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Food plants: what do teachers and students want to teach and learn?

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ABSTRACT

The scientific knowledge permeates several ecosystems until it reaches the classroom ecosystem. Therefore, this article aims to investigate which elements and contents teachers and students declare to be relevant to be included in teaching materials on edible plants, and how these suggestions can be applied in the development of such materials. Therefore, three science teachers and six students aged 11 to 14 were interviewed. This data was analyzed through data immersion, categorization, coding, and interpretation. A schema was also created with the propositions to contemplate these items in the developed material. The interviewees considered it important, mainly, to have in the material the use of images, glossaries, environmental studies, activities involving vegetable gardens, information on cultivation, scientific and popular names, recipes, nutritional properties, and reports of research on the subject. They reported that it was possible to relate them to curricular contents such as botany, health, human body, biodiversity, living beings, and others. In the material, the suggestions were complemented by inserting aspects of the Nature of Science, investigative activities, and the evolutionary approach. We concluded that it was possible to insert elements in the material that aim to meet the interviewees' desires. The aspects mentioned by the interviewees, and the exercise of outlining a teaching proposal, can be used by researchers and developers of teaching materials in the area.
KEYWORDS: Didactic transposition; Science teaching; Didactic material.

Plantas alimentícias: o que professores e alunos querem ensinar e aprender?

RESUMO

O conhecimento científico perpassa por diversos ecossistemas até atingir o ecossistema da sala de aula. Diante disso, este artigo teve como objetivo investigar quais elementos e conteúdos professores e alunos declaram considerar relevantes para estarem em um material didático sobre plantas alimentícias, e como essas sugestões podem ser aplicadas na elaboração de um material. Por isso, foram entrevistados três professores(as) de Ciências e seis alunos(as) de 11 a 14 anos. Esses dados foram analisados por meio da imersão nos dados, categorização, codificação e interpretação. Também foi realizado um esquema com as proposições para contemplar esses itens no material elaborado. Os entrevistados consideram importante, principalmente, ter no material o uso de imagens, glossários, estudo do meio, atividades envolvendo hortas, informações sobre cultivo, nomes científicos e populares, receitas, propriedades nutricionais e relatos de pesquisas sobre o assunto. Relataram ser possível dialogar com conteúdos curriculares como: botânica, saúde, corpo humano, biodiversidade, seres vivos e outros. No material, as sugestões foram complementadas inserindo aspectos da Natureza da Ciência, atividades investigativas e a abordagem evolutiva. Concluímos que foi possível inserir no material elementos que visam atender os anseios dos entrevistados. Os aspectos mencionados pelos entrevistados, assim como o exercício da esquematização de uma proposta de didatização, podem ser utilizados por pesquisadores e elaboradores de material didático da área.
PALAVRAS-CHAVE: Transposição didática; Ensino de Ciências; Material didático.

INTRODUCTION

It is not news that Brazil is a megabiodiverse country, as it is home to a high variety of species of invertebrates, vertebrates, microorganisms, plants, and fungi (Joly & Queiroz, 2020; Lévequê, 1999). However, this biodiversity has been lost due to several factors, such as agricultural expansion, overexploitation of natural resources, global warming, deforestation, overfishing, habitat loss and reduction, and other factors (Joly & Queiroz, 2020). For teachers and students to understand these effects that impact our natural heritage, it is necessary that education for biodiversity is not limited to merely conceptualizing the term, but that it reaches attitudinal and procedural knowledge (Krasilchik, 2011).

In this sense, several studies (Sakir & Kim, 2019; Descola, 1998; Louzada-Silva & Carneiro, 2013; Pereira & Lima, 2025) indicate that biodiversity teaching has privileged a biological-ecological perspective over an integrative perspective. The biological-ecological perspective focuses mainly on the conceptualization of biodiversity, ecological relationships, species richness, and other concepts. However, Orozco (2017) indicates that there are other ways to approach biodiversity. For example, it is possible to address the relationship between humans and nature, as various biodiversity resources are used by humans, such as food, medicine, clothing, raw materials, and other resources.

Nevertheless, when considering biodiversity education based on this integrative perspective, we cannot limit it solely to an anthropocentric and utilitarian view. Anthropocentrism considers the human species to be a superior species and considers that the resources existing in nature serve only its needs. However, the human species shares its habitat with a diversity of animals, plants, and microorganisms. Therefore, it is necessary to consider the limits of the exploration of biodiversity, as nature should not be dominated, but rather protected so that it can contribute to the well-being of the human species and other species (Alho, 2008).

To overcome this dichotomy between humans and nature, it is necessary to incorporate biodiversity education from an economic, political, historical, and cultural perspective (Orozco, 2017). Teaching materials have limitations in fostering this education. Analyzing biodiversity-related content in Brazilian textbooks, Calegari et al. (2021) found that the animal group was more represented than the plant group. Furthermore, among animals, the most prevalent subgroups were mammals, arthropods, birds, and fish, while among plants, angiosperms were the most frequently mentioned. Microorganisms, on the other hand, had a low representation.

Thus, this article aims to investigate the factors that influence teachers' and students' acceptability of a didactic proposal on food plants for teaching biodiversity. To this end, we aimed to identify which elements and content teachers and students would like to see present in teaching materials on food plants. This identification served to inform the development of the teaching materials, which are already publicly available (Landinho, 2022). We emphasize that the objective of this article is part of a multi-paper doctoral thesis entitled "Nourishing with biodiversity: a proposal for didactic transposition to foster knowledge about food plants."

We believe that teaching about food plants can contribute to the teaching of plant, food, and cultural diversity. We define food plants as plants with nutritional potential. We chose to work with food plants that are possibly little known to students, given that our goal is to expand knowledge about biodiversity. In addition, studies by Franzolin et al. (2021) found that students from various regions of the state of São Paulo are more interested in learning about biodiversity when it is connected to aspects of health and human utility. In other countries, such as England (Jenkins & Pell, 2006) and Germany (Elster, 2007), students' interest in aspects of the human body and health has also been observed. Conversely, students lack interest in botany content (Tolentino Neto, 2008; Santos et al., 2021). Therefore, we chose the topic of food plants because, based on content that is of greatest interest to students, it is possible to address other items of less interest.

Additionally, there is a lack of interest among students nationally and internationally in the field of Botany (Elster, 2007; Tolentino Neto, 2008). One of the factors driving this disregard is zoochauvism, which corresponds to the tendency to consider animals superior to plants. The media system contributes to this taxonomic bias, placing the spotlight on species considered "flagship" (Ballouard et al., 2011; Antonelli et al., 2024). Botanical neglect is also a factor contributing to antipathy toward plants, which consists of ignoring their presence in everyday life. This inattention is related to human visual perception itself, as the brain tends to focus on threatening or moving elements and as plants do not demonstrate apparent danger and are easily overlooked in everyday life (Piassa et al., 2023; Santos et al., 2021).

Given this problem, influenced by schooling and the media, it is necessary to adopt teaching practices and materials that address organisms that are not considered as charismatic and attractive as plants. As mentioned previously, we believe that food plants can help mitigate this cyclical process of inattention, as food is often already processed for consumption, resulting in the inability to identify which vegetables are being consumed. Therefore, by addressing food plants, it is possible to provide a more contextualized Botany teaching

DIDACTIZATION OF KNOWLEDGE ABOUT FOOD PLANT FOR TEACHING BIODIVERSITY

Given our concern with developing teaching materials for use in schools, our research sought to understand what knowledge thrives in the school environment. Our intention was to contribute to the teaching of academic knowledge about biodiversity, the objective of the Biota-Fapesp Education project, of which this research is a part. To this end, we used Lombard and Weiss (2018) as a theoretical framework, as these authors study the process of adapting knowledge from its production in the scientific sphere to the effective implementation of this knowledge in the classroom. To analyze this adaptation, Lombard and Weiss (2018) start from Chevallard's (1991) theory of didactic

According to Chevallard (1991), scientific knowledge needs to be adapted to become schoolable. These adaptive transformations occur through didactic transposition, in which scientific knowledge, also called "wise knowledge," is transformed into school knowledge, also called "knowledge to teach"

(Chevallard, 1991). To explain this process, the author clarifies that the didactic system is formed by interactions between teacher, student, and knowledge and is situated within an educational system. This, in turn, is embedded within the societal environment. The intermediary between the educational system and its environment is called the noosphere. In the noosphere, the knowledge that will become part of the "knowledge to teach" is selected and adapted. Thus, the importance of the noosphere is evident, as it is considered the operational core of the didactic transposition process. However, the noosphere is characterized as an area of conflict and tension because it is where agents of the educational system and society meet (Chevallard, 1991).

Although Chevallard's (1991) ideas are widely used, Machado (2011), in his thesis, reveals that their popularization resulted "in some cases of mischaracterization of the notions contained in the assumptions of this theory, generating criticism and casting doubt, at times, on its legitimacy" (Machado, 2011, p. 34). Among these mischaracterizations, we can highlight some criticisms of: 1) the existence of a single homogeneous "wise knowledge"; 2) the use of the term transposition; 3) the school as a reproducer and not a producer of knowledge; and 4) the failure to consider power struggles in the constitution of school knowledge.

Regarding the first aspect, Clément (2006), based on the ideas of Martinand (2003), developed the KVP model, which indicates that school knowledge is the result of scientific knowledge (K - Knowledge), values (V - values), and social practices (P - social practice). Values include ideologies, beliefs, and lifestyle, while social practices, for Martinand (2003), are considered "not only the knowledge at stake, but also the objects, instruments, problems, tasks, contexts, and social roles" (2003, p. 126). For Astolfi and Develay (1991), social practices consist of "research, engineering, and production activities, but also domestic and cultural activities" (1991, p. 153). Thus, we also used Clément (2006) as a theoretical framework, as he conceives that the conception of the authors involved in the process of didactic transposition is influenced not only by scientific knowledge, but also by social values and practices.

Regarding the use of the term "transposition," Lopes (1997) indicates that the term "transposition" conveys the idea of "transposing" from one place to another without alterations. According to Lopes (1997), the term "mediation" would be more appropriate, as it can be defined as "a process of constituting a reality through contradictory mediations, complex, non-immediate relationships, with a profound sense of dialogism" (Lopes, 1997, p. 564). The author also advocates using Basil Bernstein's term "recontextualization." Leite (2007) points out that it would not be possible to replace the term transposition with recontextualization because, despite their similarities, Bernstein and Chevallard have their own specificities, but they are not antagonistic. Bernstein emphasizes the social dimension, emphasizing the power relations in this process, while Chevallard highlights the epistemological dimension. Finally, despite drawing on Chevallard's ideas, Gericke et al. (2018) suggest the use of the term "transformation" due to its semantic sense of movement, and because it proposes to unite different theoretical contributions using the ideas of Chevallard and Bernstein. Gericke et al. (2018) define "transformation" as an integrative process in which content knowledge is transformed into knowledge that is taught and learned through various transformation processes that occur outside and within the educational system at the individual, institutional and societal levels (Gericke et al., 2018, p. 432).

The articulation of Gericke et al. (2018) seems to be interesting, but in this article we chose to use the term "transposition" because this term is used by references that we use, such as Clément (2006), Carvalho and Lima (2022), and Lombard and Weiss (2018), and is also better known in the academic community, which already know its meaning regardless of past disputes related to it.

Regarding the criticism of the school as a reproducer and not a producer of knowledge, Forquin (1992) indicates that this is a reason for disagreement with Chervel (1990) in relation to didactic transposition. However, Leite (2007) indicates that Chervel (1990) does not criticize the theory of didactic transposition, this author only highlights that the school creates knowledge. Chevallard (1991) does not deny this production of knowledge in the school environment, as he indicates that there are "didactic creations."

In general, Forquin (1992) agrees with Chevallard (1991) that the school not only selects and makes knowledge available but also reorganizes and restructures it. Thus, Forquin (1992) considers the transposition of knowledge inevitable, as the knowledge produced by academia is not directly communicable to students. Therefore, "school culture" is derived from and subordinate to the "Culture of creation and invention" (Forquin, 1996) and, therefore, "school culture" is a "second" culture (Marandino, 2004). In this "school culture," knowledge is marked by the scarcity of time, serial school organization, and the progressiveness of activities over the years (Forquin, 1992).

Finally, regarding the failure to consider power struggles, Lopes (2011) indicates that Bernstein's ideas on recontextualization would be the most appropriate to explain this power relationship. However, we agree with Leite (2007), who emphasizes that Chevallard (1991) also addresses these conflicting relationships when mentioning the noosphere, and nothing prevents other authors from delving deeper into these relationships.

Thus, according to Machado (2011) and Marandino et al. (2016), these criticisms were revised, which led these researchers, as well as other researchers (Carvalho & Lima, 2022; Gericke et al. 2018; Lombard & Weiss, 2018) to use Chevallard's ideas to study the didacticization process.

We focused on analyzing didactic transposition because this work is related to a larger project, as previously reported, which aims to teach knowledge produced by the scientific community about food plants to broaden students' understanding and interest in biodiversity. However, we consider that other modes of knowledge production on this topic that do not originate from the scientific sphere, such as social values and practices, are inevitably present in the teaching process, in agreement with Clément (2006).

Moreover, as mentioned previously, we are also interested in our research in the ideas of Lombard and Weiss (2018). These authors developed a metaphor that considers ecological and evolutionary aspects called TD-EVO. According to this metaphor, knowledge permeates various ecosystems, and adapted knowledge is selected and passed on to the next ecosystem. Two ideas stemming from this metaphor are particularly interesting to us. The first is knowing what characteristics knowledge needs to thrive in the classroom ecosystem. The second, which serves the first, consists of considering the opinion of teachers and students in the teaching process so that the acceptability of this didactic knowledge occurs.

It is with this goal, therefore, that this article aims to investigate which elements and content teachers and students declare they consider relevant to be included in teaching materials on edible plants. Therefore, our research revolves around the following question: what elements and content do teachers and students say they would like to see present in a teaching proposal on food plants?

METHODOLOGY

This research is predominantly qualitative, characterized by "direct contact between the researcher and the situation studied, emphasizing the process rather than the product, and focusing on capturing the participants' perspective" (Ludke & André, 2012, p. 13). Thus, this research relies on descriptive data collected through semi-structured interviews characterized by a previously established script, but with flexibility for including new questions (Creswell, 2007). The script was validated by a research group, and the clarity and order of the questions were discussed.

During the interviews, a cordial tone was maintained, and complete responses were encouraged through neutral questions to avoid biasing participants. Responses were audio-recorded, transcribed, and analyzed. Prior to the interviews, this research was submitted to and approved by the ethics committee (CAEE No. 67968217.5.0000.5594) on July 26, 2022. Data was collected between August and September 2022.

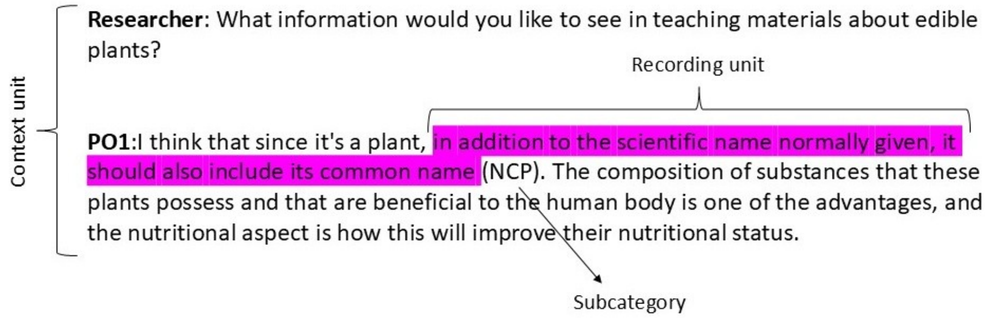
To select the schools participating in this research, we adopted non-probability convenience sampling. Thus, the research was conducted in two public schools located in the Baixada Santista region of São Paulo state, as these schools voluntarily agreed to participate. At one school, a science teacher with 12 years of experience and three students were interviewed. At the other school, a science teacher with 30 years of experience, a science teacher with 31 years of experience, and three students were interviewed. In total, three teachers and six students (two male and four female) aged 11 to 14, from the sixth and seventh grades of elementary school, participated.

The participating teachers selected the students for the interviews. The criterion for choosing these students by the teachers was having the consent form signed by the legal guardians, thus being a non-probabilistic convenience sample. This may lead to biases in the results, as the students chosen for interviews may be more engaged with biodiversity issues. Therefore, results cannot be generalized to other contexts. Future research can be conducted to explore new contexts and other sampling methods to identify common patterns and contextual specificities.

The analysis of the interview data was based on elements specific to qualitative data analysis presented by Marshall and Rossman (2006): data *organization* for initial reading, *data immersion*, establishment of *categories*, and *data coding* for *interpretation*. The analysis was also complemented with some elements of content analysis described by Bardin (2016) in the categorical analysis approach. Thus, the data was transcribed, and categories were established based on the recording and context units. The recording unit is the segment of the text to be analyzed, which can be a word, line, sentence, or paragraph. The context unit is the broader part of the analyzed segment. Thus, the recording unit is understood based on the context unit (Bardin, 2016). Considering these units, categories and subcategories were established, which were accounted for through the frequency of registration units as shown in Figure 1. The categories were defined *a posteriori* because of the exploratory analysis of the data, and the category title was only established after the end of the analysis.

Figure 1

Example of how the interviews were analyzed.



PO1= Teacher number 1; NCP=Scientific and popular name. Source: created by the authors (2025).

After giving the interviewee, a chance to express their opinion freely, the researcher chose to direct specific questions to certain aspects. For example, students were asked: “Do you think it would be interesting if the material had some excerpts talking about what scientists have researched about plants, would you like that?”, and “Do you think it is also important to have images of these plants?” The teachers were asked: “If we included descriptions of some research that has been done on these plants, do you also think they (the students) would like that?” “And news reports, glossaries, would that also be interesting to have in the material?” Thus, these aspects do not originate from spontaneous mentions by the interviewees. These questions were important, mainly, to encourage the shy students to speak. Therefore, in the results and discussions section on the table with categories and subcategories, it is indicated when the answer comes from questions posed to the interviewee that are more focused on specific aspects, rather than aspects that emerged more spontaneously from the general questions.

To differentiate between teachers and students, we used the code PO for male teachers, PA for female teachers, followed by the number 1, 2, or 3 to identify each participant. For students, the code A for female students or O for male students was used, also followed by the identification number.

RESULTS AND DISCUSSIONS

Table 1 shows the categories and subcategories that emerged from the interviews. Figure 2 explains how each subcategory was addressed in the teaching materials developed.

Table 1

Categories and subcategories indicating the elements and content that teachers and students declare are relevant for inclusion in the teaching material on food plants.

Activity Indications category (IA)			
Subcategories	**Description**	**Examples**	**Frequency**
Environmental study (IA_EM)	Explore spaces outside the classroom, whether inside or outside the school.	*"Go out and explore the plants... I don't know... bring some into the classroom"* (A6)	PA3; A5, A6
School garden (IA_HE)	Cultivate a space for planting and having direct contact with the plant species studied.	*"I think that for students, in addition to getting to know the plant itself, it's important for them to have planted specimens." (PO1)*	PA3; PO1; PA2
Apps (IA_A)	Using digital apps as a study tool.	*"We need to reinforce the importance of technology. So, perhaps using apps. A viable app. Of course, not every student has access to a cell phone, but I can tell you that most do." (PA3)*	PA3
Research (IA_P)	Incorporate research activities into educational practices.	*"Perhaps we can do some research to create this section of the notebook, researching and including what plants can be eaten."* (A2)	A2
Material Structure category (EM)			
Images (EM_I)*	Use images to visualize content.	*"I think visuals are everything. So, there must be images." (PO1)*	PA3; PO1; PA2; O3; O4; A5; A6
Glossary (EM_G)*	Explain words and expressions that are often unfamiliar.	*"There needs to be a glossary talking about plants, explaining the words."* (A2)	PO1; PA2; PA3; A2; O3

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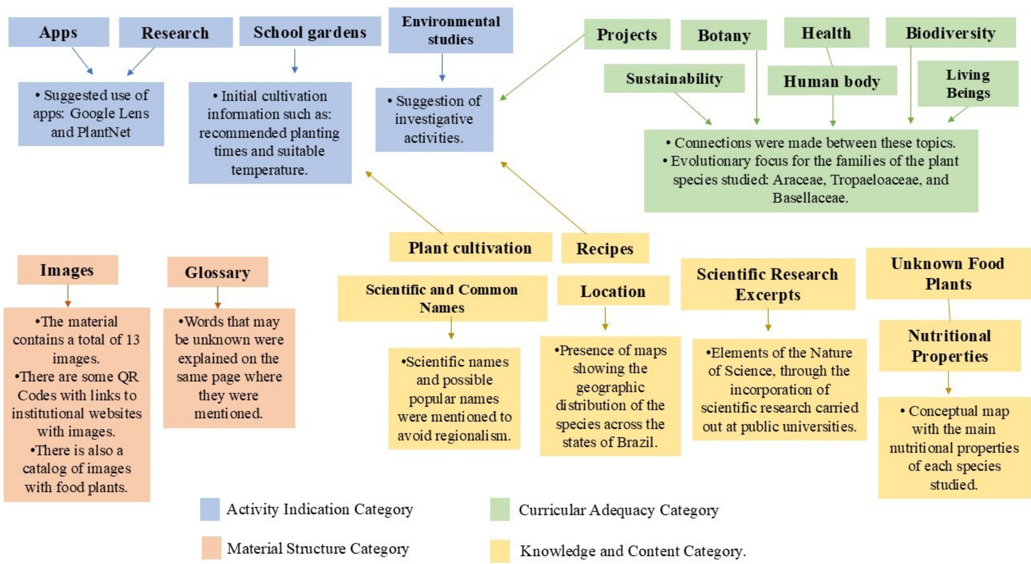
Glossary (EM_G)*	Explain words and expressions that are often unfamiliar.	*"There needs to be a glossary talking about plants, explaining the words."* (A2)	PO1; PA2; PA3; A2; O3

Curricular Adequacy Category (AC)			
Botany (AC_BO)	Addressing content from the Botany area.	*Researcher: How can we align this topic, food plants, with the curriculum? In what content?"So, within the curriculum, we cover a variety of topics, but at a given point, this material could be included, for example, in the Botany section, which I think is great."* (PO1)	PO1
Health (AC_S)	Address content related to health, food, and nutrition.	*"In terms of nutrition, regarding health issues"* (PO1)	PA2; PO1
Biodiversity (AC_BI)	Address content related to biodiversity.	*"In the seventh grade, there's biodiversity and ecosystems"* (PA3)	PA3
Sustainability (AC_ST)	Address content related to sustainability.	*"In ninth grade, they just finished studying sustainability, so I talk a little about ecology."* (PA3))	PA3
Human body (AC_CH)	Address content related to the human body.	*"Seventh Grade: Human Body Systems."* (PA2)	PA2
Living beings (AC_SV)	Address content related to living beings.	*"In the sixth grade, you work on living beings."* (PA2)	PA2
Project (AC_P)	Address the topic in the form of a project.	*"So, we could approach it as a project, as I might say... to go hand in hand with planning."* (PA2)	PA2

PA2 = female teacher, followed by identification number; PO1 = male teacher, followed by identification number; O4 = male student, followed by identification; A5 = female student followed by identification number; *Non-spontaneous mention of participants. Source: Created by the authors (2025).

Figure 2

Indication of how each subcategory (from the interviews) was covered in the teaching material.



Source: created by the authors (2025).

Using the data in Table 1, we developed teaching materials focused on food plants, targeting students in the final years of elementary school. To develop the material, titled "Is it a weed, a plant, or food?", three plant species were selected: sweet potato (*Tropaeolum pentaphyllum)*, heart-shaped bertalha (*Anredera cordifolia*), and taioba (*Xanthosoma* sp). We chose these plants because they are native species of Brazil (Tomchinsky, 2017) and our objective is to value Brazilian food flora in Science teaching. Based on the selection of these three plant species, articles and other references from scientific and government institutions were selected for the teaching process. This process was conducted by a master's-level researcher with review by the research group and the advisor.

We emphasize that our intention in this article is not to address the material in its entirety, but rather to discuss which elements and content teachers and students consider relevant for inclusion in teaching materials on edible plants, and how these suggestions can be applied in the development of such materials. In total, we obtained four categories: *activity indications* (IA), *material structure* (EM), *curricular adequacy* (AC) and *knowledge and content* (CC). Below, we describe the aspects present in each category and how they were addressed in the material and engage with the literature.

ACTIVITY INDICATION CATEGORY (IA)

The suggested activities were environmental studies (IA_EM = three mentions), school garden (IA_HE = three mentions), apps (IA_A = one mention), and research (IA_P = one mention). To consider the use of applications, environmental studies, and research, we suggest an investigative activity entitled "Mural of Food Plants." In this activity, students would investigate which plants existed in and/or around the school and whether some of them were edible. They would record these plants using cards containing drawings or photos and information such as the date and place of the record, common and scientific names, leaf characteristics, and other characteristics such as the presence of flowers. In this activity, students could research websites, apps, and books, as well as ask school staff who might be familiar with the plants.

To assist with this investigative activity, we recommend using the Google Lens and PlantNet apps. These apps can help teachers and students identify plant species. However, we would like to point out that these apps do not always provide reliable results. Therefore, it is important to consult adults who may be familiar with the plant they found. It is also important to consult websites such as Flora e Funga do Brasil and DataPlant (which are bibliographic databases on native plants).

Proposing investigative activities, such as investigating the flora of the school environment, as presented in the developed teaching materials, facilitates an understanding of the Nature of Science. These activities enable students to use procedures similar to those used by scientists to produce scientific knowledge, thus bridging the gap between scientific culture and school culture (Bizzo, 2021). This is important for the acceptability of knowledge produced by science, rather than sensationalist information (Lombard & Weiss, 2018) and fake news (Allchin, 2011).

Another example of an investigative activity present in the material which encompasses aspects of environmental study and research is called “You are the reporter.” In this activity, students interview people to assess their knowledge and habits regarding plant-based diets. Conducting these interviews corroborates Clément’s (2006) idea that modes of knowledge production originate not only from the scientific sphere but also from social values and practices. Thus, by consulting adults who may be familiar with food plants, students can engage with knowledge beyond the scientific knowledge.

Furthermore, the school garden was another suggestion made by three teachers, such as PA2:

> **Researcher:** Thinking about activities, what would be interesting for students to do about edible plants?
>
> **PA2:** Look, we have a great space here at school. We've been talking for a while about having a vegetable garden and planting. First, we study which plants are suitable for this, and then we create a small garden, have them plant and care for it. Then, they see this whole process and then learn how and where to use that particular vegetable.

The teacher’s statement reveals dissatisfaction with the lack of a vegetable garden at the school. Research (Evans et al., 2012) reveals a high prevalence of vegetable gardens as a teaching choice, but few studies analyze their implementation, maintenance, and evaluation. Silva et al. (2013) indicate that school gardens often resort to ecological appeal, using colored bottles and tires, and interventions are generally short-term due to their deactivation due to a lack of maintenance labor, especially during vacation periods. Added to this, other challenges include a lack of integration with the curriculum, a lack of materials, and a lack of training for effective implementation. To address this aspect of the vegetable garden, we included initial information on how to cultivate the three plant species studied in the material. So, if any teacher is interested in carrying out a planting activity with students or even if a student wants to grow crops at home, the material has some information such as: a calendar with the recommended planting times in each region of Brazil, suitable temperature for growth, and harvest time, among other explanations.

MATERIAL STRUCTURE CATEGORY (EM)

In this category, only two aspects were raised: the presence of images (EM_I = seven mentions) and glossary (EM_G = five mentions). The image was a frequently reported aspect, as shown in the excerpt below from the interview with PO1:

> **Researcher:** And what does good material on this subject need to have?
>
> **PO1**: I think visuals are everything. So, it must have images. Images of food plants, how they can be grown; because many families manage to plant them in their backyards, there are a lot of houses in this region.

As shown in Figure 2, the teaching material contains a total of 13 images. These include maps of the Brazilian territory showing the geographic distribution of the plants studied, drawings illustrating some of the plants' morphological characteristics, and photos of the plants themselves or QR Codes linking to these photos. Additionally, at the end of the material, there is a catalog with six images of food plants, with their common and scientific names, so they can be explored by teachers and students.

Considering the importance of images as a pedagogical resource, we were careful to place the warning "schematic representation with fantasy colors" next to each image when necessary. This prevents misinterpretations related to the dimensions of these representations (Silva, 2017). We also took the precaution of detailing the captions, as these are essential for image-based reading. The images used in teaching materials can benefit student learning, as they highlight morphological structures and bring students closer to the studied plants, as these may be inaccessible during explanations. However, as Silva et al. (2013) point out, image reading is not transparent, as the same image can have different interpretations. Although images can attract students' attention due to the attractiveness of their colors, when using this resource, it is important to clearly understand the objective and any potential difficulties students may have in understanding (Krasilchik, 2011). To avoid these difficulties, in the morphological representation drawings we use "arrows" to demonstrate, for example, the shape of the leaves, the petiole, the flowers, the inflorescences and other structures.

Pereira and Terrazan (2011) indicate that among nonverbal languages visual language has been used to construct meaning. These authors suggest that scientific explanations should be multimodal, not monomodal, meaning that images should be associated with textual resources. We agree with Martins et al. (2005) that images provide support for a better understanding of scientific ideas. However, the authors emphasize that images should not replace text but rather allow for an interrelationship between the two. Otherwise, students may think the text is unnecessary. We took this precaution when including expressions such as "this can be seen in images 9 and 10 below," "in the image on the next page," and other phrases that allow a connection between written and visual language, enabling the understanding that text and images complement each other.

Furthermore, image production also involves a process of didactic transposition. Thus, the distance between these image representations and scientific knowledge must be maintained, ensuring conceptual rigor. Therefore, when carrying out the didactic transposition process, we were careful not to only simplify scientific knowledge (Quessada & Clément, 2007). For example, the scientific name for the crem potato is *Tropaeolum pentaphyllum*, where *pentaphyllum* refers to a group of five joined leaves that the species possesses. So, in the image, we were careful to maintain this characteristic.

The glossary proposal was not the result of spontaneous mentions, as shown in Table 1. Nevertheless, when asked about the glossary, participants reported that: "It would be interesting (to have a glossary) because children are in the learning phase. They need to understand the meaning of things to incorporate them into their lives" (PO1) and "There needs to be a glossary talking about plants, explaining, and explaining the words" (A2). Thus, we included the conceptual glossary in the teaching material to facilitate the assimilation of scientific terms, rather than their memorization (Nunes, 2013). Furthermore, the glossary was presented in text boxes inserted on the same page as the corresponding terms to facilitate the reading process. Some of the terms are “inflorescence,” “sagittate,” “cotyledon,” “branch,” and others.

CURRICULAR ADEQUACY CATEGORY (AC)

In this category, teachers reported several possibilities for inserting teaching material linked to content from the National Common Curricular Base (BNCC) such as: Botany (AC_BO = one mention), Health (AC_S = two mentions), Biodiversity (AC_BI = one mention), Sustainability (AC_ST = one mention), Human Body (AC_CH = one mention), and Living Beings (AC_SV = one mention).

Martins (2011) indicates that the connection between health and botany is not so common in textbooks, and Freitas et al. (2021) found that content on plants appears in the BNCC in the thematic unit “Life and Evolution” in the Final Years of Elementary School. “The more recent the document, especially those based on the BNCC, the less the botany content is explicitly addressed” (Freitas et al., 2021, p. 48). Green and Somerville (2015) and Franzolin et al. (2021) point out that there are few formal teaching proposals that allow a connection between health education and biodiversity. Orozco (2017), when analyzing the approach to the concept of biodiversity in publications, identified the predominance of the biological-ecological approach, which focuses on species and ecosystems, rather than an integrative approach that considers biological and sociocultural aspects. Calegari et al. (2021), when investigating Brazilian textbooks, found that most living beings represented are from the group of animals (with a frequency of 65.55%) followed by plants (with a frequency of 23.26%).

Given these suggestions from teachers and literature, throughout the material, we attempted to make connections with these topics (botany, health, biodiversity, sustainability, the human body, and living beings), for example, by indicating the presence of vitamins, amino acids, and proteins in the studied plants and their relevance to the human body. Another example is the inclusion of a section in the material entitled “Relationships between the Studied Families.” This section includes a phylogenetic tree with the families Araceae (taioba), Tropaeolaceae (crem potato), and Basellaceae (heart bertalha) so that students can understand the evolutionary and kinship relationships among these plants in biodiversity. The literature (Coutinho & Santos, 2019; Santos & Calor, 2007) indicates that students tend to view the evolutionary process as linear, progressing from something simple to something more complex. Thus, to avoid these misconceptions and to develop “tree thinking” in students, we present a phylogenetic tree indicating a common ancestor. This allows the teacher to explain that the branches of the great tree of life are historically connected by a common ancestor.

Finally, in this category, a participant mentioned that the teaching material can be worked on in the form of a project, as reported:

> **PA1:** So, we could be putting it together as a project. So, how can I say... to be working hand in hand with the planning, because it's really difficult for us to include it in the planning, the topics don't always match up. So, we can do something side by side.

This statement reveals the teacher's alternative use of the material if it is not possible to link it to the national curriculum. It should be noted that only one participating teacher suggested using projects, while the other participants cited various content areas in which the topic of food plants could be incorporated.

KNOWLEDGE AND CONTENT CATEGORY (CC)

In this category, several elements were raised by teachers and students, such as: popular and scientific name (CC_NCP = four mentions), recipes (CC_R = seven mentions), nutritional properties (CC_PN) = four mentions), location (CC_L = one mention), cultivation of food plants (CC_CP = five mentions), reports of scientific research (CC_RP = nine mentions), and information on unknown food plants (CC_PCD = three mentions).

The subcategory of common and scientific names was included in the material in the section for each studied plant under the topic "How to identify?" and in the catalog of images of food plants at the end of the material, as mentioned above. The subcategory of nutritional properties was included in the section for each studied plant under the topic "What are the benefits?" This topic addressed which parts of the plants are edible and the main macro and micronutrients present in these vegetables. This allows for the suggestion of relating the topic of food plants to the health and human body content reported in the curriculum adaptation (CA) category.

The recipes subcategory was included in the investigative activity proposal titled "You are the reporter," which, as mentioned above, aims to analyze knowledge and consumption habits of plants with food potential. Thus, during the interviews, students can ask how these plants are consumed and what the most popular recipes are. The location subcategory was incorporated into the material with map images illustrating the geographic distribution within Brazil, as mentioned earlier in this article. The food plant cultivation subcategory included basic information on how to cultivate the three plant species studied, as also reported previously. The information on unknown food plants subcategory was incorporated by selecting three plant species that students may be unfamiliar with.

The subcategory scientific research reports did not emerge spontaneously; however, when participants were asked about it, they showed interest as long as the language used was accessible to students, as reported by PO1:

> **Researcher:** What if we included some researchers' experiences, would that be interesting?
>
> **PO1:** Researchers typically use language that's much more empirical, and it's not easy for children to understand. If it's translated in a way that children understand, yes. But I don't think it's advisable in an empirical format; it would be more for high school students.

Scientific language is little explored by teachers because its conception is marked by rigor and the use of specific terminology (Oliveira et al., 2009). We emphasize that the language of science corresponds not only to the understanding of concepts, but also to the process of constructing scientific thought. The idea of "translating" scientific language discussed by PO1 corroborates the theoretical assumptions of Chevallard (1991), Clément (2006), and Lombard and Weiss (2018). This "translation" can be understood as the transformation of scientific knowledge. Therefore, when developing the teaching material, we sought to consider the difficulties raised by teachers in teaching scientific language.

To this end, we considered Lombard and Weiss' (2018) evolutionary metaphor, which states that by bringing new knowledge into the classroom, such as knowledge related to the Nature of Science (NOS), we can change the school ecosystem, allowing the evolution of the knowledge that thrives within it. This can foster the acceptability of scientific knowledge, rather than sensationalist knowledge or fake news. Thus, we sought to incorporate elements of the NOS into the teaching materials, aiming to bridge the gap between scientific culture and school culture. We included reports of scientific research (CC_RP) conducted at Brazilian public universities, which included the research question to be examined, the methodology, and the obtained results. The purpose of these brief reports is to demonstrate that Science is, above all, human and collective (Forato et al., 2011). For example, the material presented research conducted by the Laboratory of Ecology, Conservation, and Biocultural Evolution at the Federal University of Alagoas on the acceptability of certain plants by marketgoers in Maceió, Alagoas. To this end, the laboratory researchers used a sensory evaluation system on a scale of 1 to 9, ranging from "extremely disliked" to "extremely liked." Marketgoers tasted several recipes using edible plants and then assigned a score. This example allows students to familiarize themselves with real research problems and with data collection and analysis. Because teachers mentioned that researchers use "language that is not easy for children to understand," we sought to write elements of the NOS in an accessible format so that the material would thrive in the classroom environment (Lombard & Weiss, 2018).

FINAL CONSIDERATIONS

What elements and content do teachers and students say they would like to see present in a teaching proposal about edible plants? Throughout this article, we reflect on this question from a practical perspective, demonstrating how the elements suggested by teachers and students were incorporated into the teaching material and how we addressed the literature's recommendations. To this end, four categories were established: activity indication (IA), material structure (MS), curricular adequacy (CA), and knowledge and content (CC).

In the activity indication category, a consensus among teachers was the issue of school gardens. However, incorporating this element into the teaching materials was challenging, as gardens require ongoing monitoring. However, we incorporated some basic technical knowledge necessary for planting and cultivating the species studied into the materials.

In the material structure category, we found that images were a consensual element among teachers and students. The literature also indicates that images can be a good resource for understanding scientific ideas; however, as these ideas undergo a process of didactic transposition, caution is required when using them. The images present in the material included maps of the Brazilian territory, drawings, and images of plants.

In the knowledge and content category, all teachers agreed with the inclusion of scientific research reports, as long as they were presented in accessible language. “Translating” knowledge into easily accessible language was also challenging, as previously reported in the literature. To achieve this, we drew on the Nature of Science, allowing students to engage with scientific culture and understand that science is not a solitary endeavor and how it is constructed.

In the curricular adaptation category, teachers also indicated that the topic of food plants could be incorporated as a project or into various BNCC subjects, such as Botany, Health, Biodiversity, Sustainability, the Human Body, and Living Beings. One way to address these subjects is through an evolutionary approach. Therefore, we incorporated a phylogenetic tree into the material, showing the angiosperm families to which the studied plant’s species belonged. This helps mitigate the compartmentalized way in which scientific knowledge is presented. Finally, to address other suggestions from teachers and students, such as environmental studies, research and recipes, and literature, we incorporated investigative activities into the teaching material. These activities facilitate a connection with practices developed in scientific culture.

Therefore, the teaching material, developed with the collaboration of teachers and students, aimed to incorporate scientific knowledge produced by the scientific community on food plants, so that this topic can thrive in the classroom environment. Subsequent studies should evaluate the potential and limitations of this material in the classroom.

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REFERENCES

Alho, C. J. R. (2008). The value of biodiversity. *Brazilian Journal of Biology, 68*(4), 1115-1118. https://doi.org/10.1590/S1519-69842008000500018

Allchin, D. (2011). Evaluating Knowledge of the nature of (whole) science. *Science Education, 95*(3), 518-542. https://doi.org/10.1002/sce.20432

Antonelli, I.B., Varela, E.P., & Zanette, V.C. (2024). Percepção e conhecimento sobre plantas medicinais em uma escola no sul do Brasil. *Actio: Docência em Ciências*, *9*(3), 1-23. http://dx.doi.org/10.3895/actio.v9n3.18363

Astolfi, J.P., & Develay, M. (1991). *A didática das ciências*. Campinas: Papirus.

Ballourd, J.M., Brischoux, F., Bonnet, X. (2011). Children prioritize virtual exotic biodiversity over local biodiversity. *Plos one*, *6*(8), 1-8. https://doi.org/10.1371/journal.pone.0023152

Bardin, L. (2016). *Análise de conteúdo* (1st ed.) São Paulo: Edições 70.

Bizzo, N. (2000). *Ciências: fácil ou difícil?* São Paulo: Atica

Bizzo, N. (2021). As cinco condições do ensino por “investigação Aberta”. In: Bizzo, N. M. V., & Santos Gouw, A. M. (Org.). *Fundamentos teóricos do ensino de ciências de base experimental* (1st ed., pp. 143-156). Appris.

Calegari, A.S., Santana, C.M.B.,Soares, J.P.R., & Franzolin, F. (2021, Jan 25-29). *Biodiversidade em uma coleção de livros didáticos do ensino fundamental: um estudo piloto* [paper presented]. Encontro Nacional de ensino de biologia, Fortaleza, CE, Brasil. https://editorarealize.com.br/editora/anais/enebio/2021/CEGO_TRABALHO_EV139_MD1_SA17_ID1522_14032020204932.pdf

Carvalho, G. S., & Lima, N. (2022). Public perception of microorganisms and microbiology education: a need for enhancing society’s microbiology literacy. In: Kurtboke, I. *Importance of microbiology teaching and microbial resource management for sustainable futures*. Elsevier,31-42.

Chevallard, Y. (1991). *La Transposicion Didactica: del saber sabio al saber enseñado*. Buenos Aires, Aique.

Chervel, A. A. (1990). História das disciplinas escolares: reflexões sobre um campo de pesquisa. *Teoria & Educação*, *2*(2), 177-229. https://edisciplinas.usp.br/pluginfile.php/3986904/mod_folder/content/0/Chervel.pdf

Clément, P. (2006). Didatic Transposition and KVP model: Conceptions as interactions between scientific knowledge, values and social practice. *ESERA Summer*, 9-17.

Coutinho, C., & Santos, M.L.B. (2019). "Pensamento em árvore" e o ensino de evolução biológica: percepções de um grupo de professores. *Experiências em Ensino de Ciências*, *14*(2), 395-412. https://fisica.ufmt.br/eenciojs/index.php/eenci/article/view/164

Creswell, J.W. (2007). *Projeto de pesquisa: métodos qualitativo, quantitativo e misto*. Porto Alegre: Artmed.

Descola. P. (1998). Estrutura ou sentimento: a relação com o animal na Amazônia. *Mana, 4*(1), 23-45. https://doi.org/10.1590/S0104-93131998000100002

Elster, D. (2007). Student interests – the German and Austrian ROSE survey. *Journal of Biological Education*, *42*(1), 5-10. https://doi.org/10.1080/00219266.2007.9656100

Evans, N., Whitehouse, H., & Gooch, M. (2012). Barriers, Successes and Enabling Practices of Education for Sustainability in far North Queensland Schools: A Case Study. *The journal of Environmental Education*, *43*(2), 121-138. https://doi.org/10.1080/00958964.2011.621995

Forato, T.C.M., Pietrocola, M., & Martins, R.A. (2011). Historiografia e natureza da Ciência na sala de aula. *Caderno Brasileiro de Ensino de Física*, *28*(1), 27-59. https://doi.org/10.5007/2175-7941.2011v28n1p27

Forquin, J.C. (1992). Saberes escolares, imperativos didáticos e dinâmicas sociais. *Teoria & educação, 5*(1), 24-28. https://edisciplinas.usp.br/pluginfile.php/1844359/mod_resource/content/1/T2%20-%20Forquin_saberes_escolares.pdf

Franzolin, F., Carvalho, G.S., Santana, C.M.C., Calegari, A.S., Almeida, E.A., Soares, J.P.R., Jorge, J., Neves, F.D., & Lemos, E.R.S. (2021). Students' interests in Biodiversity: Links with Health and Sustainability. *Sustainability*, *13*(24), 1-15. https://doi.org/10.3390/su132413767

Freitas, K.C., Vasques, D.T., & Ursi, S. (2021). Panorama da abordagem dos conteúdos de botânica nos documentos norteadores da Educação Básica Brasileira. In: Vasques, D.E.; Freitas, K.C.; & Ursi, S. *Aprendizado ativo no Ensino de Botânica* (pp. 31-51). Instituto de Biociências, Universidade de São Paulo. http://botanicaonline.com.br/geral/arquivos/Vasques_Freitas_Ursi_2021.pdf

Gericke, N., Hudson, B., Olin-Scheller, C., & Stolare, M. (2018). Powerful knowledge, transformations and the need for empirical studies across school subjects. *London Review of Education*, *16*(3), 428-444. https://doi.org/10.18546/LRE.16.3.06

Green, M., & Somerville, M. (2015). Sustainability education: researching practice in primary schools. *Environmental Education Research, 21*(6), 832-845. https://doi.org/10.1080/13504622.2014.923382

Jenkins, E.W., Pell, R.G. (2006). *The Relevance of Science Education Project (ROSE) in England: A Summary of Finidings*. Centre for Studies in Science and Mathematics Education, University of Leeds, UK.

Joly, C.A., Queiroz, H.L. (2020). Pandemia, biodiversidade, mudanças globais e bem-estar humano. *Estudos avançados*, *34*(100), 67-82. https://doi.org/10.1590/s0103-4014.2020.34100.006

Krasilchik, M. (2011). *Prática de Ensino de Biologia*. São Paulo: EDUSP.

Kohler, M., & Brack, P. (2016). Frutas nativas no Rio Grande do Sul: Cultivando e valorizando a diversidade. *Revista Agriculturas: experiências em agroecologia*, *13*(2),7-15.

Landinho. (2022). *É mato, planta ou comida?* Biota-FAPESP.

Leite, M.S. (2007). *Contribuições de Basil Bernstein e Yves Chevallard para a discussão do conhecimento escolar* [Master's thesis, Pontifícia Universidade Católica do Rio de Janeiro]. PUC-Rio Digital Archive. dbd.puc-rio.br/pergamum/tesesabertas/0212105_04_pretextual.pdf

Lévequê, C. (1999). A biodiversidade. Bauru: Editora da Universidade do Sagrado Coração.

Lombard, F., & Weiss, L. (2018). Can Didactic Transposition and Popularization Explain Transformations of Genetic Knowledge from Research to Classroom? *Science and Education***,** 27(5), 523–545. https://doi.org/10.1007/s11191-018-9977-8

Lopes, A. (1997). Conhecimento escolar em química: processo de mediação didática da ciência. *Química nova*, 20(5), 563-568. https://doi.org/10.1590/S0100-40421997000500020

Louzada-Silva, D., & Carneiro, M. H. S. (2013). Fotografia e diversidade biológica em livros didáticos de Biologia. *Enseñanza de Las Ciencias*, *extra*, 2018-2023. https://raco.cat/index.php/Ensenanza/article/view/307714

Ludke, M., & André, M. E. D. A. (2012). *Pesquisa em Educação: Abordagens qualitativa*. São Paulo: EPU.

Machado, V. M. (2011). *Prática de estudo de ciências: formação inicial docente na unidade pedagógica sobre a digestão humana* [Doctoral dissertation, Universidade Federal do Mato Grosso do Sul]. UFMS Digital Archive. https://repositorio.ufms.br/handle/123456789/528

Marandino, M. (2004). Transposição ou recontextualização? Sobre a produção de saberes na educação em museus de ciências. *Revista Brasileira de Educação*, *26*, 95-183. https://doi.org/10.1590/S1413-24782004000200008

Marandino, M., Bueno. J., Gomes, F.O., Kristel, F.L., & Oliveira, A. (2016). Os usos da Teoria da Transposição Didática e da Teoria Antropológica do Didático para o estudo da educação em museus de ciências. *Revista Labore Em Ensino de Ciências, 1*(1), 69-97. https://periodicos.ufms.br/index.php/labore/article/view/2105

Marshall. C., & Rossman, G. B. (2006). *Designing Qualitative Research*. Thousand Oaks: Sage Publications.

Martinand, J.L. (2003). La Question de la Réference en Didactique du Curriculum. *Investigações em Ensino de Ciências*, *8*(2), 125-130. https://ienci.if.ufrgs.br/index.php/ienci/article/view/543/338

Martins, L. (2011). *Saúde no contexto educacional: as abordagens de saúde em um livro didático de biologia largamente usado no ensino médio brasileiro* [Master's thesis, Universidade Federal da Bahia]. UFBA Digital Archive. ppgefhc.ufba.br/sites/ppgefhc.ufba.br/files/liziane_martins_-_dissertacao_-_saude_no_contexto_educacional_as_abordagens_de_saude_em_um_livro_didatico_de_biologia_do_ensino_medio_largamente_usado.pdf

Martins, I., Gouvêa, G., & Piccini, C. (2005). Aprendendo com imagens. *Ciência e Cultura*, *57*(4), 38-40. https://edisciplinas.usp.br/pluginfile.php/77314/mod_resource/content/1/Texto%207%20-%20Aprendendo%20com%20Imagens.pdf

Nunes, M.R. (2013). A problemática do vocabulário e o estudo etimológico como facilitador do conhecimento escolar de biologia [Master's thesis, Universidade Federal do Rio Grande]. FURG Digital Archive. https://repositorio.furg.br/handle/1/4798

Orozco, Y. A. (2017). O ensino da biodiversidade: tendências e desafios nas experiências pedagógicas. *Revista Góndola, Enseñanza y Aprendizaje de las Ciencias*, *12*(2), 173-185. https://doi.org/10.14483/23464712.11599

Pereira, A. G., & Terrazan, E. A. (2011). A multimodalidade em textos de popularização científica: contribuições para o ensino de ciências para crianças. *Ciência e Educação*, *17*(2), 489-503. https://doi.org/10.1590/S1516-73132011000200015

Pereira, L.F.L., & Lima, T.N. (2025). Crise da biodiversidade: tendências científicas e as concepções dos professores de ciências da natureza. *Actio: Docência em Ciências*, *10*(2), 1-22. http://dx.doi.org/10.3895/actio.v10n2.19655

Piassa, G., Megid Neto, J., Simões., A. (2023) Negligência botânica e zoochauvismo em livrso didáticos de Biologia no ensino médio. *Terrae Didatica no ensino médio, 19*(00), 1-10. https://periodicos.sbu.unicamp.br/ojs/index.php/td/article/view/8673697

Quessada, M. P., & Clément, P. (2007). An epistemological approach to French syllabi on human origins during the 19th and 20th centuries. *Science and Education*, *16*(9), 1-17. https://doi.org/10.1007/s11191-006-9051-9

Sakir, N. A. I., & Kim, J. G. (2019). Comparing biodiversity-related contents in secondary biology textbooks from Korea, Indonesia, and United States of America. *Journal of Biological Education*, 1-14. https://doi.org/10.1080/00219266.2019.1643760

Santos, C. M. D., Calor, A. R. (2007). Ensino de biologia evolutiva usando a estrutura conceitual da sistemática filogenética I. *Ciência e Ensino*, *1*(2), 1-8.

Santos, C.R., Silva, L.B., Moreira, L.S., Lauriano, M.P., & Corte, V.B. (2021). O ensino de botânica na formação de professores de biologia: por que é urgente reformular teoria e prática? *Actio: Docência em Ciências*, *6*(1), 1-22. http://dx.doi.org/10.3895/actio.v6n1.11490

Silva, E.C.R., Dysarz, F.P., Fonseca, A.B.C., & Carvalho, G.S. (2013, November 10-13). *Considerações (e desconsiderações) sobre hortas em escolas urbanas e seus objetivos para a Educação em Ciências e Educação em Saúde* [paper presentation]. Encontro Nacional de Pesquisa em Educação em Ciências, Águas de Lindóia, SP, Brasil.

Silva, R. M. D. S. E. (2017). *O "Reino das Plantas" nos Livros Didáticos de Ciências: Análise de Imagens* [Master's thesis, Universidade de São Paulo]. USP Digital Archive. https://repositorio.usp.br/item/002843932

Tolentino Neto, L.C.B. (2008). *Os interesses e posturas de jovens frente às ciências: resultados do Projeto ROSE aplicado no Brasil* [Doctoral dissertation, Universidade de São Paulo]. USP Digital Archive. https://repositorio.usp.br/item/001674681

Tomchinsky, B. (2017). *Prospecção de plantas aromáticas e condimentares no Brasil* [Doctoral dissertation, Universidade Estadual Paulista Júlio de Mesquita Filho]. UNESP Digital Archive. repositorio.unesp.br/server/api/core/bitstreams/cba2dd5e-1409-4629-b76c-2bd95a3e94dd/content

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