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Contributions to Science Education on the theme of paleontology through virtual visits to a paleontology center[1]

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ABSTRACT

This investigation aims to establish an in-depth dialogue with the community of science and technology education teachers and researchers, exploring the outcomes of a three-lesson remote didactic strategy focused on paleontology. This study emerges as an integral part of the ongoing doctoral research of the first author of this manuscript, grounded in the intrinsic relevance of research and scientific dissemination. The methodological approach employed in this work is qualitative and participatory, involving ten 6th-grade students from a public school in Paraná, Brazil. The research was conducted through an online meeting platform in the year 2020, amidst the global spread of the COVID-19 pandemic. The activities were developed in collaboration with the Paleontological Center and Museum of Earth and Life, University of Contestado, in Mafra, Santa Catarina, Brazil. The educational focus was structured based on the three pedagogical moments proposed by Delizoicov, Angotti, and Pernambuco. The main objective was to explore various aspects of paleontological scientific research, from its practical implementation to the importance of disseminating this knowledge for the preservation of the permanent collection of a museum. Encompassing the laboratories, collection, and exhibition area of the museum, the study used audio and video recordings of the classes for data collection, employing Discursive Textual Analysis. The results indicate significant contributions to the learning of the content covered, as well as the promotion of productive discussions on the practice of scientific dissemination, connecting scientific knowledge to social, technological, and environmental issues.

KEYWORDS: Scientific Dissemination. Didactic Strategy. Museums. Discursive Textual Analysis.

INTRODUCTION

Considering the pandemic framework associated with Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), caused by Coronavirus (COVID-19), declared a global public health emergency on March 30, 2020, education underwent unexpected transformations. This was particularly evident as the endemic escalated to pandemic status by the World Health Organization and health agencies worldwide due to the uncontrolled spread of the virus. Remote teaching (synchronous and asynchronous) gained prominence, immediately expanding the use of information and communication technologies for worldwide class development.

From this new global reality, various sectors were impacted, including health, culture, economy, and education. Schools, the spaces for teaching and learning construction, were temporarily shut down to prevent further virus spread and dissemination (PASINI; CARVALHO; ALMEIDA, 2020). Consequently, educational debates intensified to discuss the best approach for remote teaching, utilizing tools that could effectively meet this new and unexpected demand (UDESC, 2020).

Mass media and digital platforms were among the first resources employed to support educational processes in this scenario, given their significant relevance and widespread accessibility, from the advent of the internet to the emergence of research channels and social networks (ROCHA *et al.,* 2021). This is pertinent as media resources wield substantial influence in shaping public opinion, promoting new attitudes and behaviors, especially with widespread television access across demographic regions (AMARAL, 2007). Machado (2016) argues that digital media in education also enhances the teaching-learning process, as these tools can serve as impactful and engaging educational resources, such as live broadcasts (livestreams) used to foster pedagogical strategies.

In the state of Paraná, for instance, educators from public and private schools received directives from educational administrators to utilize online platforms (a practice adopted in Brazil and much of the world), leading to virtual educational meetings with students. These sessions transformed the conventional teaching methods previously employed. Coincidentally, in 2020, the Paraná State Department of Education (SEED-PR) initiated the implementation of the Paraná State Education Curriculum (CREP) for Elementary Education, fully operationalized by 2021, aligning with the demands of the new National Common Curricular Base through the Paraná Digital School portal (PARANÁ, 2021). This curriculum document introduces significant changes in the teaching-learning process, emphasizing the need to align school curricula nationwide.

During the 2020 academic year, teachers in Paraná's state education system were directed to meet CREP requirements. Throughout the school year, there was a thematic focus on rocks in the 6th-grade Science curriculum. As a result, an educational activity was structured in collaboration with teachers and researchers (who also engage in scientific dissemination) from the Paleontological Center (CENPALEO) - Museum of Earth and Life, University of Contestado, located in Mafra, Santa Catarina. This activity was conducted through virtual meetings, reflecting the remote learning environment prevalent at the time it was developed.

In this study, a didactic strategy comprising three lessons was delineated, where the theme "rocks" was diversely approached, relating it to fossils studied in paleontology. These classes were taught by the teacher from a school in Paraná, in collaboration with researchers from CENPALEO. The research center provided the paleontological laboratory, the preparation and research site for materials to be showcased during online classes, such as fossils, and the museum's permanent exhibition to enrich learning.

The didactic strategy was designed to foster discussions on elements involving paleontological research (its conceptual principles, ethical considerations, methods, etc.), understanding the work of scientists and researchers in this field, as well as the relevance and importance of scientific study dissemination, particularly through museum exhibitions (PÁSSARO; HESSEL; NOGUEIRA NETO, 2014). The aim was to stimulate debates on the scientific content of rocks, linking it to social, technological, and environmental issues surrounding this theme. The museum was considered a conducive space to problematize these issues, taking into account the intentional development of the educational project (MARANDINO *et al.,* 2004).

Thus, the objective of this work is to discuss the results of a research study on the contributions of a remote didactic strategy on paleontology and the importance of scientific research and dissemination. The issue addressed is associated with a broader research by the first author, investigating the development of scientific knowledge present in a paleontology museum for interested groups, considering limitations such as the impossibility of technical or guided visits due to major restrictions like the pandemic or geographical distance from schools. It is considered that remote activities carried out in museums, aiming to provide experiences related to scientific dissemination in science education and understanding of scientific fields, can offer significant and diverse contributions in terms of interaction and comprehension, beyond the content itself (SILVA *et al.,* 2022).

NON-FORMAL EDUCATION AND SCIENCE TEACHING

Non-formal education, according to Marandino *et al.* (2004), refers to an organized and systematic educational attempt occurring outside the formal educational environment with the aim of contributing to learning. Non-formal education spaces, such as museums and science centers, offer more playful, cultural, and artistic approaches, providing a means to ignite enchantment, motivation, and contextualization of knowledge that goes beyond the school environment.

It is a consensus among researchers on the importance and necessity of developing policies and pedagogical strategies that assist students in understanding scientific knowledge in non-formal spaces. Contemporary education can no longer be restricted solely to the school environment (VALENTE; CAZELLI; ALVES, 2005; ROCHA; LEMOS; SCHALL, 2007; JACOBUCCI; JACOBUCCI; NETO, 2009; MARANDINO; SELLES; FERREIRA, 2009).

One example of an initiative aiming to bridge formal and non-formal education is the "Ciência Vai à Escola (PCVE)" program in Curitiba, established in 1997 in partnership with the Museum of Natural History and the Department of

Genetics at the Federal University of Paraná. This program has an extensionist character and offers training and improvement courses for teachers, aiming to enhance their education and disseminate knowledge (PAULIV *et al*., 2013). This initiative aligns with the vision of Marandino, Selles, and Ferreira (2009), highlighting the importance of non-formal educational spaces such as biology, physics, chemistry, and geography museums for the scientific literacy of students.

The convergence between formal and non-formal education contributes to the promotion of scientific literacy. Lorenzetti and Delizoicov (2001) advocate for diversifying didactic resources to meet scientific demands and emphasize the importance of linking school education with activities and spaces that prioritize the dissemination of scientific knowledge to students. Museums are examples of spaces that, when designed to allow different pedagogical interventions, can establish significant partnerships in the dissemination of scientific knowledge and enrich education with meaningful experiences. According to Marandino (2001, p. 98), museums are "socially interconnected spaces that complement each other, both being essential for the formation of scientifically literate citizens."

In this context, the idea of conducting virtual visits to physical museums emerged because, in addition to being a contemporary innovation, it differs from a visit to a virtual museum. During real-time online visits, there is interaction among students, teachers, and the staff of non-formal spaces, facilitating discussions on museum themes and their various relationships. This is not possible in virtual museums, where interaction occurs solely with images and information presented on a platform. However, Carvalho (2012) suggests that virtual museums can be a new type of conducive learning environment by connecting digital collections from different institutions.

The relationship between non-formal education and remote teaching can contribute to democratizing access to education and to the personal and professional development of students. Therefore, individuals need to be more autonomous for virtual museums to truly promote reflections that provide them with positioning and diverse relationships with scientific themes, for example, as the individual will be alone during the virtual tour (HENRIQUES; CHAVES, 2020).

It is important to note the distinction between virtual environments and virtual museums. While virtual environments can refer to diverse digital spaces, virtual museums represent a more specific and specialized category. Falk and Dierking (2000) argue that virtual museums aim to digitally replicate the experiences offered by physical museums, integrating collections, exhibitions, and interactivity. In contrast, virtual environments may include a variety of online contexts, from gaming platforms to digital classrooms. Considering education and knowledge dissemination, virtual museums are specifically designed to offer authentic cultural and scientific experiences, often incorporating curated narratives and interactive elements that mimic visiting a physical museum. This can be achieved through virtual environments, such as the Google Meet application used in the didactic strategy development.

This distinction is crucial for understanding the diversity of online contexts and recognizing the potential of virtual museums in preserving and presenting cultural and scientific heritage. Therefore, non-formal spaces can establish relationships with science education, contributing to the dissemination of scientific knowledge. However, it is essential to integrate these spaces into science education during

teachers' initial training, enhancing the competencies and skills of education professionals in sciences (MARANDINO, 2003).

THE PALEONTOLOGY MUSEUM (CENPALEO)

Paleontology is indeed an area that sparks curiosity in many people. The connection between fossils, rocks, and the development of research in paleontology is essential to understanding the life of the past on Earth. The CENPALEO/MTV museum, located at the University of Contestado in Mafra, Santa Catarina, plays an important role in this context. Its collection and research contribute to telling the story of the evolution of species on planet Earth.

Museum institutions are essential pillars in the preservation and dissemination of humanity's cultural and scientific heritage. As highlighted by Cazelli *et al.* (2002), museums play a multifaceted role by serving as spaces for the storage and exhibition of artifacts that tell intricate and valuable stories about the past. The importance of museum exhibitions should not be seen solely as static repositories but as dynamic educational tools. In addition to preserving and presenting artifacts, these institutions offer valuable educational opportunities, providing the public with the chance to explore and understand different aspects of society, science, and art. By integrating technology, engaging narratives, and interactive programs, museums connect the past with the present, playing a crucial role in promoting knowledge, enriching cultural understanding, and encouraging active engagement with global heritage. These institutions play a vital role in education and in shaping cultural identity, promoting an appreciation of diversity, and contributing to the development of collective historical consciousness.

Natural history museums, such as CENPALEO, address a variety of topics that pique the curiosity and interest of the general public. They provide access to materials and information derived from scientific research, making them attractive spaces for visitation and for the public to engage with scientific knowledge.

Pscheidt (2018) points out that natural history museums cover topics that stimulate the curiosity of the general population. These spaces present a "diversity of materials and information derived from scientific research, accessible to the public, and are considered very attractive spaces for visitation, a way to attract and bring individuals closer to scientific knowledge" (PSCHEIDT, 2018, p. 34).

Although there is interest in the field of paleontology, museum institutions dedicated to this area are still limited in Brazil. The digital collection of fossils in the country is considered small compared to its potential and in comparison to international institutions (PÁSSARO; HESSEL; NOGUEIRA NETO, 2014). In this regard, teachers can play an important role in bridging non-formal spaces such as museums with formal education. This integration provides new experiences and opportunities for students, which can positively impact their learning.

It is important to highlight that the teaching and learning process for non-formal spaces has significant dimensions, establishing a relationship between classroom content and the experiences provided by museums. This involves considering not only the informal nature of these spaces but also the wide range of educational experiences they offer (HEIN, 1998). Clearly identifying these non-formal spaces, such as museums, aquariums, botanical gardens, and others, can

enhance students' learning and promote more meaningful engagement with scientific knowledge. However, it is essential for teachers to engage in thorough planning to organize educational activities effectively in non-formal settings.

METHODOLOGY

In order to observe the engagement of students in an experiential situation within a non-formal educational environment, specifically related to paleontology and scientific dissemination, the focus was not on measuring learning but rather on analyzing the contribution of a remote strategy on paleontology and the importance of research and scientific dissemination.

The research was conducted using a participatory approach of qualitative nature, involving interaction between researchers and the participants. According to Gil (2008), participatory research is characterized by interaction between researchers and members of the investigated situations, involving popular and dominant science. The author emphasizes that this type of research privileges current scientific knowledge and common-sense ideas, while also involving evaluative positions to engage participants in the research.

The research corpus consisted of ten 6th-grade students who participated in a didactic strategy developed for Science classes, where participation was still optional. For this purpose, a sequence of three 50-minute lessons was developed within the context of the Science discipline, conducted remotely and simultaneously at the CENPALEO Museum using an online meeting platform (Google Meet).

To develop the didactic strategy in each session, educational practices were planned under the guidance of the three pedagogical moments (DELIZOICOV; ANGOTTI; PERNAMBUCO, 2011): initial problematization, organization of knowledge, and application of knowledge. The development of these stages and their objectives in the classes can be identified in Table 1 below.

Regarding the organization of the classes, the first session discussed the construction of science, fossils, museum collection safeguarding, and the importance of paleontological research. In the second session, a synchronous visit to the museum's permanent exhibition was conducted. The researcher moved through all exhibition rooms with a smartphone camera to bring new knowledge closer to pre-existing concepts in the participants' cognitive structure. The use of smartphones can provide more tangible and contextualized connections, promoting meaningful learning by relating them to the content. Finally, the third session revisited previous approaches, prompting a general discussion on the topics studied.

Table 1: Summary of activities developed in classes, articulated to the stages of the methodology and their objectives.

Meeting Number	Methodological Stage	Objective	Proposed Activity
1	Initial Problematization	Enable students to express knowledge on the topic,	Discussed the construction of science, fossils,

		facilitating recognition of prior knowledge.	museum collection safeguarding, and the importance of paleontological research.
2	Organization of Knowledge	Allow the construction of a culture of collective participation in the teaching-learning process	Synchronous visit to the museum's permanent exhibition.
3	Application of Knowledge	Understand what and how the studied topic was learned.	Quiz with students on previous discussions held in earlier classes.

Source: The authors (2020).

The development of these classes was based on a segment of a doctoral research, submitted to the Research Ethics Committee (CEP). After receiving favorable opinion (under number CAAE: 52938321.3.0000.5547), the classes were recorded using the meeting platform used, facilitating the analysis and discussion of research data, aiming to identify contributions from the mentioned didactic strategy. Data analysis was conducted using the method of Discursive Textual Analysis (DTA), where the researcher interprets the data based on their theories and perspectives, as "texts do not carry a meaning to be merely identified; they bring meanings requiring the reader or researcher to construct their own meanings from their theories and perspectives" (MORAES; GALIAZZI, 2007, p. 17). The methodology involved identifying and fragmenting the research *corpus* through an interpretative and descriptive process, structured and constructed based on a category system.

The research categories emerged from the participation of the students and the two teachers involved, the 6th-grade homeroom teacher and the researcher from CENPALEO. The identified and structured categories are: scientific (involving elements of science itself); cultural-social (articulating science with cultural and social consequences); and technological (pertaining to opinions about elements linking science to technology).

From a didactic perspective, the aim was intentionally to provide students with a new educational situation through this unprecedented activity, aiming to enhance learning gains as they engage in discussions related to paleontology. This can be observed in the results, where student identities are protected using designated nomenclatures: "An" referring to "A" for student and "n" to differentiate between them, "P1" for the Science teacher who is the homeroom teacher, and "P2" for the teacher conducting the technical visit inside CENPALEO.

RESULTS AND DISCUSSION

Based on the data obtained from recordings made during the development of the classes, excerpts from students' speeches were selected, indicating significant contributions to learning, interests, and discussions related to the theme. The discussions of the results are structured in the sequence of the classes, articulating episodes that fit into each of the scientific, socio-cultural, and technological categories.

The first class began with problematizations aimed at understanding students' prior knowledge of fossils, as well as the development of research skills and the role of a researcher. With this intention, throughout this class, they were able to visit the research and material preparation laboratory where materials studied and subsequently displayed in the museum's collection are prepared. Figure 1 illustrates the room where these materials are kept and used. It is important to note that on this day, students had the opportunity to converse with individuals working at the site, asking questions about their work.

Figure 1: Image of the materials manipulated by paleontologist researchers in the internal laboratory of CENPALEO.

Source: CENPALEO

In the second class, students began to raise questions, allowing discussions about fossils to extend into another class, particularly regarding specimens that were on display (and not stored in the scientific collection). Furthermore, at this point, the importance of the scientific dissemination of these materials and how it is typically conducted was emphasized. Figure 2 shows one of the artworks displayed in the museum's collection, which students viewed during the virtual visit.

Figure 2: Image of the main and definitive collection at CENPALEO.

Source: CENPALEO

In the third class, students participated in a virtual quiz consisting of 10 questions that covered elements discussed in previous sessions on the theme, contributing to the analysis of the students' learning outcomes from the classes.

It is worth noting that the goal for the development of the classes was based on one of the museum organizational frameworks described according to educational pedagogical trends. Cazelli *et al*. (2002) propose categorization into generations for museums related to education, suggesting the fourth generation of museums, which incorporates interactivity with a multidisciplinary and problematizing basis, considering social, cultural, scientific, and technological aspects. This aims to contribute to the formation of more critical, participative, and scientifically conscious citizens, attracted to political and social debates.

This trend can be observed in the students' statements as they related social and cultural issues in the discussions that were developing when they were questioned about the purpose of fossils. This evidence fits into the category addressing science in its cultural and social aspect. Participants expressed concerns about fossils being sold or kept under the possession of those who found them.

> P1: Why are fossils in the museum?
> A1: They leave them in the museum so we know what animal it is, because if we keep them at home, we won't know what animal it is. Like if we have a piece of bone from some animal, we won't know. We'll have to take it to other people.
> A4: So that other people can study them too!
> A2: For people to discover that this species existed.

From the evidence selected above, social concern about items that are highly valuable for paleontological research and science can be observed. According to Araújo (2009), activities in non-formal spaces are usually developed to

complement or initiate topics taught in classrooms and to encourage a multidisciplinary approach to everyday topics of students. However, regardless of whether the activities proposed to bridge formal and non-formal spaces are motivating or complementary, it is important to consider that non-formal spaces should contribute to teaching and learning.

With this in mind, in the process of designing the classes, efforts were made to go beyond, introducing problematizing discussions at the beginning of each session to encourage student participation and their stance on social and economic elements related to the theme (TERCI; ROSSI, 2015). This approach is taken because a visit to a museum cannot be something isolated and punctual. Chassot (2003) argues that education should contribute to understanding knowledge, procedures, and values that enable students to make decisions and perceive both the multiple utilities of science as well as its applications, limitations, and consequences of its development. This is a fundamental aspect for promoting scientific literacy. Therefore, initial problematizations for each encounter were formulated in this direction.

This contribution can be observed when students, during the technical visit to the CENPALEO laboratory, recalled the initial discussion from the first class, bringing scientific elements about fossils into the conversation, characterizing this participation as evidence of the scientific category. In the *first meeting,* problematization allowed students to express their knowledge on the subject, facilitating recognition of their prior knowledge, as illustrated below:

> P1: How do you think research is conducted?
> A1: Research can be done... I don't know how to say it [...]. I forgot the name of those guys who look for bones, are they historians? They look for things like dinosaur bones, things from the past, it's like Google.
> P1: Ah, they will find the pieces and then this will end up on the internet?
> A1: Yes, and in the museum! Yes, they look for parts, pieces of dinosaurs and then they put them in the museum, then they take photos and put them on Google.

In this class, it was also possible to note that in response to a question from the lead teacher, some students articulated issues related to paleontology, including current topics. Many of them mentioned news they had read about dinosaurs. This speech represents evidence of the scientific category but goes beyond merely repeating what they learned about fossils, presenting the different connections students made with facts observed through media.

> P1: What are fossils to you?
> A1: Fossils are... dinosaur bones, which you can make... that's petroleum, make gasoline, but you have to wait many years.
> A2: They are from animals, they are bones to discover their species.

In the *second meeting*, it could be observed that students recalled topics discussed in the previous class, characterizing evidence of the scientific category, as they reproduce scientific concepts.

> P1: So, are fossils only bones?
> A3: From animals that went extinct a long time ago. They can be plants, animals, among others.
> P1: Where can fossils be found?
> A2: Underground, anywhere, in rocks.

A1: Anywhere, underground, in stones.

From these selected excerpts, it is considered that the activities proposed in the meetings have the potential to allow the construction of a culture of collective participation among those involved in the teaching-learning process. Sharing these results can also help disseminate information that it is possible to contribute to teaching and learning through a remote technical visit to non-formal spaces, for teachers interested in collaborating with student development (MOTA; CANTARINO; COELHO, 2018). However, it is important to have intentionality and planning, considering the need to develop diversified classes that articulate knowledge, beliefs, and values. Thus, it is evident that the teacher plays a primary role in this pedagogical mediation, by providing access to knowledge through a didactic strategy resulting from activities developed in non-formal spaces.

A remote visit to non-formal spaces presents a theoretical opportunity to establish a learning environment anywhere on the planet, as conducting a video conference facilitates engagement and interest in the discussed content, allowing the participation of other teachers and experts in the field (BERALDO; MACIEL, 2016). Additionally, it contributes to scientific outreach and enhances the museum-school interaction, as it eliminates the need for transportation to the location and can be conducted in students' homes. However, the main barrier to its development is individual access, both in terms of internet connectivity and technological devices (computers, cell phones, tablets, etc.).

Considering that many public schools received technological equipment to assist in remote teaching during the pandemic, as did the majority of private schools, educational institutions could serve as an option for conducting online technical visits. Nevertheless, it's important not to generalize access to such resources, as many schools still face precarious situations.

The teacher's involvement in these classes can also reflect the possibility of achieving the goal of connecting formal and non-formal education systems, as advocated by Marandino (2001), emphasizing that strengthening both should occur without replacing or devaluing either. This integration allows non-formal spaces to contribute to broadening the cultural horizons of participants (students and teachers alike). Marandino addresses this when highlighting that a visit to a non-formal space should not be limited solely to the classroom curriculum, but should seek to "expand the scientific culture of its students beyond these contents" (MARANDINO, 2001, p. 93).

It's noteworthy that the students' interest and curiosity about the proposed topic were positive, as they asked recurring questions about paleontology and actively engaged during the activities. Although the students did not handle the materials themselves due to the remote nature of the activity and the need for specialized handling, presentations of images, samples, and replicas in museum spaces and live laboratories captured the students' attention. Furthermore, the activities prompted reflections and questions, as evidenced in the excerpts below:

A1: How do they (researchers) figure out what the fossilized species could look like?
A1: When we find a fossil, inside our house, our land? What do we do?
A5: Teacher, what do you do with the real pieces?

P2: The real piece is stored in the collection, with controlled humidity, without constant exposure to light, because light and humidity can damage the pieces.
A6: What happens when someone working with these pieces drops them on the ground and breaks them?

Many of the questions raised during remote activities mirror those from in-person visits, which can be a positive aspect indicating that, despite the different approach to knowledge dissemination, both methods effectively connect students with these spaces, materials, and researchers.

The learning outcomes of the content became evident in the *final session* of the didactic strategy, where a quiz was conducted with the students based on previous discussions from earlier classes. Throughout the sessions, all participants actively engaged, and in the final session, they recalled and effectively answered questions related to the activities. Furthermore, there was significant interest in paleontology, as evidenced by the students' questions and discussions at the beginning of the third class, showing curiosity about their previous virtual visit to the laboratory and museum collection, highlighting the technologies and equipment used for fossil collection.

According to Marandino (2008), museums offer unique elements, objects, time, space, and language that set them apart from other educational spaces. However, these aspects can sometimes be limited in remote activities. Weinschütz *et al*. (2019) consider factors such as distance traveled to reach the museum, including transportation costs, as limiting factors for physical visits. Nevertheless, the remote activities developed in this research present an interesting alternative in such cases. Despite being conducted remotely, this study yielded satisfactory results, generating significant discussions and contributing to students' learning, scientific outreach, and potentially expanding the museum's reach to interact with even more diverse groups.

It is crucial to highlight that this approach also presents challenges, such as ensuring the quality and validity of the content offered. Teachers must carefully plan the structure of their classes during these remote visits. Although physical museum visits may be preferred by some authors, technological advancements such as digitizing museum collections have made museums more accessible. With the Covid-19 pandemic, proposals for remote visits have become more common and sought after, sparking student interest and bringing them closer to knowledge.

In the development of the proposed didactic strategy, implemented in a series of remote classes at the CENPALEO museum, elements that impacted students included curiosity, stimulation, interest in the topics discussed, and learning related to aspects of science, technology, society, and the environment. This approach is believed to contribute to students' civic education, fostering critical thinking and positioning them in response to the issues discussed throughout the classes.

Sabbatini (2004) argues that in non-formal education spaces, scientific education should aim to build a scientific culture that forms critical citizens who actively participate in society. Therefore, it is important to integrate these spaces closely with the community to enrich the culture and knowledge of all who visit these educational spaces.

In conclusion, the diversity of non-formal spaces plays a crucial role in constructing a scientific culture within society. Integrating these spaces with scientific content should be a pedagogical practice developed jointly between institutions, aligned with the interests, questions, and curiosities of each group of students participating. This approach motivates students to seek knowledge about scientific topics, enhances critical thinking, and strengthens the connection between formal and non-formal education practices. Sabbatini (2004) emphasizes the importance of non-formal education spaces, such as museums, engaging with educational communities to enrich culture and knowledge for all visitors.

FINAL CONSIDERATIONS

Considering the developed didactic strategy as a means to diversify classes, it underscores the importance of non-formal education spaces in constructing a scientific culture within society. This was evident in the implementation of educational activities proposed in this research, which involved remote visits to non-formal spaces, utilizing a formal educational setting (virtual classroom) to conduct science lessons and effectively promote the museum, aiming to contribute to the teaching-learning process.

Through this study, it is hoped to provide contributions to strengthen practices in non-formal education spaces aimed at integrating science into the daily lives of visitors. However, it is important for the teacher, as the mediator of this process, to have a clear intention in planning more effectively to promote and explore the expansion of scientific knowledge, stimulating student curiosity by discussing the values and objectives of visiting non-formal spaces, even remotely.

In light of this, it is important to note that this didactic strategy was implemented only once, so there are still elements to mature and add throughout this analysis. Therefore, being a qualitative study, the results and discussions obtained in its implementation at school may vary depending on the participants - teachers, mediators, and students. However, a positive aspect of the development, planning, and execution of activities was the collaboration between the subject teacher and the museum's teacher/researcher. This enabled greater student interaction with the activities and closer ties between the museum and the school.

CONTRIBUIÇÕES PARA O ENSINO DE CIÊNCIAS SOBRE A TEMÁTICA PALEONTOLOGIA A PARTIR DE VISITAS VIRTUAIS A UM CENTRO DE PALEONTOLOGIA

RESUMO

A presente investigação visa estabelecer um diálogo aprofundado com a comunidade de professores e pesquisadores em ensino de ciências e tecnologia, explorando os desdobramentos de uma estratégia didática de três aulas remotas focada na paleontologia. Este estudo emerge como parte integrante do doutoramento em curso da primeira autora deste manuscrito, fundamentando-se na relevância intrínseca da pesquisa e divulgação científica. A abordagem metodológica empregada neste trabalho é qualitativa e participante, envolvendo dez estudantes do 6° ano do Ensino Fundamental de uma escola pública no Paraná. A pesquisa foi conduzida por meio de uma plataforma de reunião online no ano de 2020, durante a disseminação global da pandemia de COVID-19. As atividades foram concebidas em colaboração com o Centro Paleontológico e Museu da Terra e da Vida, da Universidade do Contestado, em Mafra, Santa Catarina, Brasil. O enfoque educacional foi estruturado com base nos três momentos pedagógicos propostos por Delizoicov, Angotti e Pernambuco. O objetivo principal consistiu em explorar diversos aspectos da pesquisa científica paleontológica, desde sua realização prática até a importância da divulgação desses conhecimentos para a preservação do acervo permanente de um museu. Ao abranger os laboratórios, o acervo e a área expositiva do museu, o estudo utilizou gravações de áudio e vídeo das aulas para a coleta de dados, empregando-se a Análise Textual Discursiva. Os resultados indicam contribuições significativas na aprendizagem do conteúdo abordado, bem como o estímulo a discussões produtivas sobre a prática de divulgação científica, conectando o conhecimento científico a questões sociais, tecnológicas e ambientais.

PALAVRAS - CHAVE: Divulgação Científica. Estratégia Didática. Museus. Análise Textual Discursiva.

NOTES

1. This article concerns the full, revised, and detailed version of the text originally presented at the scientific event VIII National Symposium on Science and Technology Education (SINECT), in 2022.

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