

Bees in science education: what science textbooks bring from the final years of elementary school

ABSTRACT

Bees are extremely important insects for the maintenance of life on the planet, and they offer countless didactic possibilities in Science Teaching. Taking into account the ecological and educational importance of this theme, the objective of this study is to analyze how the content related to bees has been addressed in textbooks of the Sciences of Elementary School II, available online, within the scope of the National Book and Didactic Material Program (PNLD – 2020). The methodology is characterized as a qualitative research that presents elements of documental descriptive research. Data collection was performed through textual extracts and images from selected textbooks, submitted to content analysis and evaluated with previously established criteria. After data analysis, we observed that the theme was little explored by the books. When explored, a utilitarian and anthropocentric relationship was predominant. Medicinal, cultural and historical aspects of bee products were not even mentioned. In summary, several environmental aspects and important ecological functions are no longer presented in the evaluated textbooks, which can harm learning, especially considering the development of Environmental Education and learning in Science Teaching.

KEYWORDS: Science Textbooks. Bees. PNLD.

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1 INTRODUCTION

The word “bee” might cause fear, panic and disgust in people, as they think that these insects are killers, leading to the understanding that they must be exterminated (COSTA, 2018). They are insects belonging to the order *Hymenoptera*, which also includes wasps and ants (BRUSCA; MOORE; SHUSTER, 2018). According to the same authors, bees are social insects, which form colonies organized and divided into castes, having well-defined functions for the maintenance and survival of the swarm.

In Brazil there are still stingless bees (SB). The SB, along with another group of bees, are considered solitary and are part of the Brazilian native fauna. While the species *Apis mellifera* is exotic, as it was introduced in Brazil in the last century (OLIVEIRA; CUNHA, 2005). According to Villas-Bôas (2012), honey from native bees is characterized by being the main natural sweetener and source of energy for the peoples of the American continent. The traditional knowledge of these peoples was gradually assimilated by society after colonization, making the domestication of SB a culture, so

the indigenous heritage present in the current deal with bees is evidenced by the popular names of many species, such as Jataí, Uruçu, Tiúba, Mombuca, Irapuá, Tataíra, Jandaíra, Guarupu, Manduri and many others (VILLAS-BÔAS, 2012, p. 11).

Peruquetti (2020) estimates that there are around 25 to 30 thousand species of bees in the world, which 85% are solitary, 5% are sociable and 10% are kleptoparasites (solitary bees that lay in cells built by other bees). In other words, solitary bees practically dominate in the number of described species (95%), but we rarely hear about them or their importance. The other 5% are honeybees and native stingless bees, with which we are more familiar and, even so, we usually only hear about the “honey bee”, which can be considered as the only existing one. According to Meirelles Filho (2017, n.p) “Brazil has approximately 250 species of bees belonging to the *Meliponini* tribe, popularly called stingless bees”. Also according to the author, “of the 600 species of this genus in the world, there are 244 in Brazil, and 89 await scientific description” (MEIRELLES FILHO, 2017, n.p). In other words, of all the existing genres in the world, approximately half are found in this country.

Pollinators (bees, butterflies, wasps, bats, beetles, among others) provide an environmental economic service, estimated at R\$ 43 billion in 2018 in Brazil (NITAHARA, 2019) and in the world it is estimated a value that exceed US\$ 200 billion per year (BARBOSA *et al.*, 2017). In addition to their importance for pollination, a study carried out by the University of São Paulo (USP) revealed that bees can be considered bioindicators of environmental pollution. These insects fly long distances from their colonies to look for food, so bee products, especially pollen, can be used as indicators of environmental quality in the region (MIOTTO, 2012). Given the economic, environmental, social and health relevance, among many others, and considering the values that this and all living beings have, it is pertinent to talk about bees in Science classes in elementary school.

However, it is a subject that has been little explored, both in Science Teaching and in Biology Teaching, since few studies on the topic were found in a systematic review carried out in journals and events in the area (LOHMANN, 2021). This fact suggests that bees are not a topic addressed by school curricula and textbooks

(DL). Lohmann (2021), when looking for studies that investigated and deepened the theme in Science textbooks used in elementary school, did not find any study that carried out such an analysis.

We believe that textbooks play an important role in organizing and conducting teaching and learning activities in schools. For this reason, and considering the relevance of the theme, we started to ask ourselves: *How do textbooks bring bees in their content?* To answer this question, the present study aims to analyze how content related to bees has been addressed in Science textbooks for elementary school II, available online, within the scope of the National Book and Teaching Material Program (PNLD) 2020.

Among the relevance of this research, we highlight the textbook as the “main instrument that guides the teaching action” (ALBUQUERQUE; FERREIRA, 2019, p. 250). This is also highlighted by Rosa and Artuso (2019) in their study on the use of textbooks in the classroom, where it still appears as the main resource used by teachers in most of their classes. However, it is necessary to consider that the teacher also has autonomy in relation to the use of textbooks, deciding the moments and ways to conduct the didactic processes mediated by this tool (GRAMOWSKI, 2021). The present study is also justified in favor of the quality of this didactic material, since the Federal Government invests millions in the acquisition and distribution of books, through the PNLD.

As summarized above, we argue that the issue involving bees is relevant. In addition, Science Education, as an area of research and practices, is enriched by knowing how these insects are being presented to students and teachers, considering that many species are threatened with extinction, especially solitary bees (IUCN, 2019). Therefore, it is necessary to know them to preserve them.

2 SCIENCE BOOKS AND BEES: INITIAL REFLECTIONS

The textbook has become an important pedagogical tool for the teacher, it is even used for the preparation of tests and assessments, assignments and lesson planning (ROSA; ARTUSO, 2019). Due to this fact, it is important that books are the subject of constant research and analysis in order to guarantee their quality, since it is still widely used by teachers (ROSA; ARTUSO, 2019).

The textbook has become a reference for teachers for having a logical sequence of contents, having participated in their initial and continuing education and for keeping them updated about scientific knowledge (CAMARGO; SILVA; SANTOS, 2018; ROSA; ARTUSO, 2019). The authors of both works state that, for students, the textbook is also an important source of research, studies for evaluations and exercise resolutions.

In order to guarantee equity and access to textbooks, the Brazilian State has consolidated a public policy for this teaching material to be available to all students. The National Textbook Program (PNLD) is a Federal Government action aimed at evaluating, purchasing and distributing books to students and teachers in the public school system, with financial support from the National Education Development Fund (FNDE), a body linked to the Ministry of Education MEC (BRASIL, 2020). It is one of the biggest public policies, when compared to other countries, in the distribution of didactic, pedagogical and literary works to public schools. The PNLD, updated by Decree No. 9,099 of 2017, which updated Law No.

9,394 of December 20, 1996 (BRASIL, 2017a), was renamed the National Book and Teaching Material Program, expanding the didactic materials covered and including software, educational games, reinforcement materials, school management, among others. This program currently serves students in early childhood education, early and final years of elementary school, high school and youth and adult education (EJA) (BRAZIL, 2020).

According to a study by Cunha, Rezende and Saraiva (2017), the Science textbook has a different function from other books, being the teaching of scientific methodologies, seeking to analyze phenomena, test hypotheses and formulate conclusions, allowing for an understanding of “doing science”. The textbook should stimulate the student's critical and reflective posture so that knowledge can be built by him.

Regarding the bees theme in the National Common Curricular Base (BNCC), we understand the possibility of approaching, for example, in the 8th year of elementary school, in the thematic unit “Life and Evolution”, with the knowledge object Reproductive Mechanisms. In this one, we observe as a specific skill to be developed: “(EF08CI07) Compare different reproductive processes in plants and animals in relation to adaptive and evolutionary mechanisms” (BRASIL, 2017b, p. 349). In this skill it is possible to relate the coadaptive mechanisms between insects and plants. Bees are not directly mentioned in the document, but it is understood that this theme fits there, especially when developing content related to bees such as pollination of flowers and reproduction of angiosperms. However, they may fit into other thematic units, from other series.

We emphasize that Trivelato Junior (2001) states that zoological content (the theme of bees is included here) can provide a great opportunity for the teacher to exercise the necessary bridge between biological concepts, the student's daily life and promote socio-environmental responsibility. For the author, animals, especially insects, are recognized early on in students' daily lives. Paula, Monteiro and Rodrigues (2020) discuss that botanical and zoological themes contribute to a perspective of Environmental Education guided by learning and knowledge for preservation.

3 RESEARCH PATHS

This study is characterized as a qualitative research and presents elements of documental descriptive research. Data collection was performed through textual extracts and images of selected textbooks, which were submitted to content analysis with previously established criteria (MYNAIO, 2010). In this study, we can consider the textbooks as the documents that were analyzed.

Following the content analysis or thematic analysis, we aim to “discover the nuclei of meaning that make up a communication, whose presence or frequency means something for the [study of] the intended analytical object” (MYNAIO, 2010, p. 316).

3.1 Research Stages

Initially, the selection of textbooks to compose the analysis corpus was carried out:

- a) The PNLD 2020 Digital Guide consisted of 12 collections, in the Science discipline, for elementary school II (from 6th to 9th), each collection consists of four books, totaling 48 books;
- b) However, of the 12 collections, only five were fully online, in digital format, on the publishers' websites, which totaled 20 books fully available for analysis.
- c) Of these 20 books, only seven textbooks had content about bees and, therefore, made up the corpus of analysis, as can be seen in Table 1.

The strategy of selecting only the online versions was adopted considering the need for social isolation imposed by the Covid-19 pandemic in 2020 and 2021, which made it impossible to carry out research in a school context.

All four TBs from each of the five collections available online were investigated. However, in Table 1 we have included a column to highlight the school year of the analyzed books, as they present content related to bees.

Table 1 - PNLD collections available fully online and books with the bee theme

PNLD Colection	Book Publisher	Authors	Year	Code ¹
Ciências Naturais – Aprendendo Com O Cotidiano	Moderna	Canto e Canto (2018a);	7º	CNAC7
		Canto e Canto (2018b)	8º	CNAC8
Araribá Mais – Ciências	Moderna	Carnevalle (2018)	7º	AMC07
Inspire Ciências	FTD	Bueno e Macedo (2018)	6º	IC006
Ciências Vida e Universo	FTD	Godoy (2018a)	7º	CVU07
		Godoy (2018b)	8º	CVU08
Observatório de Ciências	Moderna	Thompson e Rios (2018)	8º	OC008

Source: Survey data (2022)².

The thematic analysis took place in three stages defined a priori by the researchers: 1) pre-analysis, in which an exploratory reading of the material was carried out; 2) selection of textual extracts and images associated with the treatment of these materials; 3) analysis and interpretation of the results obtained. The analysis and interpretation took place based on pre-established analysis criteria. Both the research stages and the elaboration of the analysis criteria were based on studies by Mulinari (2015), Magalhães (2013), Pereira (2013) and Rosa (2009), who analyzed textbooks. These studies contributed to the elaboration of the following criteria for analysis:

a) Language, structure and images: identifies if the language used is adequate and clear, brings technical and scientific information, checks if the images used are photographs of bees, with greater ability to approach reality, or figures and if these

are related with the text. In addition, it analyzes the sections and topics in which the theme appears.

b) Complementary exercises and activities: analyzes whether the exercises are contextualized, whether they promote reflections on the theme involving bees, the environment, anthropocentric activities, species decline, among other discussions. It also analyzes the complementary proposals, whether in students' books or teachers' manuals, seeking to understand what the proposals and approaches are.

c) Relationships between bees and non-human beings: identifies how the LD addresses the relationship of bees with other organisms, such as plants, other insects and fungi (coevolution relationships, coadaptation or mutualistic interactions), with the exception of human beings.

d) Relationships between bees and human beings: analyzes how LD presents social, economic, historical, cultural and health aspects involving bees and human beings.

e) Relationships between bees and the environment: analyzes how the LD presents the relationship between bees and the environment, their importance and ecological functions.

f) Relationships between bees and students' daily life: analyzes whether the way insects are presented is related to the student's daily life, experience and reality.

4 RESULTS AND DISCUSSION

We consider it important to initially highlight that the contents related to bees were found in the textbooks of the 7th and 8th grades of Elementary School, which made up the corpus of analysis. This fact can be explained in the specific skill of the BNCC "EF08CI07", as mentioned earlier. Next, we present the results found for each of the categories.

4.1 Language, structure and images

In TB CVU07, CVU08, OC008 and CNAC7 the language used in the text is clear, objective and scientific. In the book CVU07, the theme bees appears in a few lines of the main text, under the subtitle "*Arthropods*". They are mentioned as excellent pollinators and for being well-organized social insects. There are no images in this section. In the book CVU08, there is a graphic illustration that occupies two pages, as shown in Figure 01, to demonstrate the reproductive cycle of an angiosperm, presenting a scheme of guava pollination carried out by *Apis mellifera*. This scheme mentions the co-adaptation between plants and bees in their search for pollen.

Figure 01: Illustration available in the book CVU08.



Source: Godoy (2018b, p. 128).

OC008 and CNAC7 bring information from safe and reliable sources about bees, coming, for example, directly from the UN (United Nations), from the Intergovernmental Science Policy Platform³ or indicating the website *Webee*, a partner of the National Council for Scientific and Technology (CNPQ). However, some subjects were left out of the main text of CNAC7, such as the topics “Use the internet” and “Topic for research”, which encourage students to do research on social insects (ants, bees and termites). However, this can be understood by the fact that not all content can be addressed in the LD, considering its number of pages, the criteria established by the PNLD and the BNCC itself. Regarding the PNLD public notice, Martins and Garcia (2019) state that there are many aspects involved in the preparation of books and that must be met by authors and publishers. The authors emphasize that the LDs have their contents chosen so that they are more attractive, which increases their sales, therefore they are also subordinated “to the commercial relations in which the publishers keep their expectations” (MARTINS; GARCIA, 2019, p. 177). Reasons that may be associated with the fact that CNAC7 does not bring any image of bees or related to them.

In OC008, the theme appears articulated with the pollination of flowers, with a page for the complementary text "*Decline in the bee population threatens agriculture, UN alert*". This contains a single image (Figure 02) of an *Apis mellifera* perched on a geranium and the caption informs the size of the bee. Considering the insertion of the theme in a complementary text, we consider that the approach to the theme is indirect, as it will depend exclusively on the available time, planning and incentive of the professor. That is, the student, if he wants to carry out readings on the subject on his own, will not find it in his textbook.

Figure 02: Photograph available in textbook OC008.

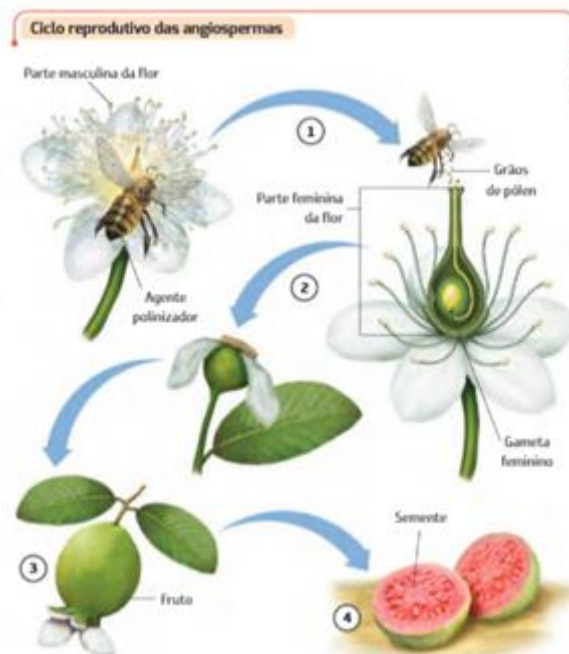


Abelha *Apis mellifera*,
com cerca de 1,3 cm de
comprimento, sobre flor de
gerânio (*Pelargonium* sp.).

Source: Thompson and Rios (2018, p 157).

The TB AMC07 and CNAC8 do not present further details on bees in the student's book. In AMC07, there is only one graphic illustration that represents the reproductive cycle of an angiosperm (from guava, as in CVU08), with an *Apis mellifera* performing the pollination (Figure 03). The image occupies practically an entire page and the book features a complementary activity.

Figure 03: Illustration available in the book AMC07.



Source: Carnevale (2018, p. 97).

The book IC006 brings scientific information of social interest, correlating them with everyday life and proposes an interdisciplinary approach. This TB presents a text entitled “*Without bees, without food*” and “*reflection*” activities that encourage research on the contributions of bees to the planet and forms of preservation, aiming to develop student autonomy in building their knowledge and of their ways of thinking. We can observe the interdisciplinarity in IC006 (as in the example analyzed at the end of item 4.2, below), which increases its quality. In this study, we recognize interdisciplinarity as the use of different areas of knowledge

to understand situations, problems or phenomena (VENTURI, 2018). Therefore, when we use the term “*interdisciplinary*”, it means that the textbooks sought to articulate other areas of knowledge (Physics, Mathematics, among others) to the Biological Sciences.

TB IC006 presents on page 150 a photograph of an *Apis mellifera* resting on a white flower. Regarding the images found in the books, we verified the concern to bring students closer to reality, whether through photographs or diagrams. For this purpose, the scales used, or the actual size of the insect, are mentioned in all images. Fact provided for in the PNLD public notice that states the need to “use an appropriate scale for the object of knowledge” in the illustrations and “when, of a scientific nature, respecting the proportions between objects or beings represented” (BRAZIL, 2020, p. 41).

We consider it important to highlight that no conceptual errors were found in the books evaluated and the language was always appropriate for the level of education and target audience, therefore, textbooks are able to properly relate titles, texts, images and captions, which establishes clear communication with the reader (VITAL, 2015). However, we observed a tendency in textbooks to leave bees as a secondary issue, as they are rarely mentioned in the body of the text. This fact is justified, since it is a content that is not directly provided for in the BNCC. On the other hand, we emphasize the large number of suggestions for research on the subject, proposing the student's role in the theme, but which requires teacher mediation, especially regarding reliable sources for consultation.

4.2 Exercises and complementary activities

We believe it is important to highlight that complementary activities are present only in the teacher's textbook. Therefore, in the students' textbooks there are no complementary activities, only complementary texts as mentioned above.

The book OC008 proposes to the teacher to show the video lesson available online “*Without bees, without food: the importance of bees in food production*”, as a complementary activity. In this book there is only one exercise for students related to flower pollination. However, it is interesting to note the novelty of the theme “rental of hives for fruit growers”, as shown below:

1. Due to the reduction of the bee population in the world, farmers resort to renting hives to guarantee the production of some fruits, such as apples, avocados and melons.
 - a) What is the role played by bees in fruit production?
 - b) Relate the activity of some animals, such as bees, with the sexual reproduction of angiosperms (THOMPSON; RIOS, 2018, p. 161).

The book CVU08 brings an issue as an exercise that involves bees and does not have complementary activities. The wording of the question contextualizes the specialization of flowers so that only one pollinating agent can visit them, such as the nectar guide that only allows the visit of bees. Next, the question asks the student to reflect on implicit concepts of mutualism and reproductive success, without providing ready-made answers, as we can see in the following excerpt:

- b) What is the importance of the specializations present in the flowers of some plants pollinated by animals? (GODOY, 2018b, p. 130).

CNAC7 and AMC07 do not present exercises to students, but propose two complementary activities each. CNAC7 suggests carrying out a research on social insects (bees, ants and termites) and visiting the Webee website, where there is a lot of information about bees, their ecology, development, food, species identification, among others. And AMC07 recommends visiting a USP website that deals with the drop in pollination and the impacts on agriculture, and also suggests the documentary "More than honey", which discusses the relationship between bees and food production.

Finally, the book IC006, despite not bringing any complementary activity, brings the topic "*reflections*", transcribed below:

Form a group with two colleagues. Together, look for other information in magazines, websites and books about bees, the importance of these insects for pollination, the possible causes of their mass disappearance and the consequences of this disappearance for humans. Then create a campaign to alert people to this environmental problem, proposing possible solutions. Make sure that the campaign is understood by all people, even younger students and older people. The campaign can be publicized on social media, messaging apps and the school blog, if any. It is also possible to design posters to be displayed at school (BUENO; MACEDO, 2018, p. 150).

Among all the activities proposed in the analyzed textbooks, this one can be considered the most complete, complex and contextualized, as it encourages student autonomy, creativity in the dissemination of results and includes social, environmental and everyday aspects. That is, the textbook proposes the development of more complex and critical reflections, without ready, direct and objective answers, favoring learning.

Two analyzed books did not bring exercises or complementary activities, CNAC8 and CVU07.

4.3 Relationships between bees and non-human beings

In the book OC008, the relationship between bees and other living beings is quite frequent, since the book addressed the theme of bees together with the content of pollination of flowers. This fact is evidenced in the contents presented in the subtitles "*pollination, dispersion and germination of seeds*" and "*Decline in the bee population threatens agriculture, UN alert*". The latter is suggestive and addresses the importance of plant pollination in agriculture. bees are related only to the pollination of fruit plants (as shown in Figure 03, previously presented).

The book IC006 does not directly address the relationship with other beings in its texts and images, but does so in research activities and suggestions, given the topic "*reflections*" that seeks to encourage an investigative stance, as we analyzed in the previous item. In CVU07, this criterion is quite evident in the question that seeks to relate the flower nectar guide (specialization) with bees, in a mutualistic relationship between insect and plant.

At the beginning of this study, we discussed the importance of bees and their interaction with plants, more specifically pollinating flowers. However, among the analyzed books, three of them – CNAC7, CNAC8 and CVU08 – did not mention any relationship between bees and non-human beings. The other books emphasize the importance of these insects for pollination and for agriculture and mention that

the latter is affected by the decrease in the bee population. However, there could be discussions about possible solutions to the problem, such as the inclusion of migratory beekeeping or the installation of beekeeping in forests close to arable regions, promoting a mutualistic relationship between agriculture and preservation in a more sustainable way.

4.4 Relationships between bees and humans

In TB OC008, the text "*Decline in the bee population threatens agriculture, UN alert*", discusses the decrease in the population of bees and other pollinators. Factor that can interfere with food production on a world scale. However, the text mentions the subservience of bees to agriculture, justifying their preservation. In other words, we verified an anthropocentric, utilitarian and economic view of the relationship between bees and human beings, since their preservation is encouraged in order to meet human needs. The text also argues that the human being is the main cause of the population decline of bees, due to deforestation, pesticides, pollution and loss of habitat.

The other books, CNAC7, CNAC8, AMC07, CVU07 and CVU08, did not show any relationship between bees and humans, even though these insects have numerous natural products, which bring social, economic and environmental benefits (SORDI; SCHLINDWEIN, 2014).

4.5 Relationships between bees and the environment

Regarding the relationship between bees and the environment, their importance for biodiversity and ecosystem balance, we did not identify any direct mention in any of the analyzed collections. However, we can consider that it appears indirectly, that is, depending on the teacher's mediation and the research carried out by the students. Especially complementary activities such as documentaries, films, video classes, research and texts that can support the environmental importance of these pollinators.

We consider that texts, images and exercises could lead to reflections on these relationships, but we can highlight the preference of the analyzed textbooks about the relationships between bees, the environment and their environmental importance in their explicit texts, focusing more on an agricultural, anthropocentric view and economic, as we will see in the excerpt transcribed in the next item.

4.6 Relationships between bees and students' daily lives

When looking at the relationships established between bees and students' daily lives, we can see that TB OC008 addresses the pollination of many fruits, vegetables, nuts and seeds, foods that should be present in the basic diet of all people (although are not always due, among other reasons, to different socioeconomic conditions). This statement can be evidenced in the excerpt:

micronutrients, vitamins and minerals in the human diet (THOMPSON; RIOS, 2018, p. 156).

Bee death significantly affects all life on the planet. For this reason, approaching the campaign "No bees, no food", as in the book IC006, is interesting and becomes a daily issue for students, as it significantly affects everyone's diet. The relationship with everyday life is not very present in CVU08, since it is up to the teacher to relate pollination with the fruits we eat on a daily basis. In CNAC7, AMC07 and CVU07, we did not find any subject that suggested the relationship between bees and everyday life.

In order to complement the textbook approach, exploring more contextualization and interdisciplinarity, we suggest that investigative principles be adopted in the teaching and learning process, such as, for example, didactic strategies related to the observation of the school surroundings and the identification of the existence of bees in their homes in the urban (or rural) area, in order to initiate discussions that take into account everyday life, so that learning is more contextualized.

5 FINAL CONSIDERATIONS

In general, we did not identify conceptual errors and the books used information obtained from reliable sources. They even encourage research of this nature, something extremely important to be worked on in the pandemic context of the beginning of the current decade, in which there is also deliberate dissemination of false information and scientific denialism.

Regarding the images, all were real photographs or illustrations very close to reality, with no personifications of bees. In all of them there was a scale in lengths, in order to demonstrate the real size of the insect. In addition, they were adequate and integrated into the proposed text and activities.

Regarding the exercises, three books presented a single exercise in the student's book, of which we highlight IC006 that proposes contextualized and complex reflections, not allowing an obvious answer from the student. A suggestion in this regard is that textbooks explore more the multiple aspects of the theme about bees (ecological interactions, pollination, reproduction, agriculture, population reduction, among others) and bring more activities, especially those of a critical and reflective nature. For teachers, there are countless possibilities to insert the theme and activities in the classes in a contextualized way and according to the student's reality, such as the benefits to human health.

As mentioned before, the content related to bees can be interpreted, indirectly, in the skill of the 8th grade of elementary school proposed by the BNCC. However, in the analyzed books, the predominance of the theme occurred in the 7th and 8th grade textbooks, only one book addressed the theme in the 6th grade. Future investigations could focus on analyzing the reasons why the theme is also present in 6th and 7th grade books, aiming to understand which skills could be being met with such insertion. Still, despite the importance of bees, already discussed throughout this study, the textbooks, following what the BNCC proposes, leave bees as a secondary issue, as examples or as research suggestions to be carried out by students. Thus, our criticism is directed at the absences of the

theme in the BNCC that extends to public policies, impacting, in this case, the PNLD notices, consequently the TBs are not committed to addressing and discussing the importance of bees.

In this sense, we emphasize that, of the seven books analyzed, six did not bring the relationship between bees and humans in a broader way. Relationships between bee products and medicinal, cultural and historical aspects were not mentioned. The ecological relationship was addressed indirectly by the books, and can be better worked by mentioning important characteristics, for example, the use of bees as bioindicators of environmental quality. In summary, several environmental aspects and important ecological functions are no longer presented in the textbooks (TBs) evaluated, which can harm learning, especially considering the development of Environmental Education.

Again, we reiterate that these are absences resulting from the silencing of the BNCC itself that guides the elaboration of the textbooks. Still on this view, we found that a utilitarian approach, focused on the economic aspects of agriculture, was prioritized in the books, neglecting sustainable visions that articulated human, social and environmental relationships with bees. A fact that we characterize as an anthropocentric view, in which preserving to meet human desires is predominant.

We are experiencing a health and socio-environmental crisis, and Environmental Education can be an important pillar of critical analysis and social transformation, seeking to raise awareness and motivate reflections on environmental problems (BARBOSA; OLIVEIRA, 2020). For which the teaching of themes that involve zoology, botany, among others, can contribute with critical reflections, towards Environmental Education, and for life in and with the environment in a sustainable way. Therefore, we defend the need for a more contextualized Science Teaching and committed to the development of socio-environmental principles, so that in the future students become sensitized adults with their actions, especially in the case of bees, in view of their ecological, social importance, economic and environmental.

In this way, we believe that future public policies, especially those related to curricula and textbooks, need to be concerned with inserting this theme in a transversal way, thus ensuring that several school subjects have the possibility to approach the theme with different visions, in an interdisciplinary way, participatory and collective. Perhaps, inserting these discussions in the TB is one of the ways to recognize the problems that humanity has been causing to the planet and try to mitigate or reverse the impacts we cause.

ABELHAS NA EDUCAÇÃO EM CIÊNCIAS: O QUE TRAZEM OS LIVROS DIDÁTICOS DE CIÊNCIAS DOS ANOS FINAIS DO ENSINO FUNDAMENTAL

RESUMO

Abelhas são insetos extremamente importantes para a manutenção da vida no planeta, e oferecem inúmeras possibilidades didáticas no Ensino de Ciências. Ao levar em conta a importância ecológica e educacional desta temática, o objetivo deste estudo é analisar como o conteúdo relacionado às abelhas vem sendo abordado em livros didáticos da disciplina de Ciências do Ensino Fundamental II, disponíveis online, no âmbito do Programa Nacional do Livro e do Material Didático (PNLD – 2020). A metodologia caracteriza-se como uma pesquisa qualitativa que apresenta elementos da pesquisa descritiva documental. A coleta de dados foi realizada por meio de extratos textuais e imagens de livros didáticos selecionados, submetidos à análise de conteúdo e avaliados com critérios estabelecidos previamente. Após análise dos dados, observamos que a temática foi pouco explorada pelos livros. Quando exploradas, uma relação utilitarista e antropocêntrica foi predominante. Aspectos medicinais dos produtos apícolas, culturais e históricos sequer foram mencionados. Em síntese, vários aspectos ambientais e funções ecológicas importantes deixaram de ser apresentadas nos livros didáticos avaliados, o que pode trazer prejuízos à aprendizagem, especialmente em que pese o desenvolvimento da Educação Ambiental e da aprendizagem no Ensino de Ciências.

PALAVRAS-CHAVE: Livros Didáticos de Ciências. Abelhas. PNLD.

NOTES

1 To facilitate data processing and analysis, five-character codes were established for books in which content about bees was present, in which the letters represent the initials of the names of the collections and the numbers represent the school year, as observed in the last column of Table 1.

2 Organized by the authors.

3 It is coordinated through four United Nations agencies (UNEP, UNESCO, FAO and UNDP). Just as the IPCC is the Climate Platform, the Intergovernmental Science Policy Platform (IPBES) works to document biodiversity trends, identify practical policy instruments for the protection and sustainable use of species and ecosystems.

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Received: May. 28th, 2021.

Approved: Jul. 06th, 2022.

DOI: 10.3895/rbect.v15n2.14343

How to cite: LOHMANN, L. A. D.; VENTURI, T. Bees in science education: what science textbooks bring from the final years of elementary school. **Brazilian journal of Science teaching and Technology**, Ponta Grossa, v.15, p. 1-20, 2022. Available at: <<https://periodicos.utfpr.edu.br/rbect/article/view/14343>>. Access on: XXX.

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