.

The categories underlying each dimension were adapted to current conceptions of the teaching and learning processes of Statistics for 6-to-10-year-old students

(Alsina, 2017, 2018; NCTM, 2000; Ministry of Education, 2018; Franklin et al., 2007; Bargagliotti et al., 2020).

Regarding data analysis procedures, categories related to dimensions 1 and 2 underwent a strictly qualitative approach. In contrast, data regarding dimensions 3 and 4 were subjected to an initial qualitative analysis based on narrative descriptions and a detailed examination of the evidence observed in the textbook.

Aiming to provide objectivity to the description of the findings, the responses obtained underwent a quantification process. The systematization followed the parameters of Espina and Novo (2019), as shown in Table 1, establishing a numerical scale for the categories based on the degree of incidence identified in the analyzed paradidactic book.

Table 1

Allocation criteria for scoring categories

Level	Criterion
0 – None/Absent	The editorial project (paradidactic book) does not align with the indicators specified in this category.
1 - Low	There are insufficient references, and the specifications outlined in this category are scarce.
2 - Medium	It can be ensured that the specifications determined in this category are moderately met within the editorial project (paradidactic book).
3 - High	The specifications established in this category are fully reflected in the editorial project (paradidactic book).

Note. Adapted from Espina and Novo (2019, p. 98).

Considering the data presented in Table 1, Level 0 indicates absence; that is, the evaluated criterion is simply nonexistent in the paradidactic book. In other words, there is no attempt or evidence that the point was considered. At Level 1, an attempt exists but is superficial. This is the case when something is mentioned, but it lacks the details, examples, or solid structure required to support the category.

At Level 2, the paradidactic book is understood to meet the requirements in a balanced or "acceptable" manner. Essential information is present, meaning it fulfills its role, but it could be further elaborated. Finally, Level 3 indicates excellence. The activities of paradidactic book reflects exactly what the category demands in a clear, detailed, and visible way throughout the editorial proposal. Consequently, a numerical value was assigned to each category based on its degree of presence in the textbook.

The results follow the order in which they were collected via the analytical instrument and presented in the methodological design: divided into four dimensions and their respective categories (C_i , where $i = 1, \dots, 17$). Additionally, some tasks from the paradidactic book are illustrated to provide a better understanding of the results.

The description of the paradidactic book includes the year of publication, title, educational level, and methodological approach. The methodological focus is "globalized," as statistical and probabilistic content is integrated with other mathematical content blocks. The paradidactic book utilizes problem-solving as the guiding pillar of its methodology.

Dimension 1, dedicated to the characterization of the paradidactic book, comprises five categories (C_1 to C_5). This initial stage systematizes information regarding the year of publication, title, target educational level, and the adopted methodological framework. Dimension 2, composed of categories C_6 and C_7 , specifically verifies the inclusion of Statistics within the scope of the work. Dimension 3 (C_8 to C_{11}) focuses on the analysis of the statistical content itself. Finally, Dimension 4 encompasses categories C_{12} to C_{17} , aimed at examining the planning and management of the paradidactic book.

Describing the paradidactic book according to its editorial structure (Dimension 1)

Data regarding Dimension 1 are organized in Table 2, which provides details on the paradidactic book through its categorization and structural analysis.

Table 2

Description of the paradidactic book regarding Dimension 1

C ₁ . Publisher: Amazon Kindle eBook	C ₂ . Paradidactic Book: Knowing Statistics – Statistics for Little Ones – Book 1
C ₃ . Publication year: 2020	C ₄ . Education Level: Ages 4 and up (Early Childhood Education)
C ₅ . Methodological approach of the paradidactic book: Project-Based Learning	

Note. Compiled by the authors.

Regarding the methodological approach, according to Espina and Novo (2019), Braz's (2020) paradidactic book is structured as a project-based method. It stems from a process-oriented learning perspective, encompassing non-differentiated fields or

disciplines and building upon children's natural curiosity. For instance, a project focused on statistical literacy addresses types of activities related to statistical concepts.

In this context, the paradidactic book is described as follows: in 2020, the Amazon Kindle E-book project titled "Conhecendo a estatística (estatística para baixinhos – Livro 1)" [Knowing Statistics - Statistics for Little Ones – Book 1], authored by Gabriela Braz, was published. Its target educational level is Basic Education, specifically Early Childhood Education for children aged 4 and above.

Braz (2020) develops statistical concepts and skills with children starting at age 4 in an interactive and playful manner, aiming to promote statistical learning and provide a broad worldview. The skills presented align with the BNCC (National Common Curricular Base; Ministry of Education, 2018) through the development of the investigative cycle as a teaching strategy for literacy development. The book's narrative presents situations where the character named "Estatística" (Statistics) is embedded in daily life, introducing her friend "Gráfico" (Graph) through analogies with real-world objects, as well as the importance of their friend "Tabela" (Table) and the overall purpose of statistics.

Furthermore, after classifying narratives in paradidactic book, Dalcin (2002) highlights that images are present in all such books that opt for narrative-based work. Thus, the author also describes the types of illustrations observed, which are directly associated with the narratives. In the case of this specific book, it is characterized as a fictional narrative, meaning it features:

1. Embedded illustrations (figures or drawings integrated into the text to aid the understanding of the narrative and statistical concepts);
2. Contextualizing illustrations, intended to represent a scene narrated in the written text without performing a specific function in the process of understanding the statistical content;
3. Visualization illustrations aid in the understanding of statistical content and incorporate statistical symbology (the characters Statistics, Table, and Graph) and mathematical symbology (the character Mathematics, the mother of Statistics).

Drawing on Dalcin's (2002) framework, the paradidactic book under analysis aligns with the pragmatic category. While it encompasses the discipline's historical background, its core value stems from the interplay between Statistics and the student's everyday reality, fulfilling the demands for a functional and contextualized approach to learning.

The presence of statistical concepts in the paradidactic book (dimension 2)

Regarding category C_6 of Dimension 2, it is observed that the paradidactic book under analysis is specifically aimed at teaching Statistics to children aged four and older. In this sense, it can be inferred that the proposed set of activities is compatible with the developmental level of first-grade students in Elementary School (approximately six years old).

The subsequent section is dedicated to the analysis of category C_7 within the scope of the aforementioned dimension. The objective is to investigate the distribution of Statistics activities designed for the first year of Elementary School, a segment that defines the scope of this research.

The skills presented in the paradidactic book follow the BNCC (Ministry of Education, 2018) by developing the investigative cycle as a teaching proposal for reading development. Among the established skills, those described for the first year of Elementary School (6-year-old students) stand out: i) (EF01MA21) – Reading data expressed in tables and simple column charts; ii) (EF01MA22) – Conducting research involving up to two categorical variables of interest and a universe of up to 30 elements and organizing data through personal representations.

Furthermore, the BNCC (Ministry of Education, 2018) indicates that the initial steps for teaching Statistics involve working with the collection and organization of data from research of interest to the students. The teaching and learning process must consider planning how to conduct research while reflecting on the role of statistics in the students' daily lives. Thus, reading, interpreting, and constructing tables and charts play a fundamental role, as does the production of written texts for data communication, since it is necessary to understand that the text must synthesize or justify the conclusions.

As recommended by the BNCC, Early Childhood Education, the stage addressed by the book in question, demands the promotion of experiences that stimulate observation, the manipulation of objects, and the investigation of the environment. In this context, the pedagogical process is responsible for encouraging the exploration of surroundings, the formulation of hypotheses, and the consultation of diverse information sources as means to satisfy the curiosity and inquiries inherent to child development (Ministry of Education, 2018).

At this stage of Basic Education, according to the BNCC, essential learning encompasses behaviors, skills, and knowledge, as well as experiences that promote learning and development across various "fields of experience," always taking interactions and play as structuring axes.

Among these learning goals, those that constitute learning and development objectives stand out, specifically those expressing measurements (weight, height, etc.) and the construction of basic charts (Ministry of Education, 2018).

Consequently, the paradidactic book fosters the systematization of data, encompassing the stages of collection, organization, tabulation, and graphic representation, by anchoring itself in elements intrinsic to the students' daily lives.

Dimension 3: Statistical topics in the paradidactic book

Through Dimension 3, we aimed to examine the didactic transposition of the subject matter and its pedagogical suitability for students in the early stages of primary education, as outlined in Table 3.

Table 3

Description of the paradidactic book regarding Dimension 3 (presence of statistical content)

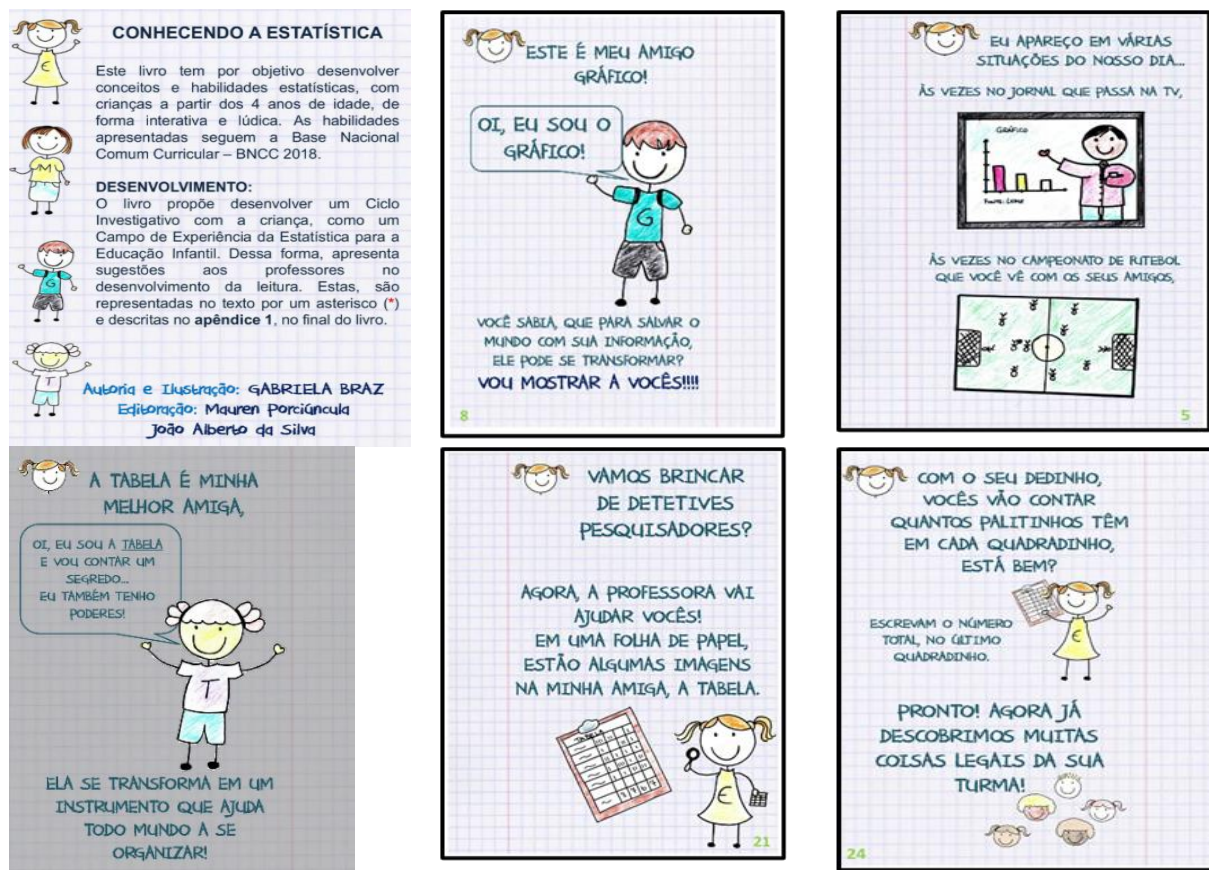
Category	Analyses	Level
C ₈ . Is the content appropriate for the developmental level of the target audience?	Regarding the analyzed aspect, the content is considered appropriate for the subject's developmental level. The narrative explains the importance of statistics in daily life, exploring data collection through tables and graphs while employing playful language suited to this educational stage.	3
C ₉ . Is the content related to the students' daily lives?	Indeed, the narrative exemplifies the collection and organization of data concerning, for instance, the students' preferred food, games, and colors.	3
C ₁₀ . Is the Statistics content integrated with other disciplines?	The narrative presents themes and brief investigative proposals, originating from the introduction of statistics in everyday contexts. However, an interdisciplinary approach is not explicitly proposed; that is, no association is made with other fields of knowledge, such as Geography, History, or Science. Although the material holds potential, it leaves such integration entirely to the teacher's creativity.	1
C ₁₁ . Does Statistics learning occur cyclically within the project?	The story begins by introducing Statistics and clarifying its daily relevance, subsequently presenting methods for data collection and organization through statistical tables and charts.	3

Note. Compiled by the authors.

Regarding category C₈ (Are the contents appropriate for the subject's developmental level?) of Dimension 3, the statistical content is deemed appropriate for the developmental stage of primary school students. This adequacy is centered on three fundamental pillars: contextualization, visual tools, and language (Figure 1).

Figure 1

Research on students' daily lives



Note. Adapted from Braz (2020, pp. 2, 9, 12, 21, and 24).

As advocated by the BNCC (Ministry of Education, 2018), the introduction of statistical concepts should occur in the early years of schooling, grounded in elements of the students' daily lives. By investigating variables familiar to the world of children, such as preferences for colors, fruits, or toys, the teaching and learning process promotes the transition from abstract thought to a tangible and contextualized understanding of reality.

Regarding data systematization, the use of statistical tables and graphs proves to be strategic, as children's thinking at this stage is enhanced by visual resources. The conversion of listed information into a column-based model optimizes the visual identification of frequencies, making "greater than" and "less than" relationships more intelligible. Additionally, a playful approach to the analyzed material fosters student emotional engagement, which, according to pedagogical literature, is a determining factor for the efficacy of the teaching-learning process.

Concerning category C₉, which relates to the transposition of statistical content to the everyday sphere, narrative segments are observed that bring the object of study closer to the students' empirical reality. The work employs fictional resources to

exemplify data processing, specifically data collection and tabulation, based on thematic axes of daily school life, such as the choice of food, games, and colors (Figure 2).

Figure 2

Investigation into elements of students' daily lives



Note. Adapted from Braz (2020, p. 19).

Regarding category C_{10} (Relationship between statistical content and other disciplines), it can be inferred that the mere exposure to "statistical daily life", exemplified by the isolated analysis of graphs in journalistic media, establishes a context but does not necessarily constitute interdisciplinarity. For the latter to materialize, pedagogical intentionality is essential; learning objectives must deliberately articulate technical-statistical proficiency with a critical understanding of other fields of knowledge, such as the convergence between data literacy and awareness of water resource waste.

It is crucial to define a research problem, considering that it stems from a question that cannot be answered by intuition alone, requiring data instead. Opportunities should be provided to foster a positive attitude in which the child is not merely a reader of graphs, but a "young researcher" who collects, organizes, and interprets information. Thus, by leaving these aspects solely to the teacher's creativity, an opportunity is missed to guide educators in constructing investigative projects that make Statistics less abstract for children.

Regarding category C₁₁ (Does statistical learning occur cyclically within the project?), the excerpt from the paradidactic book's narrative highlights that statistical content is structured through a spiral curriculum perspective. It is observed that the investigative cycle is fully addressed, encompassing the stages of data collection, organization, and representation in tables and graphs, as illustrated in Figure 3.

Figure 3

Sequence of statistical topics from basic to advanced levels



Note. Adapted from Braz (2020, p. 5).

It is important to highlight that both the BNCC (Ministry of Education, 2018) and the GAISE I and II reports (Franklin et al., 2007; Bargagliotti et al., 2020) are concerned with the educational stages of each student, recommending a spiral curriculum approach to knowledge objects, progressing gradually according to cognition and learning expectations for each school stage. The BNCC expands statistical content as the years progress, which resembles the GAISE levels, thus possessing a verisimilitude with the spiral curriculum, as contents are broadened as the student learns.

Furthermore, it is considered that paradidactic books act as mediators in teaching Statistics to children in early childhood. By integrating playfulness into the presentation of content, this resource promotes a cognitive proximity to the statistical universe, contextualizing abstract concepts through everyday experiences and ratifying the social applicability of this knowledge.

In turn, GAISE establishes three levels of statistical literacy: A, B, and C. At Level A, the focus of this work, it is recommended to approach activities with simple

experiments where the population of interest may be the class participants. In this case, the study sample consists of all elements of the target population (census). It is important to emphasize that it is at this level that the primary ideas for building statistical literacy are introduced (Franklin et al., 2007; Bargagliotti et al., 2020).

Thus, the concept of statistical literacy for the early years of Elementary School, when analyzed through the lens of the BNCC (Ministry of Education, 2018) and the North American GAISE I and II documents (Franklin et al., 2007; Bargagliotti et al., 2020), reveals a pedagogical convergence: Statistics should not be taught as isolated calculations, but as an investigative process.

Therefore, to meet both BNCC and GAISE standards, the teaching of "pre-made graphs" should be avoided, as statistical literacy occurs when the student formulates the research question. As an example, rather than providing a graph about endangered animals, the teacher should challenge the class: "How can we find out which animals our classmates want to protect the most?". By traversing the path from doubt to visual answer, the student constructs the literacy defined by Franklin et al. (2007) and the BNCC (Ministry of Education, 2018).

Dimension 4: Management and Planning

In Dimension 4, the design, management, and evaluation of mathematical competence activities in the classroom were analyzed according to Alsina (2016) in the paradidactic book titled "Conhecendo a Estatística – Estatística para baixinhos – Livro 1" [Knowing Statistics - Statistics for Little Ones – Book 1] (Table 4).

Table 4

Description of the paradidactic book regarding Dimension 4 (Management and Planning

Category	Analyses	Level
C ₁₂ . Are teachers encouraged to conduct preparatory activities prior to the proposed files related to Statistics?	The paradidactic book does not provide activities prior to the Statistics-related content, which is a key strategy for teachers to identify students' prior statistical knowledge. Thus, a diagnosis of statistical literacy levels could be established and based on this knowledge, lessons, strategies, and interventions could be planned to enhance learning.	0
C ₁₃ . Is it suggested that, at any point, teachers prepare complementary activities related to	Regarding this aspect, after presenting the content, the book proposes a survey on class preferences at the end. In this activity, students must apply the statistical concepts introduced during the narrative to collect, organize, and represent data.	2

the Statistics content?		
C ₁₄ . Does the paradidactic book provide for potential curricular adaptations in the proposed tasks related to Statistics??	It is noted that the paradidactic book does not offer proposals for curricular adaptation of its activities. Given the diverse learning levels present in the classroom, such adaptation is essential to ensure the inclusion of all students in the teaching and learning process.	0
C ₁₅ . Is precise mathematical vocabulary utilized in the paradidactic book regarding Statistics?	Statistical terms such as table, graph, statistics, research, and data organization are presented. Furthermore, some characters in the narrative are named after statistical terms, allowing for reflection on their meanings through the tasks proposed throughout the story.	3
C ₁₆ . Beyond the printed material, are other activities exemplified in different contexts: everyday life situations, manipulatives, games, stories, songs, and technological resources?	Within the narrative itself, it is observed that the book does not address this aspect precisely. However, in Appendix 1, a suggestion for using manipulative materials to organize survey data can be identified.	1
C ₁₇ . Does the paradidactic book establish any guidelines for the assessment of Statistics content?	There are no established guidelines for assessing Statistics content, which is essential for enabling teachers to identify learning difficulties, evaluate their own practice, and redesign their lessons.	0

Note. Compiled by the authors.

Initially, theoretical premises suggest that the absence of diagnostic assessment propositions or initial mobilization activities in paradidactic materials constitutes a significant pedagogical gap. Such an omission neglects children's prior knowledge and intuitive conceptions, which are fundamental elements for the construction of meaning in meaningful learning.

In this perspective, to deepen the analysis regarding item C₁₂ (Is it suggested that teachers perform preliminary activities for the proposed statistics-related files?), it is necessary to ground the discussion in the following theoretical and practical axes:

- i. Diagnostic Assessment as a Starting Point: The discussion should focus on the premise that children enter the classroom with prior statistical concepts. Without a preliminary activity, educators risk proposing tasks that are either overly complex, leading to frustration for both teacher and students, or too simplistic, resulting in disengagement. In other words, diagnostic activities make it possible

to identify whether a student has mastered counting and classification before being required to construct a graph.

- ii. Investigative Cycle: the proposal of a preliminary activity serves to situate the problem within the student's context. If the material presents real-world situations and research questions, it is possible to advance the understanding of the investigative cycle, that is, one might ask: "What do we want to discover about our class?", thereby opening various investigative possibilities.
- iii. Identification of Misconceptions: The use of diagnostic pre-assessment activities allows the teacher to map potential conceptual gaps. If the instructional material does not suggest such practices, the teacher may focus solely on teaching graphing techniques, failing to foster the ability to interpret, understand, and explain statistical processes and results.

In this sense, the absence of guidance for preparatory activities in the analyzed material limits teacher autonomy in designing personalized learning trajectories. Statistics education in the early years of Elementary School requires instruction to stem from the student's context and informal knowledge, ensuring that the formalization of concepts (graphs and tables) attains both practical and cognitive significance.

Regarding category C_{13} (Suggestions for teachers to prepare complementary activities related to statistical content), after presenting the content, the paradiactic book concludes by proposing a survey on class preferences. In this activity, students must apply the statistical concepts introduced during the narrative to collect, organize, and represent data (Figure 4).

Figure 4

Proposal for Complementary Activities



Note. Adapted from Braz (2020, pp. 21–25).

It is observed that the pedagogical reader operationalizes the competencies established by the BNCC (Ministry of Education, 2018) by linking the teaching of Statistics to the student's reality. According to the regulatory text, pedagogical work in the early years should begin with students' engagement in processes of collecting and organizing information, based on themes of their direct interest.

Planning how to conduct research helps students understand the role of statistics in their daily lives. Thus, reading, interpreting, and constructing tables and graphs play a fundamental role, as does the method of producing written text for data communication, as it is necessary to understand that the text must synthesize or justify conclusions.

This complementary activity proposal ensures the objects of knowledge directed by the *Base* for the 1st Year of Elementary School: i) Collection and organization of information; ii) Reading of tables and simple column graphs; iii) Personal records for communicating collected information. By ensuring the aforementioned objects of knowledge, the activity addresses the skill (EF01MA22): "Conduct research involving

up to two categorical variables of interest and a universe of up to 30 elements and organize data through personal representations."

Based on the description of learning objects and skills according to the BNCC (Ministry of Education, 2018) for students aged 6 to 10, it is perceived that they are associated with Level A as expressed in GAISE II (Bargagliotti et al., 2020). That is, it is intended to present the statistical problem-solving process more formally, introducing simple experiments and recommending the use of non-complex activities.

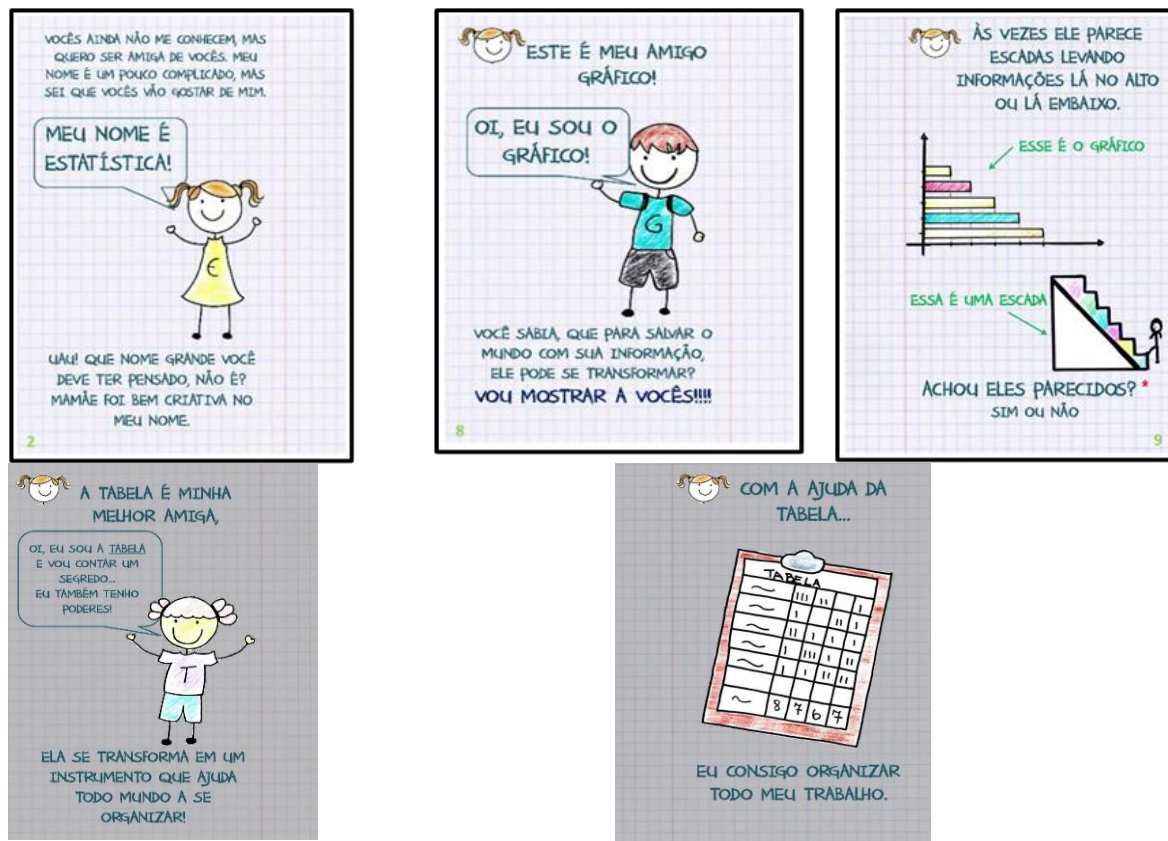
To discuss category C_{14} (Curricular Adaptation) in statistical pedagogical readers for the proposed cycle, one must consider the heterogeneity of student proficiency levels and the different stages of cognitive development. Thus, curricular adaptation in this context refers to the flexibility of the task so that it remains challenging both for students at an initial literacy level and for those with more advanced logical-mathematical reasoning.

In other words, the absence of guidelines for curricular adaptation in the pedagogical reader transfers the entire planning burden to the teacher. For the material to be considered "adaptable," it should offer suggestions for simplification or enrichment for the same activity, allowing the teacher to adjust their lesson plan according to the class's response, ensuring that the statistical concept is achieved through distinct paths.

Regarding category C_{15} (Presents vocabulary for statistics teaching), it is considered that throughout the narrative, specific vocabulary is used precisely, introducing the reader to statistical terms such as table, graph, research, and data organization (Figure 5).

Figure 5

Presentation of Statistical Vocabulary Usage



Note. Adapted from Braz (2020, pp. 8, 9-14).

Category C₁₆ illustrates activities that link statistical instruction to practical everyday scenarios. Aiming to guide teachers in implementing the investigative cycle, the Appendices section (Figure 6) provides guidelines for conducting empirical research on ludic themes and assessing the students' level of engagement with the material. It is observed, however, that although the paradidactic book suggests the use of manipulatives for data collection, there is no clear definition of which materials should be prioritized.

Figure 6

An overview of the appendices provided at the end of the paradidactic book

APÊNDICE 1

ORIENTAÇÕES AO PROFESSOR

As orientações abaixo, têm o objetivo de auxiliar o professor no desenvolvimento do ciclo Investigativo.

PÁGINA	ORIENTAÇÃO
01	PREENCHER ITEM 1 TABELA APÊNDICE 2
03	INTERAGIR PERGUNTANDO OS NOMES DOS ALUNOS
04	CONFECCIONAR CRACHÁ DE PESQUISADOR
09	PREENCHER ITEM 2 TABELA APÊNDICE 2
10	PREENCHER ITEM 3 TABELA APÊNDICE 2
11	PREENCHER ITEM 4 TABELA APÊNDICE 2
12	PREENCHER ITEM 5 TABELA APÊNDICE 2
17	PREENCHER ITEM 6 TABELA APÊNDICE 2
18	GERAR DISCUSSÃO
22	ENTREGAR AOS ALUNOS FOLHA COM TABELA DE TEMÁTICAS (APÊNDICE 3) DE INTERESSE DA TURMA. EXEMPLO: FRUTAS, CORES, BRINQUEDOS... CADA GRUPO SERÁ RESPONSÁVEL POR UMA VARIÁVEL.
25	CRIAR COM MATERIAL MANIPULÁVEL UM GRÁFICO COLETIVO COM AS VARIÁVEIS INVESTIGADAS.
26	CONSTRUIR COM A TURMA, UM GRÁFICO DE UMA PESQUISA DE SATISFAÇÃO, QUESTIONANDO SE GOSTARAM DA HISTÓRIA E DA ATIVIDADE DO LIVRO.

APÊNDICE 2

TABELA

CONHECENDO A ESTATÍSTICA

Considera-se o símbolo para SIM ou FELIZ e o símbolo para NÃO ou TRISTE.

1.		
2.		
3.		
4.		
5.		
6.		

APÊNDICE 3

INVESTIGANDO A TURMA

BRINCANDO DE DETETIVE

Com palitinhos vá formando quadradinhos com as respostas dos amiguinhos

FRUTAS	CORES	BRINCADEIRAS
TOTAL	TOTAL	TOTAL

Note. Adapted from Braz (2020, pp. 29–31).

An examination of the activities indicates that the transposition of statistical literacy occurs through playful strategies, which nonetheless lack a robust methodological foundation and a progressive learning sequence. Consequently, an analysis is presented below of the elements that could constitute each Appendix of the paradidactic book to ensure its pedagogical consistency.

- i. Appendix 1: Teacher Guidelines and the Investigative Cycle – the discontinuity in the presentation of the statistical cycle stages constitutes a significant theoretical weakness, as it hinders a comprehensive view of the investigated phenomenon.

To preserve the unity of the cycle, teacher intervention is imperative to bridge the gap between the collection phase and the interpretation of results. Without this methodological sequencing, students tend to perform tasks automatically, failing to grasp the causal and statistical nexus of the investigation.

- ii. Appendix 2: Table "Getting to Know Statistics" – the use of smileys (happy/sad faces) is a common strategy in Early Childhood Education and the early years of Elementary School to address identification and classification. However, while visually appealing, this activity seems to focus solely on icon recognition rather than on conceptual understanding.
- iii. Appendix 3: Investigating the Class (Playing Detective) – This activity holds the greatest practical potential. Utilizing sticks to form squares (frequency by grouping) can serve as an excellent transition from concrete to the abstract.

Additionally, it is necessary to present an analytical synthesis of the activities contained in the Appendices. Although these activities demonstrate an effort to make statistics accessible, it is noted that the feasibility of the Investigative Cycle remains contingent upon the teacher's subjectivity. Table 5 details the primary aspects and variables concerning the activities in the *paradidactic book* analyzed.

Table 5

An analysis of the strengths and weaknesses of the activities proposed in the paradidactic book's appendices

Activity	Positive Point	Negative Point
Appendix 1	Reference to the Investigative Cycle.	Lack of clarity and logical continuity.
Appendix 2	Introduces statistical notation.	Lack of depth (limited to identification).
Appendix 3	Indicates hands-on data manipulation.	May result in a mere isolated count.

Note. Compiled by the authors.

Finally, in order to deepen the debate regarding category C₁₇, concerning the scarcity of rigid evaluative guidelines in *paradidactic book* and the consequent teaching autonomy, an analytical framework aimed at fostering pedagogical reflections is proposed.

Thus, student error can be considered a learning tool, representing a valuable opportunity for instructional redesign. In other words, if the *paradidactic book* allows

the teacher to identify student difficulties, assessment ceases to be punitive and becomes diagnostic.

The narrative of the *paradidactic book* appears to rely on the teacher's competence to understand what defines a statistically literate student. Literacy for students in the initial age group (from four years old) encompasses proficiency in interpreting and communicating statistical data. This skill consists of the critical analysis of everyday charts and tables, constituting a fundamental requirement for an individual's inclusion and understanding within a global context. More importantly, it requires that the student be capable of making conscious decisions and questioning information, moving beyond the simple comprehension of basic concepts to develop a reflexive stance on the relevance of statistics in society.

Consequently, the freedom to assess requires the teacher to be well-acquainted with learning descriptors (such as those in the BNCC), which may not always be the case. Should the book fail to provide assessment guidelines, the teacher must decide whether to evaluate technical skills (constructing a graph) or critical skills (reading the data).

Furthermore, the absence of evaluative guidelines in *paradidactic* material should not be interpreted as a gap, but rather as a recognition of pedagogical autonomy. By not prescribing methods, the material allows the teacher to align assessment with the classroom's socio-cultural context. This enables dynamic replanning, wherein statistics is evaluated as a "world-reading" competence rather than merely the mechanical manipulation of numbers.

Concluding remarks

The analysis of Braz's (2020) *paradidactic* book reveals that the work supports the acquisition of statistical concepts. The narrative aims to develop statistical skills in children starting at age four, employing playful and interactive language. Initially, the central role of interdisciplinarity is observed as a facilitator of learning. This approach seeks to foster logical, critical, and reflective reasoning by articulating the syllabus with the students' empirical reality.

Although the work highlights the ubiquity of statistics in daily life, exemplified by news reports, sports competitions, and electoral processes, it is noted that the interdisciplinary proposal lacks explicit clarity within the plot. Consequently, the

implementation of this articulation between fields of knowledge is left to the teacher's discretion.

In alignment with the BNCC (Ministry of Education, 2018), the *paradidactic* book converges toward overcoming disciplinary fragmentation by encouraging the practical application of knowledge. Regarding the methodological dimension, the importance of conducting prior diagnostic activities is emphasized. This strategy is fundamental for the teacher to identify the students' levels of statistical literacy, allowing for more assertive pedagogical intervention planning.

However, gaps regarding curricular adaptation are identified. The narrative does not propose guidelines for adjusting tasks, an essential element for teachers to manage the heterogeneity of knowledge in the classroom. Another absence refers to the lack of formal assessment instruments. Assessment, as a continuous process of reorienting pedagogical praxis, is essential for measuring teaching effectiveness. It is worth noting, however, that the research activity suggested at the end of the book can be reframed by the teacher as a tool for verifying learning.

The skills promoted by the *paradidactic* book align with BNCC guidelines for Early Childhood Education and the early years of Elementary School, addressing processes of data collection, organization, and graphical representation. It is imperative to understand that such objectives should act as guiding elements for the early years (ages 6 to 10), serving as a foundation for further depth, rather than as exclusionary prerequisites for access to subsequent levels.

When comparing the *paradidactic* book's proposal with the recommendations of the GAISE document (Franklin et al., 2007; Bargagliotti et al., 2020) and the BNCC (2018), a theoretical convergence regarding statistical literacy is observed. The fundamental concepts presented corroborate the need for this literacy as an essential competence for contemporary citizenship (Bargagliotti et al., 2020).

Thus, the analysis indicates that the situations proposed by Braz (2020) are suitable for introducing notions of data collection, organization, interpretation, and representation. Consequently, the *paradidactic* book proves pertinent for fostering the development of early statistical competencies, provided it is mediated by reflective and adaptive teaching practice.

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