



POSSIBILITIES OF USING ETHNOASTRONOMY IN TEACHING AND SCIENTIFIC DISSEMINATION ACTIVITIES

Possibilidades de uso da etnoastronomia em atividades de ensino e de divulgação científica

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Abstract: This article aims to investigate the importance of using themes related to the areas of ethnoastronomy and cultural astronomy in teaching and scientific dissemination activities. For this, actions involving research, teaching and extension were articulated. To support the investigation, a broad theoretical review on ethnoastronomy and the possibilities of its pedagogical uses was carried out. Five educational activities involving themes of ethnoastronomy were organized by the authors and carried out in 2022, four of which were face-to-face and one remote. A questionnaire was created to investigate the participants' conceptions about the themes dealt with in these actions. This questionnaire was answered by a total of 75 participants of the implemented actions. The data obtained point to the importance of expanding the amount of research on ethnoastronomy and its applications in education. Access to an education involving ethno-knowledge can help Brazilian citizens to learn about the history and knowledge of the native peoples of their country. The knowledge developed by different cultures was fundamental for their survival and understanding them can help in building an education that truly values diversity.

Keywords: Cultural astronomy. Science teaching. Scientific dissemination. Diversity.

Resumo: Este artigo objetiva investigar a importância do uso de temas relacionados às áreas da etnoastronomia e da astronomia cultural em atividades de ensino e de divulgação científica. Para isso, foram articuladas ações que envolveram pesquisa, ensino e extensão. Para fundamentar a investigação foi realizada uma ampla revisão teórica sobre etnoastronomia e as possibilidades de seus usos pedagógicos. Cinco atividades de caráter educacional envolvendo temas de etnoastronomia foram organizadas pelos autores e realizadas em 2022, sendo quatro presenciais e uma remota. Foi elaborado um questionário para averiguar as concepções dos participantes acerca dos temas tratados nestas ações. Este questionário foi respondido por um total de 75 participantes das ações implementadas. Os dados obtidos apontam para a importância de ampliar a quantidade de pesquisas acerca da etnoastronomia e de suas aplicações na educação. O acesso a uma educação envolvendo etnoconhecimentos pode contribuir para que os cidadãos brasileiros conheçam a história e os conhecimentos dos povos originários do seu país. Os saberes desenvolvidos por diferentes culturas foram fundamentais para a sua

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sobrevivência e compreendê-los pode ajudar na construção de uma educação que de fato valorize a diversidade.

Palavras-chave: Astronomia cultural. Ensino de ciências. Divulgação científica. Diversidade.

1 Introduction

This is an investigative work on an area of study that is of increasing importance in the educational field, the ethnoastronomy, which is an interdisciplinary branch that combines elements of astronomy, history and ethnology to study how different cultures and ethnic groups perceive, interpret, and use celestial phenomena in their belief systems, cultural practices and everyday activities. This field focuses primarily on the relationship between astronomy and human cultures, looking at how indigenous peoples, traditional societies, and local communities around the world incorporate astronomy into their lives. By bringing natural sciences closer to the humanities, ethnoastronomy encourages dialogue, promotes cultural understanding, contributes to the structuring of a more contextualized education, and serves as inspiration for a deeper exploration of the themes covered by this area of knowledge (KELLEY; MILONE, 2011).

The study of ethnoastronomy and cultural astronomy has several significant implications for education. Integrating principles of ethnoastronomy into the educational curriculum can enrich students' understanding of science, culture, and diversity, and promote a deeper appreciation of the different ways in which human societies interact with the universe, as well as help to create more culturally aware citizens. The study of the educational possibilities of ethnoastronomy also shows that it is necessary to invest in and encourage the teaching of astronomy in basic education (ARAÚJO; VERDEAUX; CARDOSO, 2017).

Teaching, research and extension are interconnected components of the educational process that can be effectively related in a work on the pedagogical possibilities of using ethnoastronomy in the classroom, as they: allow producing solid research as a basis for educational activities; help in the development of teaching material; value an intercultural perspective on science that can collaborate with the teacher training process; enable extension activities for the community in order to establish partnerships with civil society organizations.

After the introduction, the theoretical foundation on topics studied by ethnoastronomy and cultural astronomy is carried out, based on the reading and systematization of academic works relevant to these areas. These works were found through an internet search using the “Google Scholar” tool (<https://scholar.google.com.br/?hl=pt>). Next, the methodological procedures used in the educational actions and scientific dissemination carried out are explained. Then, the results obtained with the answers given by the participants of the actions to a questionnaire elaborated for this research are presented and discussed. The answers given to the closed questions (with pre-defined alternatives as answers) were analyzed quantitatively, based on the percentages obtained, taking into account what they indicate regarding the participants' views and perspectives. In turn, the answers given to the only open question (“Which constellations did you already know?”) were qualitatively analyzed in order to gain an idea about the constellations best known by the respondents. At the end, the final considerations are made, with some reflections about all the work carried out.

The main objective of this paper is to report and examine the possibilities of using themes related to ethnoastronomy in science teaching and science communication activities.

The activities carried out and investigated in this work reached the internal and external communities of the Instituto Federal de São Paulo (IFSP).

The research problem investigated can be formulated as follows: “What are the educational possibilities of incorporating ethnoastronomy into educational activities and how does this approach can affect student learning?”. It focuses on exploring the opportunities offered by ethnoastronomy as an educational tool and the resulting impacts on both students' understanding and attitudes about science and cultural diversity.

2 Ethnoastronomy

Ethnoastronomy and archaeoastronomy are research areas of the so-called cultural astronomy. They constitute the ethnosciences, which study the knowledge constructed by different ethnic groups and peoples, relating their practices to the local culture. Some other ethnosciences are ethnomathematics and ethnobiology. It can also be defined as the study of knowledge referring to the way in which traditional peoples and populations characterize celestial phenomena and use them in their daily practices and in the formation of a system of knowledge that is important for the cultural identity of these peoples (LIMA, 2004), being, therefore, an ethnography built from academic references for the production of conceptions about the concept of ethnoscience (CAMPOS, 2021).

This area of study is important for disseminating and bringing more relevance to the knowledge of people from different cultures, as is the case with Brazilian indigenous peoples. Cultural knowledge linked to ethnoastronomy is still little treated in basic education, even in a country such as Brazil, with rich cultural diversity and a comprehensive heritage of indigenous peoples, which makes even more important to study ways to disseminate this knowledge and the research carried out about them, seeking more effective forms of communication to popularize this knowledge.

Therefore, ethnoastronomy investigates how different cultures, in different times and spaces, understand, perceive, interpret, represent, and describe the sky, in an integrated way with their cosmoperceptions. Of Greek origin, the term “ethnos” means people, the term “astro” means star and the term “nomos” means law; thus, ethnoastronomy is the science that studies, through the customs of a people, their astronomical knowledge (MOURÃO, 1995), that is, it investigates astronomy developed by different human groups according to their cultures.

Over millennia, human beings have sought guidance from the sky both for the basic needs for their own survival and for the search for a greater understanding of the Universe. There is evidence that since prehistoric times, human beings have been speculating about the nature of the world around them. Thus, it is possible to affirm that Astronomy is one of the oldest fields of human knowledge: each people sought to interpret the sky in different ways, considering different contexts, behavior patterns, needs, beliefs, knowledge, customs and values that changed from time to time (ARAÚJO; VERDEAUX; CARDOSO, 2017).

Educational activities can work, for example, with topics from the discipline of archaeoastronomy – which is the study of prehistoric astronomy around the world – within the framework of each specific cultural context, including the analysis of archaeological sources and covering topics such as calendar making, practical observation of the sky, symbolic representation of celestial events, astronomical orientation of tombs, temples, sanctuaries and urban centers, cosmology and traditional cosmogony related to celestial myths, development of concepts about astronomical objects and ceremonies related to astronomical traditions (LANKFORD, 1996). In the educational context, it is fundamental to emphasize the way in

which investigations carried out with physical archaeological artifacts related to astronomy, show the interest of human beings, since prehistory, in understanding celestial phenomena and using them to synchronize calendars and try to predict the future, not only from celestial objects, but also from terrestrial events (BROSCH, 2011).

As in the past, human ancestors lived with hunting as their basic activity, they visualized in the sky images of hunters or of some animal that was considered game: this is the origin, for example, of the constellation of Orion, a giant hunter in Greek mythology, and the constellation of Leo, which is one of the zodiac symbols (VIEIRA, 1996). The zodiacal constellations are examples of representations that are also related to the movements of the Moon and the Sun, throughout the months and the year (CARDOSO, 2021).

About ten millennia ago, in the Fertile Crescent region, rudimentary agriculture began to develop in the prehistoric period called the Neolithic. Farmers visualized the zodiacal constellations of Aquarius and Virgo, while shepherds saw the constellations of Capricorn (represented by a goat or goat) and Aries (or Ram), as well as more compact constellations such as Cowboy constellation (VIEIRA, 1996). The zodiacal constellation of Taurus appears as the main representative of the group related to the cycles of plowing the earth, planting and harvesting.

The oldest astronomical records are from approximately 3000 BC and they are due to the civilizations that emerged in ancient Mesopotamia, the region located between the Tigris and Euphrates rivers, especially in the region now belonging to Iraq, where the beginning of History also occurred, with the development of writing. Among the various peoples who lived there, the Sumerians, Akkadians and Assyrians can be highlighted. Centuries later, the Babylonians inherited the astronomical knowledge of the Sumerian people from which they were descendants (RONAN, 1997).

With the emergence of agriculture, regarding the seasons, the need to know the best time for planting and harvesting arose (ROONEY, 2018): this led to the creation of calendars and the determination that the duration of a year was 365 days, by the Egyptians, about five millennia ago (SOUZA; TEIXEIRA, 2023). This type of knowledge was also developed and appropriated by the Mesopotamian people (BARRETO; SOUZA, 2017) and by the Chinese who knew the duration of a year in days, according to records made several centuries before Christ. Thus, these records of peoples relating celestial phenomena and events to cyclical events in the world, represent one of the most frequent marks of knowledge about the movements of the stars to produce useful time markers for the elaboration of calendars (CARDOSO, 2021).

The constellations – understood as images linked to arrangements or alignments of stars – called western or classical, were gathered by the astronomer Claudius Ptolemy (90-168 AD), in his work *Almagest*. The list comprised 48 constellations that symbolized some heroic feat of hunters, farmers, gods, demigods, and heroes (FARES *et al.*, 2004): they emerged as a result of various traditions and in different periods of history. This means that these zodiacal constellations were conceived and constructed by one or several different social groups in times before Ptolemy (CARDOSO, 2021).

With regard to the History of astronomy, we generally remember with greater intensity, in antiquity, civilizations such as Mesopotamia, Egypt, Greece and Rome (CORREIA; SIMÕES, 2016), however, this type of perspective leaves aside other cultures who also developed theories and methods of observation of astronomical objects, such as indigenous civilizations. The western array of constellations is not the only way to represent the sky (CARDOSO, 2007). In particular, the Brazilian indigenous people also established a method of counting time, in view of their routine activities of fishing, gathering and hunting, as well as

representing part of their myths in the sky, in addition to showing through these practices the complexity of their rituals and natural, spiritual and socio-environmental relationships typical of their cultures.

The indigenous people observed the apparent movements of the Sun, the Moon and the constellations, associating them with the characteristics of the local biodiversity, something necessary for the survival of their societies. Considering their cultures and their different ways of living, they integrated meteorological, cosmological and astronomical aspects in the process of building their knowledge about the sky. The empirical astronomical knowledge of indigenous peoples is still little investigated and disseminated (AFONSO, 2009): in a relatively recent research work, out of 217 studies found in astronomy teaching, only five addressed the sky of indigenous groups (BUENO *et al.*, 2019).

Recognition of the cultural dimension of Astronomy led to the emergence of the so-called Cultural Astronomy, involving the work of astronomers, archaeologists, historians, anthropologists and linguists (LIMA *et al.*, 2013) and which is part of a larger area of study called ethnoknowledge.

In this way, as in the case of ethnoastronomy, ethnomathematics is attentive to the facts and practices of cultures that were historically marginalized and of peoples who were defeated in the colonization process (ROSA; OREY, 2003), such as, for example, the indigenous people of Brazil: it recognizes that different cultures have different ways of dealing with numerical and geometrical problems present in their daily lives and of explaining facts and natural and social phenomena (D'AMBROSIO, 2018).

Another example of ethnoknowledge is ethnobiology, which studies human knowledge about the environment and the way in which it manipulates these natural resources (DIEGUES *et al.*, 2000). The agricultural landscape units of many of the original peoples of Brazil are characterized by productive arrangements and forms of management of natural resources that allow an agroecologically based production with mechanisms inherent in the process of conservation of flora and fauna, derived from their ethnoknowledge, thus being forms and means of production aimed at self-sufficiency and sustainability (NODA *et al.*, 2012). These groups of humans developed cultures according to their specific ways of life and with great dependence on renewable resources: the knowledge produced by them can be used for the debate on sustainable development (FLEURY; ALMEIDA, 2007), as well as for educational purposes. Therefore, it is important to value this knowledge of populations with less cultural representation in Brazilian society and to study its possible inclusion in basic education (SIQUEIRA, 2011).

Ethnopharmacology, in particular, is a field of study associated with Ethnobiology that studies popular knowledge related to traditional medicine systems (ELISABETSKY, 2003), with the aim of improving the efficiency of bioactive molecules and devising approach strategies for plant selection with medicinal potential (QUIRINO, 2015). As each type of plant blooms at a certain time of the year, ethnobiology and ethnoastronomy were interrelated in the daily lives of each person. In this way, the integrative nature of knowledge from ethnoastronomy can be used for educational purposes, taking advantage of the way in which it relates the science of astronomy to other areas, such as biology, chemistry and various fields of knowledge in the humanities, such as archeology, history, ethnography, anthropology, philosophy, social sciences and the arts (AVILÉS, 2018).

Traditional knowledge about the surrounding environment still exists orally among indigenous groups and has significance in the characterization of local and regional memory, but it may disappear with the death of the “wise old men”. Together with the students, it is

pedagogical to deal with the discredit associated with prejudices against this knowledge, which produce an epistemological and cultural impoverishment, by breaking with the possibility of historical contextualization and appropriation of this knowledge by younger people (JAFELICE, 2013).

3 Methodological procedures

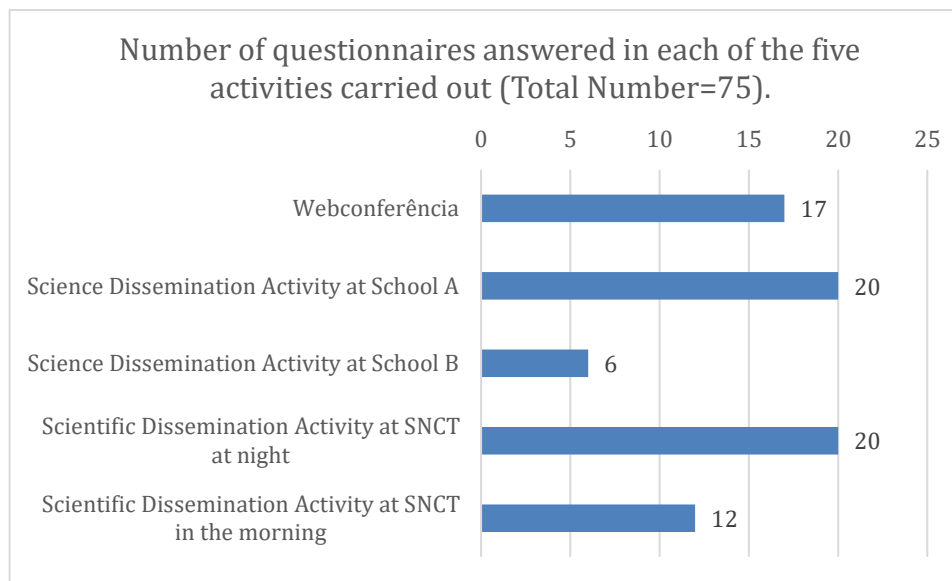
In order to investigate the existing didactic possibilities in teaching and scientific dissemination activities involving studies on ethnoastronomy and cultural astronomy, five different actions of an educational nature were organized by the authors of this article during the year 2022, one of them remotely and the other four in person. To carry out face-to-face activities, presentations were prepared with a series of slides to expose an introduction to the theme that would allow reflection on several aspects of studies carried out in the areas of ethnoastronomy and cultural astronomy. All these activities were carried out within the scope of educational and extension actions of scientific dissemination that took place within the scope of Caraguatatuba campus of Instituto Federal de São Paulo (IFSP), located on the north coast of the state of São Paulo, in Brazil.

Two of these face-to-face presentations had an extensionist character and were held in the auditorium of the IFSP-Caraguatatuba for students from two state high schools – called in this work School A and School B – also located on the north coast of the state of São Paulo, who visited the institution, in the months of May and November 2022. Two other presentations took place in October 2022 (one at night and the other in the morning) for IFSP students during the “Semana Nacional de Ciência e Tecnologia” (SNCT) or “National Week of Science and Technology”. The remote activity was a web conference that took place in June 2022 with simultaneous transmission on the YouTube platform.

At the end of the four face-to-face activities and during the remote activity, its participants answered questions in a questionnaire that were designed to better understand their conceptions about the topics covered. The answers given by the participants will be analyzed in this article. In all, 75 participants responded to the questionnaire, with the number of participants in each of the five activities responding to the questionnaire following the distribution shown in Figure 1.



Figure 1 – Number of questionnaires answered in each of the five activities carried out (Total Number=75).



Source: Authors (2023).

Regarding student visits to the IFSP-Caraguatatuba, which were both in the afternoon, 20 students from school A visited on a Tuesday in May 2022, while 6 students from school B visited on a Thursday in November 2022. In both cases, the students were accompanied by a teacher from the school where they studied and the visit in each case lasted a total of about 2 hours and 30 minutes. In both cases, the visiting students were from high school classes and were gathered in the IFSP-Caraguatatuba auditorium, where they attended some scientific dissemination presentations, among which the presentation on ethnoastronomy (with emphasis on the knowledge of Brazilian indigenous peoples) organized by the first author of this work – under the guidance of the second author – which lasted about 15 minutes and had a total of 7 slides. A theme that was addressed during the presentations and that attracted the interest of the students present were the constellations of indigenous populations originating in Brazil. The use of the *Stellarium* website planetarium (<https://stellarium.org/>) during these presentations helped considerably in the explanations that were made.

During the “National Week of Science and Technology” (SNCT) of the IFSP-Caraguatatuba, which took place between October 17 and 21, 2022, there were also two presentations on ethnoastronomy (emphasizing, particularly, the astronomy of the cultures of indigenous peoples originating in Brazil), the first in the evening of a Monday and the second in the morning period of a Thursday. The audience present in both cases was undergraduate course students at IFSP-Caraguatatuba, with 20 participants in the activity carried out in the evening period and 12 participants in the activity carried out in the morning period. Both presentations were prepared by the first author of this work – under the guidance of the second author – lasted about 60 minutes and had 15 slides. During the presentations, three short videos were used that proved to be useful resources for introducing topics related to the field of ethnoastronomy: “Os céus das culturas” (“The skies of cultures”) with Professor Walmir Cardoso and produced by “Casa do Saber”, about 6 minutes long (CASA DO SABER, 2018); “Stonehenge da Amazônia', o observatório erguido há mais de mil anos na floresta” (“Stonehenge from Amazon', the observatory erected over a thousand years ago in the forest”) produced by BBC News Brasil, about 5 minutes long (BBC NEWS BRASIL, 2015);

“Constelações indígenas brasileiras” (“Brazilian Indigenous Constellations”) produced by the “Universidade Federal de Lavras” – UFLA, about 6 minutes long (UFLA, 2018).

In turn, the remote activity on ethnoastronomy was the web conference “Astronomia Cultural – Flavia Pedroza” (“Cultural Astronomy – Flavia Pedroza”) held by Prof. Ms. Flavia Pedroza Lima from “Fundação Planetário da Cidade do Rio de Janeiro” (“Planetarium Foundation of the City of Rio de Janeiro”) with simultaneous broadcast on the “Debate Consciência” channel on the YouTube platform in the afternoon of June 20, 2022, a Monday (DEBATE CONSCIÊNCIA, 2022). The duration of this web conference was approximately 1 hour and 50 minutes. The video available on YouTube with the recording of this web conference was left as a legacy of this event and until April 16, 2023, it had 313 views. The questionnaire was made available to be answered by the participants, voluntarily, during the web conference, through a link of a “Google Form” (<https://docs.google.com/forms/u/0/?tgif=d>) included in the chat of the transmission made by YouTube. After the end of the web conference, access to the form was closed to new responses.

The decision to invite Professor Flavia Pedroza came after an internet search that found that she is a researcher with important works involving topics related to areas such as Astronomy in Cultures and History of Science. Professor Flavia was contacted by email and agreed to hold the web conference remotely. The date and time of the web conference was decided in advance, in agreement with the lecturer and the two authors of this work. The virtual room in which the web conference took place was created using the StreamYard platform (<https://streamyard.com/>), free of charge. Due to the characteristics of the internet and especially YouTube, the audience that watched the web conference online was quite diverse and included the community outside the IFSP.

4 Results and discussion

The five activities carried out and investigated in this article involved themes of ethnoastronomy and cultural astronomy; this also applies to the questions provided in the questionnaires. For this reason, the analysis of the results that will be carried out covers the distribution of the data obtained in all five activities, involving a total amount of 75 questionnaires answered.

It is important to highlight that the sample of N=75 participants who answered the questionnaire and which will be analyzed in this article was obtained for convenience and the results presented do not claim to be statistically rigorous. However, due to the diversity of audiences reached by the five investigated activities, the answers given by the participants can help to point out some trends and patterns and can be useful for the development of new research on this topic.

The first three questions made available in the questionnaire were intended to characterize the profile of the public that participated in the activities. In this sense, the first of these questions asked about the age range of the participants: 35% of them were between 13 and 17 years old, 40% were between 18 and 29 years old, 23% were between 30 and 59 years old and 2% were 60 years old or older. The second of these questions asked about the gender of the participants: 49% identified themselves as female, 47% as male and 4% as another gender. The third of these questions asked about the level of education of the participants: 70% of them had completed or incomplete secondary education, while 28% had completed or incomplete higher education and 2% had completed or incomplete graduate school; all, therefore, had completed elementary school.



The other questions were related to the themes of this research and aimed to understand the vision and opinions of the participants about ethnoastronomy, the cultures of different peoples and the importance of knowledge developed by different cultures for education. With this objective, four closed questions and one open question were asked, whose answers will be analyzed below.

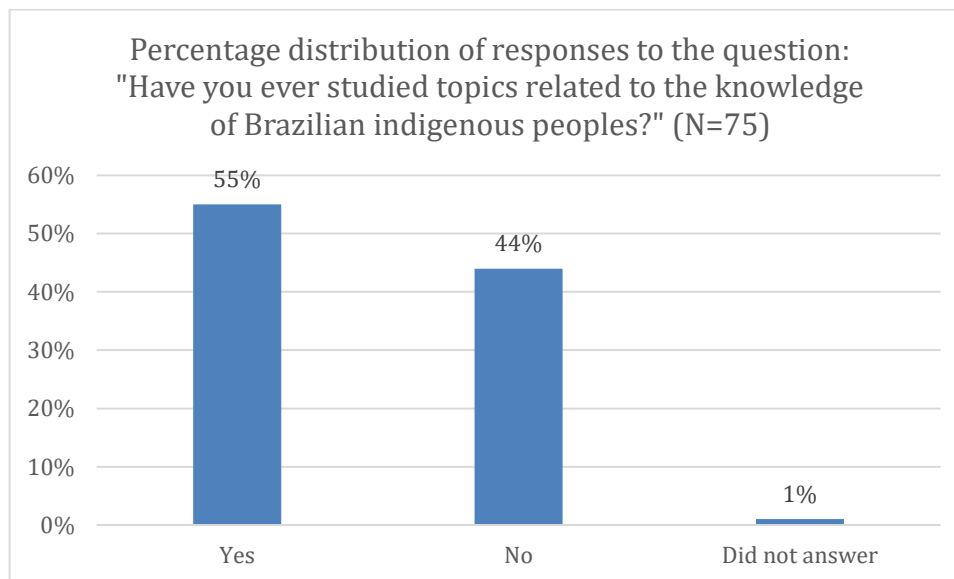
The four closed questions (with alternatives offered as answers) sought to investigate, with the participants, their knowledge about indigenous peoples of Brazil, the level of their interest in ethnoastronomy, the level of importance given by them to knowledge developed by other peoples and cultures and whether they had already made systematic observations of constellations or planets in the night sky before.

The first closed question presented to the participants, and which will be analyzed was: “Have you ever studied topics related to the knowledge of Brazilian indigenous peoples?” The answer options were: “Yes”; No”. This question sought to investigate whether the participants had previously studied topics related to Brazilian indigenous peoples. For this question, 55% answered affirmatively and 44% answered negatively, while 1% did not answer (Figure 2): the sample was divided approximately in half. It is important to note that the unfamiliarity by a large number of Brazilians about the knowledge developed by Brazilian indigenous peoples is part of the Eurocentric culture in which we live, in which we usually almost only learn in basic education and higher education about European-based knowledge. Overcoming Eurocentrism is necessary for us as Brazilians to realize that there is not an active place, Europe, and a passive place, such as America (LANDER, 2005), and to overcome this type of dichotomous thinking.

In Brazil, Law No. 11,645 of March 10, 2008, defined the study of Afro-Brazilian and indigenous history and culture as mandatory in primary and secondary education establishments, public and private. From the data obtained, in the activities that were carried out in 2022, 14 years after the enactment of Law n° 11,645, 44% of the participants stated that they had never studied topics related to indigenous knowledge, which may indicate the need to establish public policies to encourage actions – for example, with regard to teacher training – seeking the actual application of what is written in the Law.



Figure 2 – Percentage distribution of responses to the question: “Have you ever studied topics related to the knowledge of Brazilian indigenous peoples?” (N=75).

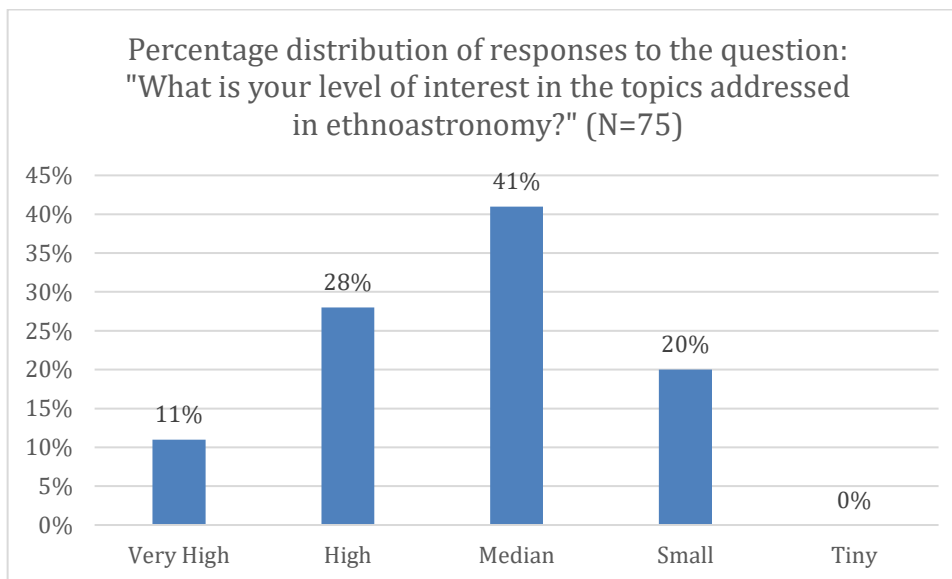


Source: Authors (2023).

The second closed question was: “What is your level of interest in the topics addressed in ethnoastronomy?” The response options that followed a Likert scale were: “Very High”; “High”; “Median”; “Small”; “Tiny”. This question sought to observe how interested the participants were in learning more about the field of ethnoastronomy. According to the responses of the 75 participants (Figure 3), 11% of them showed a very high interest in ethnoastronomy, 28% showed a high interest, 41% showed a medium interest and 20% showed a low interest in this area of knowledge. Based on the answers given to the first question, 44% of the participants had not previously studied topics related to the knowledge of Brazilian indigenous peoples: this may be a factor that influences the participants' level of interest in subjects related to ethnoastronomy, because when someone does not know a certain subject, it is more difficult for that person to show some interest in the area of knowledge related to this subject. About this, there are data indicating that learning Brazilian indigenous astronomy topics in the Physics discipline can motivate and arouse the interest of high school students (ARAÚJO; VERDEAUX; CARDOSO, 2017).



Figure 3 – Percentage distribution of responses to the question: “What is your level of interest in the topics addressed in ethnoastronomy?” (N=75).

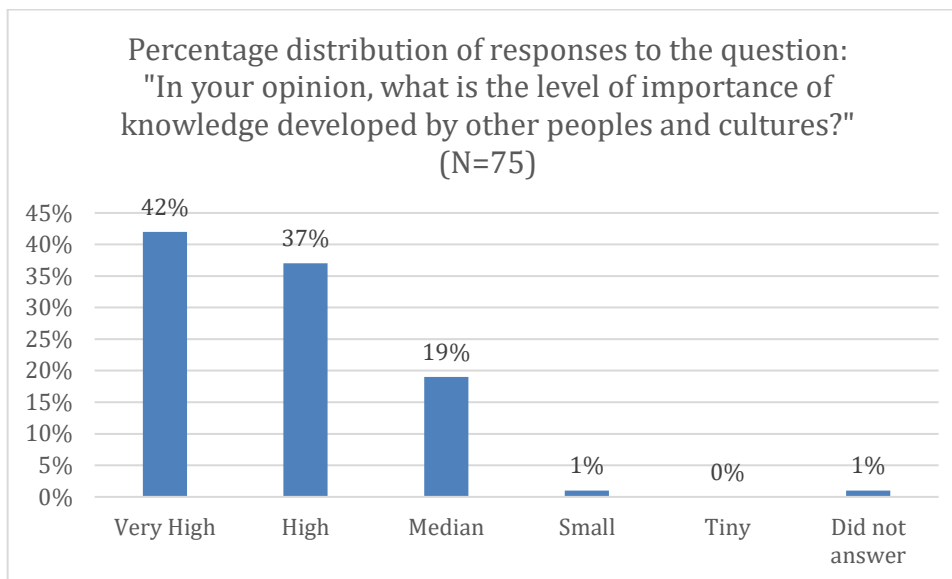


Source: Authors (2023).

The third closed question was: “In your opinion, what is the level of importance of knowledge developed by other peoples and cultures?” The response options also followed the same Likert scale: “Very High”; “High”; “Median”; “Small”; “Tiny”. This question sought to observe how important the knowledge developed by other cultures was for the participants in the activities. For this question, in total, 79% of the participants stated that they considered the level of importance of this knowledge to be very high (42%) or high (38%), against 19% who stated that this knowledge had a medium level of importance and only 1% who stated that this level of importance was small, while 1% did not respond (Figure 4). There is, therefore, considerable awareness in the public of the sample regarding this importance, even on the part of many of those who in the second question did not claim to have a high or very high interest in the area of ethnoastronomy. Cultural astronomy, by highlighting the diversity of knowledge about the sky produced by different cultures, indicates that we, human beings, can relate in countless ways with the celestial elements: discussions in this regard can be important to introduce students to other logics of thought that are different from the most common references in Western culture (RODRIGUES, 2015).



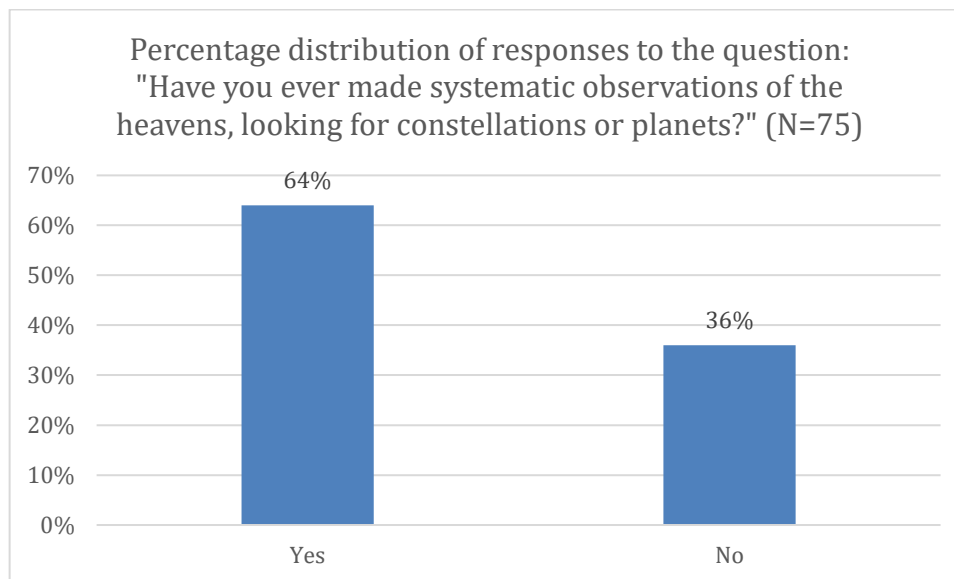
Figure 4 – Percentage distribution of responses to the question: “In your opinion, what is the level of importance of knowledge developed by other peoples and cultures?” (N=75).



Source: Authors (2023).

The fourth closed question was: “Have you ever made systematic observations of the heavens, looking for constellations or planets?” The answer options were: “Yes”; “No”. This question sought to investigate whether the participants had already carried out systematic observations of the night sky in order to identify constellations and planets, probably under the guidance of someone (a teacher, for example) with at least basic knowledge of astronomy. For this question, 64% answered affirmatively and 36% answered negatively (Figure 5). For a better understanding of the celestial sphere and our position in the universe, it is essential to know how to locate the planets and constellations in the night sky (SOUZA, 2018), something that – even with the night sky being generally accessible to human eyes – is not an easy task for the general population (MUNHOZ; STEIN-BARANA; LEME, 2012) and, therefore, needs to be learned during the stages of basic education.

Figure 5 – Percentage distribution of responses to the question: “Have you ever made systematic observations of the heavens, looking for constellations or planets” (N=75).



Source: Authors (2023).

At the end of the questionnaire, participants were presented with one open question, for which there were no previously prepared response options: thus, participants were free to write the texts of their responses using the words they wanted.

The open question was: “Which constellations did you already know?” This question sought to determine the participants' previous knowledge about the constellations, whether those they had already seen represented in movies, games and books, or those they had already studied in some way before or even observed in the night sky. The answers provided to this discursive question were qualitatively analyzed in order to understand the scope of the constellations best known by the participants and to find out about the knowledge on the topic that is most widespread and taught. Only 4 of the 75 participants mentioned constellations that originated from Brazilian indigenous peoples, such as “Ema” (“Emu”), “Anta” (“Tapir”) and “Homem Velho” (“Old Man”). The examples of constellations cited by the participants were mostly linked to the mythologies of ancient civilizations, such as the Babylonian, Egyptian, Greek and Roman peoples (this is the case of Orion, Ursa Major and the constellations of the various Zodiac signs such as Pisces, Aries, Sagittarius, Capricorn, Leo and Scorpio) or were constellations derived from customs and popular knowledge, as is the case of the “Three Marys” (also known as “Three Kings” or “Orion’s Belt”) and the “Southern Cross”.

5 Final Considerations

Ethnoastronomy is an interdisciplinary research area that studies how the cultures and traditions of different peoples have led to different interpretations of the heavens based on their own cosmovisions. This article aimed to discuss the importance and possibilities of using ethnoknowledge in educational activities, as well as to present examples of practices in this regard.

Given what is presented throughout this article, it is possible to conclude that ethnoastronomy is a relevant area of study and rich in educational possibilities. The use of ethnoastronomical knowledge in education can contribute to a learning process that is more meaningful for students, in addition to valuing the cultural diversity of traditional peoples, something that is fundamental for citizenship.

There are obviously challenges to incorporating ethnoastronomy into teaching. More adequate teacher training in this regard is essential for the development of pedagogical practices that are in fact more inclusive and contextualized, that respect cultural differences and that contribute to the construction of a more pluralistic society.

The educational actions investigated in this work were carried out in the year 2022, fourteen years after the enactment in Brazil of Law No. 11,645 of March 10, 2008, that includes in the official curriculum of education networks the mandatory theme of Afro-Brazilian and Indigenous History and Culture. However, from the data obtained during the investigated activities, it was possible to observe that a considerable portion of the participants did not have prior access to the knowledge of Brazilian indigenous peoples during basic education, and when they did, these did not cover topics related to culture and indigenous constellations, which are intrinsically linked. All those who answered the questionnaire had already gone through the elementary school stage, so this absence is probably due to the lack of a critical inclusion of the theme in a decolonial process of discussion of these topics in schools, in order to understand and act in the world we live in and which is marked by the permanence of coloniality (LIMA; NADER, 2019).

A possible interdisciplinary approach to themes related to the field of ethnoastronomy may prove to be quite effective; it is important to deal with these demands in the educational field through a critical and inclusive intercultural approach. In addition, to discuss certain concepts, it may be useful to use different didactic resources, such as the game of the jaguar, circular calendars and gnomons (sundials).

It is also necessary to highlight the importance of continuing and expanding research on ethnoastronomy and its use in teaching and scientific teaching activities. There is still much to be explored in this area and the adoption of an interdisciplinary approach involving cultural astronomy can contribute to the enrichment of the educational process and to the formation of more aware and critical citizens.

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