

The scrapbook as a pedagogical resource for teaching biology in basic education

ABSTRACT

The scrapbook technique is characterized by making a book or album of scraps related to a particular theme. As well as images, scrapbooks can be made up of texts, articles published in books, magazines, audiovisual media and various objects. This research was based on the possibility of using scrapbooks in high school biology classes. The aim is to verify evidence of how the scrapbooking technique contributes to the construction of knowledge from the perspective of scientific literacy and to student autonomy. This research is characterized by a mixed approach (quantitative and qualitative). The activities were developed and the data collected in a high school class in a public school in the state of Pará, Brazil. A didactic sequence was used to discuss the objects of knowledge of cytology, dialogued lessons on the concepts and examples of scrapbooks and the construction of what was called a Cytological Scrapbook. In addition to the work done by the students, semi-structured questionnaires were used to compile the data. The results indicate that the use of the scrapbook meets the proposed objectives and can be proposed as an educational product in biology teaching.

KEYWORDS: Biology teaching; Cytology; Scrapbook; Scientific literacy.

O scrapbook como recurso pedagógico para o ensino de biologia na educação básica

RESUMO

A técnica do scrapbook é caracterizada pela confecção de um livro ou álbum de recortes relacionados a um determinado tema. Além de imagens, os álbuns podem ser constituídos por textos, artigos publicados em livros, revistas, mídias audiovisuais e objetos diversos. A presente pesquisa foi desenvolvida a partir da possibilidade do uso do scrapbook em aulas de biologia do Ensino Médio. O objetivo é verificar evidências de como a técnica de confecção do álbum contribui para a construção de conhecimentos voltados à perspectiva do letramento científico e para a autonomia do estudante. Esta pesquisa se caracteriza pela abordagem mista (quantitativa e qualitativa). O desenvolvimento das atividades e a constituição dos dados ocorreram em uma turma do Ensino Médio numa escola pública do estado do Pará, Brasil. Utilizou-se uma sequência didática para discussão dos objetos de conhecimento da citologia, aulas dialogadas sobre os conceitos e exemplos de scrapbook e a construção do que se denominou Scrapbook Citológico. Além dos trabalhos construídos pelos estudantes, questionários semiestruturados foram utilizados para compor os dados. Os resultados indicam que o uso do scrapbook confere com os objetivos propostos, podendo ser proposto como produto educacional no ensino de biologia.

PALAVRAS-CHAVE: Ensino de Biologia; Citologia; Scrapbook; Letramento científico.

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INTRODUCTION

Science and technology are part of our daily lives and, in contemporary times, in a dynamic and interactive way. Despite this, pedagogical practices based on the memorization of concepts, definitions and accumulation of information still persist in schools, which contribute little to students' understanding of scientific and technological development (Maldaner, 2007).

As a curricular component in the area of Natural Sciences and their Technologies, biology is a science that is commonly associated with learning concepts that are intrinsically related to a large and varied repertoire of words, expressed through scientific language. In this sense, linking learning to practical and dialogical actions can improve students' understanding, especially in cytology, an object of knowledge in biology, providing students with an understanding of these concepts in their daily lives (Oliveira et al., 2015).

The study of cells, despite its importance, presents concepts, structures and processes that are sometimes abstract and which, in many cases, are presented exclusively through textbooks, making the learning process exhausting and decontextualized (Nascimento, 2016).

In this context, students tend not to show interest in their objects of knowledge, especially when the approach is limited to lectures with the limited resources presented in schools. There is a constant need to research and propose interesting alternative methodologies and teaching resources to alleviate these gaps in biology teaching (Oliveira et al., 2015).

It is important to say that "a teaching resource is any material used as an aid in the teaching and learning of the content proposed to be applied by the teacher to their students" (Souza, 2007, p. 111). Therefore, teaching resources include a variety of pedagogical tools and methods that are used as experimental support in the development of lessons and in the organization of the teaching and learning process.

Given this scenario, the possibility arose of working with the technique of making scrapbooks in biology classes in public schools and, in the context of research into science education, the following question emerged: in what terms can the construction and use of the cytological scrapbook, as a teaching resource, stimulate student protagonism and the development of important aspects for scientific literacy in secondary schools? To answer this question, we opted for a mixed research methodological approach (Cruz, 2009; Miranda & Silva, 2018) for a better understanding of the phenomenon studied.

The search for answers to this question has resulted in this communication. To organize it, the text is divided into four sections, in addition to this introduction. It begins with information about the scrapbook and the theoretical basis of science teaching, especially from the perspective of scientific literacy. This is followed by the methodological options. Next are the analyses and discussions, divided into three subsections and named according to the categories pre-defined in the analysis. Finally, the final considerations are presented, which focus on the relationship between the construction of the scrapbook, the role played by students in their learning and the development of scientific literacy premises.

THE SCRAPBOOK AND BIOLOGY TEACHING

Scrapbook is a terminology that comes from English and means scrapbook. The nomenclature is based on the fact that it is made up of clippings of materials which, in addition to images, can consist of texts, articles published in books, magazines or any other sources, audiovisual media, and objects such as strands of hair, pressed flowers, postcards, pages or covers that can be made of scraps of paper, pieces of fabric or any other elements that are intended for this purpose.

For Hunt (2006), scrapbooks are cultural artifacts that contain literary expressions and the rhetorical impulse to express themselves in words, images and so on. In other words, scrapbooks are ubiquitous throughout the population and in all sectors of society. They contain evidence of personal writing and involvement in discourses about family and society.

As stated above, a scrapbook can be defined as an object organized with ideas, whether chronological or not, relating to a theme based on texts, whether written by the author or others taken from newspapers, articles, books or any other sources, associated with images, relevant objects, media such as audios and related videos. In this way, it is possible to explain in a playful and attractive way to readers or even interlocutors what you want to say through your album (Hunt, 2006).

According to Copezzi (1994), albums can come from a desire to get involved in the intellectual activities with sensory possibilities of a certain period. In this way, scrapbooking predates photography, being an art that dates back to the Middle Ages, when it was quite common for people to keep personal diaries in which they recorded their thoughts on the activities and events of their lives around them.

However, there is no investment in the construction of scrapbooks for learning biology knowledge objects commonly dealt with in basic education schools, as verified by searching for the word “scrapbook” on the index pages of scientific journals in the field of science teaching in 2018. For Hunt (2006), the lack of interest is due to the negative connotation of “leftovers” and a failure to recognize scrapbooks as sites for personal writing and reflections on our history and culture.

In the field of biology teaching, it is possible to say that scrapbook construction can contribute to objectives relating to writing, reading and communication. It is therefore possible to say that, in many ways, they support various educational objectives, making them a powerful pedagogical tool for learning (Bazerman, 1994).

In this context, the classroom can be a space for using this strategy, with teachers suggesting topics to be covered according to the curriculum or in response to demands from the learners themselves. With this resource, we can envision what Freire (1996) mentions, that is, the construction of autonomy in relation to the process of knowledge and learning, in which the teacher becomes the mediator of the process (FREIRE, 1996).

There are also possibilities for the development of reading and writing which require the integration of various elements in the text with which the author is involved, specifically in complex relationships with memory, surrounding

documents, artifacts and people. According to Bazerman (1994, p. 20), “the writer must gather, select, evaluate, analyze, synthesize and draw conclusions from the materials”. Then, the writer must also figure out which of these elements need to be made present and visible in the text, how these elements should be displayed and how they should be functionally used within the rhetorical structure of the text.

Another aspect concerns the constant use of images, which can also favor learning, something that has been widely advocated in the literature by numerous studies, such as those carried out by Silva et al. (2006). This study highlights that images play an important role in science teaching, since conceptualization itself often depends on visualization, since most scientific phenomena are abstract in nature.

In addition, reading, writing and socializing ideas are fundamental to an education aimed at building the knowledge, skills and values needed to make responsible decisions about science and technology issues. In other words, this desire, especially in science teaching, can be called scientific literacy, understood as the ability to learn for effective social participation and citizenship building (Santos, 2007).

In the field of linguistics, Soares (2008), when distinguishing alphabetization from literacy, argues that the former has been used in the more restricted sense of teaching how to read and write, while literacy refers to the state or condition of those who not only know how to read and write, but also cultivate and exercise social practices that use writing.

Therefore, it can be inferred that by using the term scientific literacy in this text, the aim is to emphasize the social function of science education, as opposed to the restricted meaning of school literacy. According to Santos (2007), this provides meaning for the science curriculum, since scientifically literate citizens have the possibility of understanding the basic principles of everyday phenomena in order to be able to make decisions on issues relating to science and technology in which they are directly involved, whether these are personal decisions or decisions of public interest.

It is desirable for the science curriculum to prioritize environmental, political, economic, ethical, social and cultural issues related to science and technology in different objectives with the aim of problematizing science teaching that gives new meaning to scientific knowledge, something achieved through participatory practices. We can therefore see that the use/construction of the scrapbook in biology teaching can enhance scientific literacy, taking into account the aspects recommended to promote this in its preparation, based on the guidance of the mediating teacher.

METHODOLOGICAL PROCEDURES FOR RESEARCH AND TEACHING

This research is characterized by a mixed methodological approach, integrating quantitative and qualitative aspects (Cruz, 2009; Miranda & Silva, 2018). The choice of this approach is justified by the complexity of the phenomenon investigated, which requires multiple analysis strategies.

The quantitative dimension was explored through the use of semi-structured questionnaires with closed items, the answers to which made it possible to construct graphs in percentages. These numerical representations made it possible to observe general trends in students' perceptions, such as confidence in oral communication and the development of scientific literacy (Cruz, 2009).

In turn, the qualitative dimension is expressed in the analysis of the open-ended responses, the spontaneous speeches of the students and the interpretation of the scrapbooks constructed. This approach recognizes the subjects as active social actors and values the meanings they attribute to their educational experiences (Cruz, 2009; Miranda & Silva, 2018). The interaction between the researcher and those being researched, as well as the textual and imagery analysis of the scrapbooks, made it possible to understand subjective aspects of learning, creativity and scientific literacy, which would not be captured by quantitative data alone.

As Moraes, Galiazzi and Ramos (2002) point out, the communication of the results by the students themselves - whether in the writing of the scrapbooks or in their speeches during the exhibition - also constitutes a form of knowledge production, reaffirming the relevance of the qualitative approach. Thus, the mixed strategy adopted in this research allowed for a broader, deeper and more contextualized understanding of the effects of using scrapbooks in biology teaching.

The educational activities in which the data was collected took place during Biology lessons at a public high school in the state of Pará, Brazil. The activities on the Cytology knowledge objects were carried out in a first grade class made up of 40 (forty) students.

In order to deal with the objects of knowledge, a didactic sequence was established, addressing historical and scientific aspects with the aim of raising prior knowledge and enhancing the construction of new knowledge. The scrapbook was then presented in terms of its conceptualization, history and social use, as well as its evolution over time.

This was followed by the suggestion to build an album covering the theme mentioned and the socialization of the work in the class. The actions ended with exhibitions of the work in the school community through an action called "Coffee with Biology", in which there were interactions between students from the school's various classes.

The data from the educational activities was analyzed using pre-established categories in the questions contained in the questionnaire in order to support the hypothesis that the use of the scrapbook as a pedagogical resource favors learning in cytology, promoting student protagonism and scientific literacy. The anonymity of the students is observed through the use of the names of cytoplasmic organelles when referring to them.

The following sections deal with data analysis and discussion. They show the emergence of the following categories: autonomy in research and communication; scientific literacy; and creativity in the production of scrapbooks.

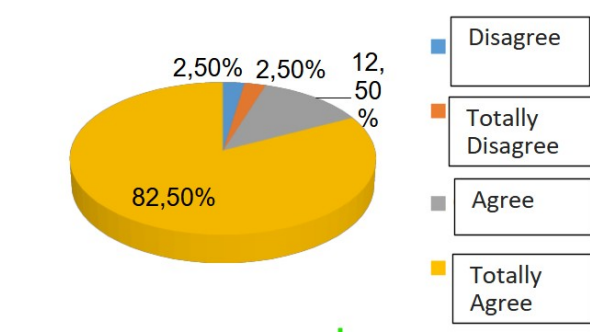
AUTONOMY IN RESEARCH AND COMMUNICATION

This category shows how the use of the scrapbook has contributed to students' autonomy in the learning process, through the construction of knowledge and the communication of this activity within the school community. In this way, it is possible to say that scrapbooking can enhance youth protagonism by allowing the students themselves to conduct the investigation, select relevant information and communicate their learning.

When asked if they considered themselves to be protagonists during the preparation of the material, 82.5% of the students said they totally agreed with this perception (Figure 1).

Figure 1

Graph of protagonism in learning



Source: research data (2018).

The expressions also revealed that the students saw themselves as active agents in the search for knowledge, highlighting the experience of building their own material as a differentiator from other more traditional teaching practices.

"Yes, I felt like I was being a researcher myself who went in search of knowledge and saw that it was there and that I just needed to go and look for it more and more" (plasma membrane student).

"A lot because I was able to go in search of knowledge with my colleagues and I saw that we are capable of learning, we just need to be encouraged to do so. And I saw this encouragement in the construction of the album, which many other types of work don't have, because sometimes we take things that have already been written just to read them and draw a conclusion from there and that's it" (cytoplasm student).

"Yes, since when I did my work with my teammates we felt like we were constructors of our own learning and that made us very satisfied because we understood that we can be better and better students and with the autonomy to learn more" (Cell nucleus student)

"Yes, because if I can build knowledge to make my scrapbook then I can build a lot of other knowledge" (Ribosome student).

The statements show how enthusiastic and participative the students felt in constructing their own knowledge, showing that the educational activities carried out encourage intellectual and emotional autonomy. This is in line with the

concept of youth protagonism, understood as the ability to actively participate in and influence educational and social processes.

It is in this sense that youth protagonism presents itself as a response to this social need. (2004, p. 03), youth protagonism is about “the ability to participate and influence the course of events, playing a decisive and transforming role in the scenario of social life”, in an understanding of entrepreneurial practice capable of dealing with existing social problems.

By highlighting the necessary skills and competencies to be worked on in secondary education, the National Common Curriculum Base (BNCC) points to the importance of protagonism in the face of problems or issues in personal, social, political, economic and cultural life (Brazil, 2018).

With regard to the communication dimension, it was observed that the students felt better prepared to speak in public after constructing the scrapbooks, i.e. 92.5% said yes. This shows that, by mastering the content based on their own production, they felt more confident in expressing ideas clearly and confidently. The following reports stand out:

“Yes, because I'm very nervous and so I felt very confident about what I was going to explain, because it was something that I had grasped through reading and building our album” (cytoplasm student).

“Yes, because unlike seminars that are given to us to explain where we only read our part and don't understand the whole subject, this technique made us have a more comprehensive knowledge of the whole subject studied, with this it was possible to feel more prepared, besides, seminars, we sometimes do in a rush” (mitochondria student).

“Yes, because we were building new knowledge. So explaining it was very easy” (cell nucleus student).

“As I had built it myself, I already knew what was there, so I was prepared to explain it to people” (nucleic acid student).

“As I had prepared my scrapbook myself, I already knew all the content that was there” (ribonucleic acid student).

According to Moraes, Galiuzzi and Ramos (2002), the act of communicating one's knowledge - whether through writing or speaking - is an important moment in consolidating knowledge. In this context, communication is not just an exhibition, but an integral part of the training process, as the student is repositioned as an active subject, transformed by the experience of learning and sharing.

The data analyzed in this category shows that the use of the scrapbook in cytology teaching favored the development of student autonomy and strengthened their scientific communication skills, validating the research hypothesis and reinforcing the importance of pedagogical practices that encourage student protagonism.

SCIENTIFIC LITERACY

As an initial note, there is no evidence in the literature about the construction of scrapbooks as a tool for systematizing scientific information and knowledge and the possibility of developing scientific literacy. In searches carried out on Scielo and the Sucupira Platform in 2018, no papers were found related to the object of study of this research.

However, we cannot ignore the possibility of using the practice of making scrapbooks as a powerful factor in developing aspects of scientific literacy, as described by Santos (2007), i.e. the appropriation of scientific language and its use in social situations involving science and technology.

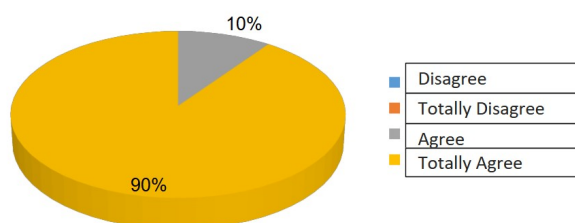
To analyze this category, we considered two elements: the participants' answers to three questions and the analysis of the scrapbook entries. The participants were asked the following questions, which we will analyze at this point. Let's look at the questions below:

- i) Do you think that the scrapbook has helped to broaden your interpretation and understanding of texts and/or biological phenomena?
- ii) Do you think that making your scrapbook has contributed in any way to your ability to write about biological phenomena?
- iii) Do you think you have been able to relate the knowledge you have learned to elements and/or phenomena in your everyday life? Give examples.

It was found that 90% of the participants agreed that the construction of the cytological scrapbooks contributed significantly to improving their skills in interpreting, understanding and writing about biological phenomena. These data indicate that the activity favored the development of scientific literacy by stimulating the appropriation of scientific language through integrated reading and text production practices.

Figure 2

Improved interpretation and understanding of biological phenomena



Source: research data (2018).

According to Nascimento (2012), reading and writing should be encouraged in order to develop the ability to understand and interpret what is read in an appropriate way, improving the ability to properly select information, challenge its reliability, produce and share.

From this perspective, Nascimento (2012) assures that this skill related to biology teaching and scientific literacy implies providing students with mastery of the codes specific to this area, i.e. scientific language, which is important for developing the ability to read, write and understand scientific and technological phenomena.

Once these skills have been achieved, it is possible to develop the conditions to use them in social practices related to different contexts, building scientifically literate practices. To achieve this, adds Soares (2008), it is necessary to do more than simply master the codes, it is necessary to understand how to use them.

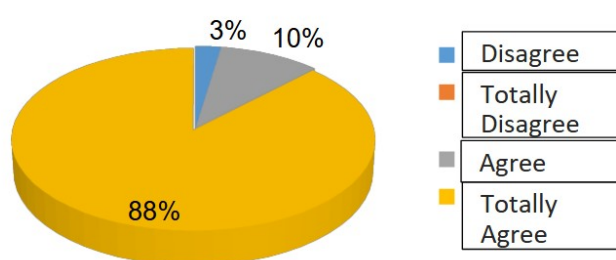
In this context, the importance of scientific language is defended in agreement with Santos (2007, p. 84), because “teaching science means teaching how to read its language, understanding its syntactic and discursive structure, the meaning of its vocabulary, interpreting its formulas, graphs, diagrams and tables”.

When reading is encouraged with pedagogical strategies that facilitate this exercise, such as the scrapbook, we are contributing to the appropriation of scientific language, making it possible to develop scientific literacy. According to Bazerman (1994), when “designing/building a scrapbook, the authors will inevitably get involved in reading and writing about certain topics.

Regarding the question about building their scrapbook and relating the knowledge they had learned to elements and/or phenomena in their daily lives, 87.50% (eighty-seven and a half percent) of the participants considered this a possibility, as shown in the graph below:

Figure 3

Scrapbook construction and learning about elements/phenomena from everyday life



Source: research data (2018).

Here are some expressions used as evidence of this:

“When we grow, it means that our cells are undergoing cell division called mitosis” (student golgiense complex).

“When we gasp for breath after physical activity, it's because we've consumed a lot of energy and therefore oxygen needs to be absorbed by the body to serve as raw material to produce energy again” (student cytoplasmic organelle).

"I learned that when we eat salty foods we drink water because the internal medium of our cell becomes very concentrated and that's why we feel thirsty. In this case, we drink water, which helps to balance the intracellular and extracellular media. Reducing the sensation of thirst" (cell nucleus student).

"I learned that many things were discovered such as the cure for many diseases after it was discovered that living beings are made up of cells and more was studied about them [cells]" (student mitochondria).

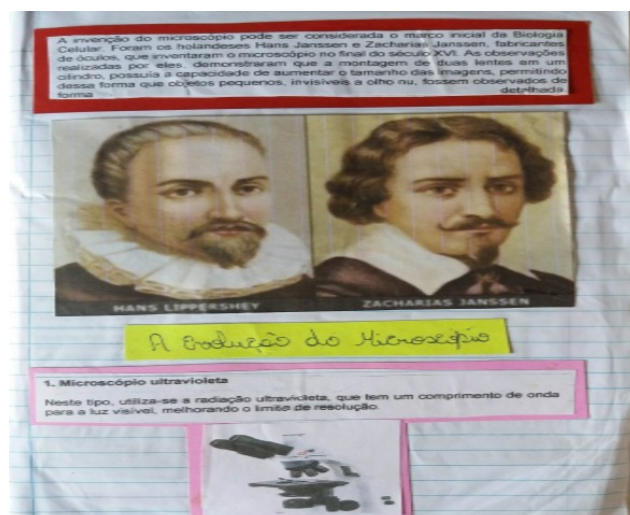
"That all our characteristics, such as the color of our hair, are determined by our genes, which are in the nucleus of our cells" (ribosome student).

It is possible to infer, from the examples cited by the students, the relationship between scientific knowledge and everyday phenomena. According to Santos (2007), this contributes to scientific literacy, since a scientifically literate individual has an understanding of the basic principles of everyday phenomena. This is a fundamental condition for their ability to make decisions on issues relating to science and technology in which they are directly involved, whether these are personal decisions or decisions of public interest.

This brings us to the second element of this category, which concerns the analysis of scrapbook writings. In this analysis, we try to find texts or parts of texts that show the possibility of scientific literacy, and we can see this occurring in various ways. Below are some excerpts for this analysis.

Figure 4

Scrapbook page built by students

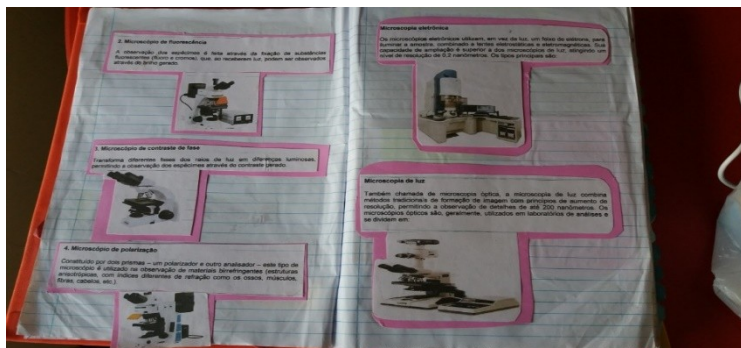


Source: research data (2018).

In this excerpt from the album, the authors, when referring to the invention and improvement of the microscope, present a linear sequence of images of these, in which the various pieces of equipment created are shown over time, emphasizing their improvement as scientific knowledge develops from the human need to explain the phenomena of nature.

Figure 5

Scrapbook page built by students

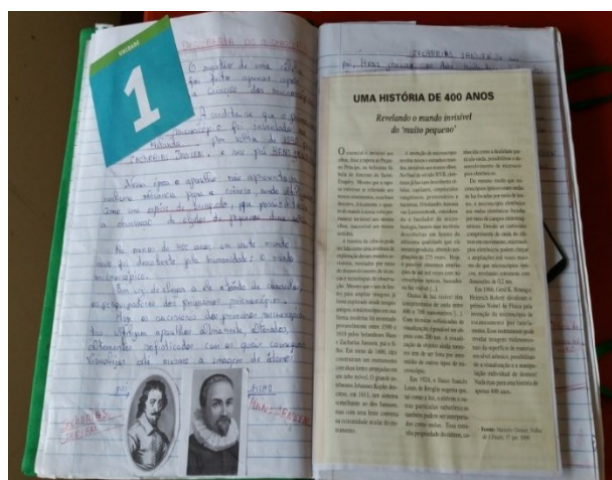


Source: research data (2018).

These pages depict the evolution of the microscope from its earliest versions to contemporary models. This construction reveals potential for the development of scientific literacy because, as Santos (2007) argues, considering the nature of science in the organization of the curriculum favours the expansion of scientific knowledge. This includes overcoming previously accepted ideas, recognizing that what is often considered an “error” plays a fundamental role in the formulation and reconstruction of scientific knowledge throughout history.

Figure 6

Scrapbook page built by students



Source: research data (2018).

On this page, the scrapbook's authors present an article that recounts 400 years of discoveries related to the invisible world, revealed progressively since the invention and improvement of the microscope. This content, when included in the scrapbook, shows not only a mastery of scientific information, but also a historical understanding of the construction of knowledge.

Santos (2007) points out that a curriculum aimed at scientific literacy must consider the nature of science, allowing students to understand how scientists produce knowledge and face their limitations. It is essential to give students

access to the history, philosophy and sociology of science, enabling them to perceive science as a human activity, subject to revisions, errors and continuous transformations. This vision breaks with the idea of science as a fixed and immutable set of truths, reinforcing its dynamic and provisional nature.

In this context, the use of scrapbooks as a teaching resource is particularly powerful. By bringing together images from textbooks, science texts, news clippings and other sources, students can visualize and reflect on the variations, controversies, multiple interpretations and conceptual changes that permeate the history of science. In this way, the scrapbook becomes a tool capable of materializing the evolutionary process of scientific knowledge, favouring a critical and contextualized understanding of this process.

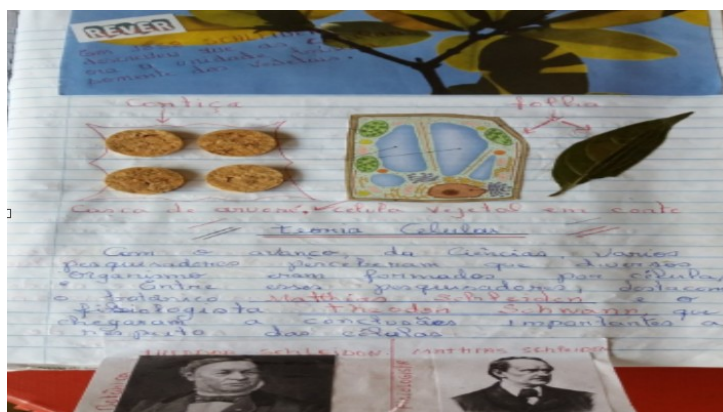
CREATIVITY IN THE PRODUCTION OF SCRAPBOOKS

This category seeks to identify the students' creativity when making their work. To do this, the 13 (thirteen) materials they produced were analyzed. We looked at the texts, images and other elements used, as well as how they were organized in the album (simple or elaborate). The intention is to show characteristics of the authors' involvement, immersion in the theme and love of making things.

It was noticed that 80% (eighty percent) of the scrapbooks were creatively formatted, as they contained texts with information relevant to the objects of knowledge. The images below are extracts from some of the albums to show this inference.

Figure 7

Scrapbook page built by students



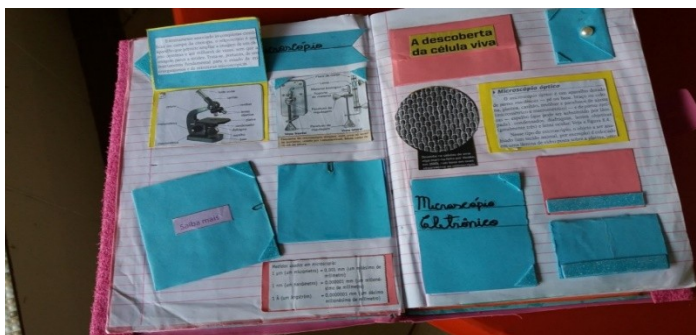
Source: research data (2018).

In this image, you can see that the authors used three-dimensional objects to illustrate the vegetable cork analyzed by Mathias Schleiden, such as cuts of bottle corks and a desiccated leaf.

In the image below, we can see a representation of the various microscopes developed from their first invention to the present day. To do this, they used clippings of scientific texts placed in small envelopes in their albums, which in a way piques the curiosity of their readers.

Figure 8

Scrapbook page built by students

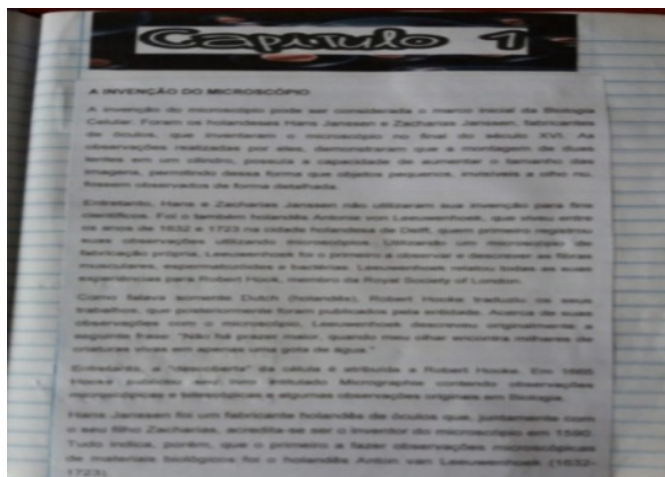


Source: research data (2018).

The others, 20% (twenty percent), didn't show the same creativity or take the time to select and cut out their albums. In this section of the class, we can see that the albums contained entire texts, as they found them at the time of selection, and they pasted them without taking care to cut out only what was most relevant, leaving the impression that they hadn't done more elaborate and careful reading in order to really understand the content of the knowledge there. As we can see in the images below:

Figure 9

Scrapbook page built by students



Source: research data (2018).

Here it is possible to infer the need for assertive and punctual guidance before the albums are made, so that the proper readings and selection, cut-outs and organization can be done during assembly.

When making the album covers, some teams showed not only creativity, but also cultural sensitivity by reusing materials and highlighting elements of Amazonian culture. An expressive example is the album illustrated in the picture below, whose cover was made with tururi, a vegetable fiber extracted from the Ubuçu palm (*Manicaria saccifera*), typical of the region. These fibers, which are brown in color and have an interwoven texture, are traditionally used in the handicraft production of purses, bags, briefcases, hats, dolls and clothing, revealing the dialogue between local knowledge and school teaching practices.

Figure 10

Scrapbook page built by students



Source: research data (2018).

The choice of these materials and other recycled materials is in line with what Hunt (2006) says, in other words, home-made scrapbooking is intrinsic to the reuse of recycled materials by using elements that could be discarded, in many cases inappropriately, contributing to an increase in environmental pollution.

The analysis of the scrapbooks shows that the students' creativity was evident both in the careful selection of texts and images and in the way the materials were organized and in the use of cultural and sustainable elements. This diversity of approaches reveals the involvement of the theme, pointing to the potential of the scrapbook as a resource that stimulates not only the learning of scientific content, but also the exercise of authorship, expressiveness and the articulation between science, culture and the environment.

FINAL CONSIDERATIONS

This research sought to analyze the scrapbook technique as a possible pedagogical resource for teaching biology, enabling youth protagonism and contributing to student learning. In this sense, it is worth noting that it was possible to experience this technique as a pedagogical resource and look for evidence of the development of youth protagonism, creativity, communication and autonomy, which culminated in possibilities for building scientific literacy in the subject addressed.

The analysis of the data shows that the adoption of diversified approaches to the treatment of knowledge objects, stimulating their active participation in classes and expanding their possibilities for acquiring and constructing knowledge. It is assumed that a motivated student is potentially a more engaged learner, and in this process, the teacher assumes the role of knowledge mediator. It is therefore essential to invest in teaching strategies that arouse interest and promote more meaningful and participatory educational experiences.

In addition, it can be seen that the construction of scrapbooks makes it possible to work on creativity. However, for this to happen, assertive guidance is needed before the albums are made. Teacher training and reflection can be important points to check in this process.

In this context, it is worth highlighting the importance of the research teacher, who observes the context and the problems and plans educational actions based on the knowledge built up to improve the processes of learning conditions.

This confirms the need to look for other contexts and objects of knowledge in which the scrapbook technique can be used. This creates space for teaching action and research. The intention is to reach out to other professionals with the aim of facilitating student learning from an autonomous and creative perspective, with a view to scientific literacy as a social practice.

NOTES

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