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Grandma's ethnociences: composting of household organic waste in Biology and Chemistry teaching[1]

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ABSTRACT

This article proposes to carry out a family cultural investigation, based on ethnoscience discipline, through reports of women who are grandmothers about domestic composting. According to their narration, the practice of mixing food leftovers in the soil, animal manure and ashes from a wood stove, was a knowledge acquired since childhood, and that was passed from generation to generation. Bibliographic research was carried out to analyze the theme of composting, associating it with ethnoknowledge, based on conventional wisdom. The subject can be explored in educational environments, being a way of valuing empirical knowledge combined with science, since it involves contemporary issues such as environmental awareness and sustainability. The article also presents an alternative way to explore the topic through the interdisciplinarity between chemistry and biology, decharacterizing the current fragmented teaching of these disciplines.

KEYWORDS: Domestic composting. Interdisciplinarity. Ethnosciences.

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Etnociências da vovó: a compostagem dos resíduos orgânicos domésticos no ensino de Biologia e Química

RESUMO

O presente artigo se propõe a fazer, a partir da disciplina de etnociência, uma investigação cultural familiar, através de relatos de mulheres que são avós, sobre o tema compostagem doméstica. De acordo com a narração feita por elas, a prática de misturar restos de alimentos no solo, estercos animais, cinzas de fogão à lenha, era um conhecimento obtido desde a infância, e que foi passada de geração em geração. Foram realizadas pesquisas bibliográficas para analisar o tema compostagem, associando isso ao etnoconhecimento a partir de saberes populares. O tema apresenta possibilidades de ser explorado nos ambientes educacionais, sendo uma forma de valorização dos conhecimentos empíricos aliados à ciência, uma vez que envolvem questões contemporâneas, como a conscientização ambiental e a sustentabilidade. O artigo apresenta ainda, uma forma alternativa de explorar o tema através da interdisciplinaridade entre a Química e a Biologia, descaracterizando o atual ensino fragmentado entre as disciplinas.

PALAVRAS-CHAVE: Compostagem doméstica. Interdisciplinaridade. Etnociências.

Las etnociencias de la abuela: Compostaje de residuos orgánicos domésticos aliado a la enseñanza de la biología y la química

RESUMEN

Este artículo propone realizar, desde la disciplina de la etnociencia, una investigación cultural familiar, a través de los relatos de mujeres abuelas, sobre el tema del compostaje doméstico. Según su narración, la práctica de mezclar restos de comida en el suelo, estiércol de animales, cenizas de una estufa de leña, fue un conocimiento adquirido desde la infancia, y que se transmitió de generación en generación. Se realizó una investigación bibliográfica para analizar el tema del compostaje, asociándolo con el etnoconocimiento basado en el conocimiento popular. La temática presenta posibilidades para ser exploradas en entornos educativos, siendo una forma de valorar el conocimiento empírico

combinado con la ciencia, ya que involucra temas contemporáneos como la conciencia ambiental y la sustentabilidad. El artículo también presenta una forma alternativa de explorar el tema a través de la interdisciplinariedad entre la química y la biología, descargando la enseñanza fragmentada actual entre disciplinas.

PALABRAS CLAVE: Abono doméstico. Interdisciplinariedad. Etnociencia.

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Introduction

The discipline "Ethnoscience: cultural diversity and pedagogical practices", offered in the Master's course in Nature Science Teaching, provided us with an immersion in the culture of our ancestors, as well as stimulated our curiosity to learn about the practices, customs and diversities of distinct groups.

Since receiving the materials that were sent to us long before the beginning of the classes, as well as during the reading of the articles proposed for the discipline, the interest and curiosity to learn more about the differences between people aroused in us, especially the culture of the people from Indonesia reported in the scientific article "*A critical analysis about ethnoscience approach of the science teachers in 'Peo Nabe'-Nagekeo using rasch model*", an article that was designated for our presentation. It was possible to observe the specific details of each culture, and the ways of teaching using ethnoscience in disciplines such as Physics, Chemistry and Biology, through the methodology proposed for the classes, which was based on the organization of groups, the study of specific articles and subsequent presentation and debate.

From these moments of debate, we began to remember the lessons of our ancestors, as well as to identify ancient knowledge that our relatives had, connecting it with our training. Some topics came to

mind, such as the knowledge about the lunar phases and their influence on crops, growth and harvest, since this was usual to talk about in the family of one of the authors. Although the authors were not from the same family, it was possible to identify similar customs and traditions in their grandparents' culture.

However, we felt that it was necessary to bring our training areas to the debate, to address some contents of the Brazilian National Curricular Common Base (Base Nacional Comum Curricular – BNCC) and to work in an interdisciplinary way, then, based on these assumptions, we chose to focus on domestic composting. The choice was made for some specific reasons, among them, the fact that this kind of procedure is widely used by our family members in their vegetable crops, where the composted biodegradable food is used to make compost for the soil used for cultivation.

This is a subject that can be discussed within the Chemistry discipline, more precisely within Green Chemistry, which is focused on environmental preservation and one of its foundations is the reduction of incorrectly disposed waste and the recovery of the environment.

In Biology, this topic contextualizes several contents provided in BNCC. Waste transformations are caused by living organisms, which are of great interest in the area. Besides living organisms, it can also be included pieces of knowledge such as the environment in which they live and their interactions.

In this way, this article provides a bibliographic review about composting and the several ways of discussing it in classroom, including the experiences transmitted to the authors by their families and ancestors. According to Santos (2019), composting brings the possibility of interconnecting several contents of Chemistry and Biology, since, these sciences are strongly interrelated. Therefore, it is noted that there is a possibility to work on this theme and to embrace its aspects of interdisciplinarity and ethnoscience.

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Ethnoknowledge in domestic composting

Ethnoknowledge is the beliefs and traditions that are passed down from generation to generation (CÓRDULA and NASCIMENTO, 2014 apud NASCIMENTO, 2013). There are still many definitions for ethnoknowledge. The one employed here as reference is:

> We call "traditional knowledge" or "ethnoknowledge" the knowledge produced by indigenous peoples, Afro-descendants and local communities of specific ethnic groups, passed from generation to generation, usually orally and developed beyond the formal social system. They are dynamic pieces of knowledge that are in a constant process of adaptation, based on a solid structure of values, ways of life and mythical beliefs, deeply rooted in the daily life of the peoples. We can, then, consider ethnoknowledge to be the knowledge produced by different ethnic groups in different locations around the globe, based on conventional wisdom (MIRANDA, 2007, p. 3).

Composting can be considered this kind of knowledge, since while applied as a socio-environmental methodology, it can collaborate with the discussion about varied cultures and environments (IRIBARREM; CALDERIPE; DE ALMEIDA, 2020). So, domestic composting can be part of school content, involving ethnoknowledge, since it is a millennial sustainable practice (CARVALHO; LIMA, 2010).

Thus, the definition of composting is an action that occurs through a biological process, in which the soil's microorganisms carry out the process of decomposing organic matter, and at the end of the process, a compost similar to soil is obtained. This kind of composting practice is very suitable, especially for organic waste that is produced in household environments. "Domestic composting can be done by piling up the

material to be composted in the form of a pile or bed, in a compost bin, or even by landfill" (WANGEN; FREITAS, 2010, p. 82).

According to Oliveira *et. al.* (2005), about 60% of the garbage produced at home is organic waste. It can be seen then that there is an excessive amount of domestic waste that is produced daily in the world and that could be used sustainably, thus avoiding many environmental problems.

Organic waste is often discarded in garbage dumps, streets, rivers, and forests, polluting the environment. The accumulation of organic residues in open air promotes the development of bacteria, worms and fungi that cause illnesses in humans. "In addition, it also favors the proliferation of insects, rats and other animals that can transmit diseases to humans" (SILVA *et al.* 2014, p. 76). The process of domestic composting is an alternative for the useful disposal and recycling of biodegradable organic waste.

Furthermore, "domestic composting of organic matter brings several socio-environmental benefits [...], among them, it revalues the utilization of organic matter for succeeding home gardens" (MONTEIRO, 2016, n.p). This reinforces the idea that organic compost is an excellent fertilizer.

There are many ways to provide composting at home and also in schools, but the most common is aerobic composting. Pereira and Gonçalves (2011, p. 14) state that "the aerobic process is the most suitable process for the treatment of domestic waste, the decomposition is done by microorganisms that only live within oxygen". Pile composting is a practical and easy alternative, in which water-rich organic waste is alternated with drier waste, such as grass from the garden or fallen leaves from the trees.

Thus, according to Furtado *et al.* (2016, n.p), "as it is a topic of fundamental importance for society, the problematization of solid waste should be addressed and discussed mainly within educational institutions, to inform and raise the environmental awareness of the population in a didactic and continuous manner."

Grandma's ethnocomposting

The empirical knowledge of the older generations is present today. In conversations with our relatives from older generations, it can be noted how much ethnoknowledge is present concerning domestic composting, for example. According to Grandma Alzira, "I learned this from my mother, we used to throw the food scraps into the garden and cover them with a little bit of earth, this was a good fertilizer to produce food for us to eat". Grandma Luíza also reported, "My dear, we were 14 children, we were very poor, sometimes we lacked what to eat, so we needed to have a garden with good soil to give us food to eat".

Some other reports from them reveal that they were already taught by their mothers to produce and cultivate home gardens, from a very young age, and that their production would be part of the livelihood of the whole family. Taking this into consideration, the way they treated and cared for the land was also a fundamental role.

Grandma Luíza also told us that they used to throw chicken manure and leftover ashes from the wood stove on the land as fertilizer, while Grandma Alzira said that for fertilization, they used organic waste in addition to animal manure, which is biodegradable food scraps that would be thrown away and, consequently, would pollute the environment when they decomposed incorrectly, thus causing environmental impacts. Empirical knowledge, without any theoretical basis, but which was legitimate, stands out here.

> Organic waste is all material of animal or plant origin and its accumulation in the environment is not desired. For example, animal manure (horse, pig, chicken, etc.), sugarcane bagasse, sawdust, weeding waste, grass clippings, garden leaf litter, corn stover, fruit trees, etc. The remains of kitchen food, raw or cooked, such as fruit and vegetable peelings, leftovers, etc, are also included (OLIVEIRA; DE AQUINO; CASTRO NETO; 2005, p. 1).

In their description, the foods that had the garden as their final destination were: eggshells, coffee powder, potato peelings, carrots, cabbage, bananas, leftovers and fruit peelings in general, animal manure, wood stove ashes, among others. Grandma Luíza also told us that at that time it was very common to plant rice and beans on the family farm, and the harvest was done manually, so there were leftovers of straws or husks, and these were also put in the vegetable garden. This reinforces the existing practical knowledge of how to make this composting, with homemade, but effective, methods.

Curiously, it is observed that the food that was thrown into the garden was cut into smaller pieces because, in this way, it decomposed more quickly and easily, and this food was not left uncovered, because people had already observed that it attracted insects and unwanted animals, as well as the bad smell it produced; for this fact, they covered the food with a bit of earth and in this way avoided these unwanted situations.

It is evident that this knowledge of our ancestors and the way they carried out this type of practice is very instigating and curious, because they knew what could and what could not go through this decomposition process; they knew that meat scraps, for example, could not be thrown in the garden, because they have a difficult degradation, and could rot, causing a bad smell and pollution from the emission of toxic gases.

Another curious fact observed was the use of wood stoves, common at that time, which generated a considerable amount of ash daily. These ashes, for being rich in several nutrients, including the capacity of decreasing soil acidity, were used with the other residues to complement the composting.

Nowadays, to reproduce this knowledge, one of the authors, helped by her grandmother, has built a mini domestic compost bin, in the backyard of her house, with only stacked bricks. In it were thrown organic kitchen scraps, such as eggshells, coffee powder, and, in the end, covered with grass clippings and dry foliage.

Figure 1: Mini domestic compost bin.

Source: Authors' photo archive, 2021.

This domestic compost bin was used for 1 year, it produced a soil-like compost, with a dark color and a mild earthy smell. Therefore, these are dynamic practices that come from a learning process that is passed from generation to generation orally, without any kind of scientific and theoretical knowledge, just putting into practice a procedure that came from observations and findings of what worked or not.

Ethnoscience and interdisciplinary teaching involving composting

Teaching through the practice of composting can be very effective within the educational process, as it has already been seen, it can be approached as a theme that makes it possible to involve ethnoscience, because it brings ancient cultural knowledge to the educational process. "The effort to create a learning environment integrated with

culture as part of science learning is called an ethnoscience approach" (ASBANU; BABYS, 2017, p. 324).

According to Kumalasari, Sudarmin and Sulistyorini (2019, p. 327), "through ethnoscience-based learning, students can make direct observations so that they can identify scientific questions and explain the phenomenon scientifically". This kind of approach, therefore, tends to contribute to the formation of the student's scientific knowledge, through the contextualization of everyday practice.

Another very important factor is that this subject can be applied in an interdisciplinary way, involving Biology and Chemistry, and, from this, stimulate the development through the understanding of the subject and its applicability in various contexts. According to Gomes, Puggian and Albuquerque (2013), interdisciplinarity emerged to combat the fragmented teaching of science that is based on memorization and abstraction of contents. From now on, through this type of approach, the student can observe facts and learn from various points of view, from a single theme, including cultural ones, and thus stimulate an improved cognitive development.

Through the composting subject, it is possible to link several contents from Chemistry and Biology. Although many contents of these disciplines are closely related, they are hardly ever approached in an interdisciplinary way in basic education. One of the factors that can cause this difficulty is the lack of didactic material, which also requires teachers' adequacy and articulation (MOZENA; OSTERMANN, 2014).

According to Santos (2019), Chemistry and Biology disciplines are often taught abstractly, thus bringing greater difficulty in understanding the content taught. The use of composting in the classroom in an interdisciplinary way can bring many benefits, because it is a way to contextualize the content, thus arousing the interest of the students.

Both Chemistry and Biology are sciences that are based on understanding and explaining phenomena in our world. The interdisciplinary approach of the chemical and biological contents also

enables students to have a better understanding of the universe, and enhances their curiosity and search for solutions to problems and phenomena in their daily lives.

In Chemistry, in the third year of high school, for example, the topic of composting and its practices can be related to science and technology today and in everyday life. The Green Chemistry content can be developed by attending to the skills that refer to the development of the student's critical sense regarding the idea of waste, pollution and recycling.

Composting is also an excellent practice that can easily be carried out in schools and can develop the environmental awareness of students, their families and the community in general. "Similarly, integrating the ethnoscience approach into science education appears to be an effective and sustainable method to realize the purposes of augmentations in science curricula" (KASI *et. al.* 2020, p. 3150).

The large amount of domestic waste that is produced is extremely high and it is usually disposed of in dumps, landfills and incinerators, which emit toxic gases into the atmosphere, thus increasing environmental pollution. In this context, according to Ferreira et al (2018, apud Li et al, 2013), "composting has several advantages over incineration and landfill and is an effective solution to recycle this waste. This is because it has lower operating costs, reduces environmental impacts and, most importantly, the final product can be used as fertilizer".

For Marques et al. (2017), involving students in a project focusing on the composting theme makes it possible to develop a critical and analytical sense of the current environmental scenario. This way, they can also be stimulated to active participation with the dissemination of knowledge about the environmental issue, which is part of the everyday life of each one.

Within the discipline of Biology, which is a science that investigates living organisms in general, some contents can be integrated into the composting topic with a very effective approach. According to Dalazoana (2019, p. 122) "composting related content can

be used to pique students' interest, correlate and consolidate theoretical and practical knowledge". Environmental education, consumption reduction, solid waste management and sustainability are some of the many issues that can be addressed in the composting topic.

Thus, it is observed that bringing the composting topic into the school space can be very effective in the teaching-learning process, working on interdisciplinarity and also bringing ethnoknowledge into the classroom.

Final Considerations

After the development of this work, it is concluded that it is necessary to observe the ethnoknowledge available in families, to value this method of knowledge and its benefits for the cognitive enrichment of students, since "through ethnoscience-based learning, students can make direct observations so that they can identify scientific questions and explain the phenomenon scientifically" (KUMALASARI; SUDARMIN; SULISTYORINI, 2019, p. 237).

Through this report, it can be observed the elders' knowledge about composting. In addition to the notorious skills with the technique of producing organic composts, we also noticed a certain enthusiasm from the collaborating grandmothers in sharing their experiences.

Domestic composting brings innumerable benefits and advantages, for both family and the environment, because besides the fertilizer produced, it also reduces considerably the amount of garbage that would be discarded.

For sure, the use of the composting topic for ethnoscientific and interdisciplinary teaching in Chemistry and Biology can increase the students' interest and thus improve the teaching-learning process.

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