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Legal and pedagogical foundation for teaching indigenous astronomy in basic education

Jannyny de Oliveira Fogaça Rodrigues
jannyny1388@gmail.com
0000-0002-5063-4138
Universidade Federal do Norte do Tocantins, Centro de Ciências Integrada/Cimba, Araguaína, Tocantins, Brasil.

Elisangela Aparecida P. de Melo
elisangelamelo@uft.edu.br
0000-0001-6827-0566
Universidade Federal do Norte do Tocantins, Centro de Ciências Integrada/Cimba, Araguaína, Tocantins, Brasil.

ABSTRACT

The objective of this research is to analyze official documents, seeking to highlight points that allow for the teaching of Indigenous Astronomy (IA) in indigenous and non-indigenous schools, in order to question: What are the recommendations of official documents that can guide the teaching of Indigenous Astronomy for Elementary School I and II? To do so, the new Brazilian National Learning Curricular Standard (BNCC), the National Curricular Parameters (PCN), and the National Curricular Reference for Indigenous Schools (RCNEI) were analyzed, in order to reflect on the possibilities of teaching Indigenous Astronomy. A descriptive and analytical theoretical study of the skills envisaged in the BNCC to be developed in the teaching and learning processes of Science with Elementary School I and II students was carried out, focusing on the theme "Earth and Universe". Thus, it was observed that Observational Astronomy, developed by different civilizations, served as the basis for Modern Astronomy and the development of Science.

KEYWORDS: BNCC. PCN. RCNEI. Amerindian Astronomy.

INTRODUCTION

Among the socio-cultural manifestations of indigenous peoples, which are passed down from generation to generation, Cultural Astronomy (CA) stands out. As Astronomy has been a human construction since ancient times, as evidenced by the fact that "there are records even from prehistoric times of speculations regarding the nature of the Universe" (MARTINS; BUFFON; NEVES, 2019, p. 811), it has been one of the topics of interest to many researchers in recent years.

Thus, through observations of the sky, humans realized that it was possible to orient themselves, both for transportation and for obtaining food through agriculture, since astronomical knowledge from ancient civilizations, "in some cases, also helped maintain dominant ideologies and complex social hierarchies" (LIMA, 2021, p. 8). This discovery gave rise to Astronomy as a Science.

In modern times, according to Rodrigues and Melo (2021, p. 47), Astronomy is validated "with scientific evidence, with Physics Laws and Mathematical calculations as its main allies." To understand the relevance of research on CA, it is necessary to understand that Astronomy as a science began with naked-eye observation "thousands of years ago, with our ancestors observing the sky, before it was described through beliefs and myths" (RODRIGUES; MELO, 2021, p. 47). Knowledge about the skies provided by observations made during daily work activities formed the basis of knowledge for ancient civilizations, and thus this subject has the potential to address cultural diversity in the context of science classes.

Therefore, Astronomy is part of the main scientific advances and is a topic directly linked to the History of Science (HS). According to Milone *et al*. (2003), astronomical instruments were improved, and with that, human knowledge expanded, thanks to the evolution of ideas, as the cosmos has been revealing itself in surprising and impressive ways. Therefore, in this research, Astronomy is understood as the Science that studies celestial bodies, with the aim of explaining them scientifically.

It is worth emphasizing the importance of traditional indigenous knowledge and ancient civilizations, which, in carrying out their daily work activities or in simple daily observations while contemplating nature, developed astronomical sketches, which along with others form the basis of Modern Astronomy (MA).

Considering the modes of operation of ancient civilizations, indigenous people around the world have built a legacy of knowledge about celestial bodies. "Prehistoric astronomers not only made continuous observations, but also interesting records, so that the knowledge acquired by a particular community would not be lost" (GALDINO, 2011, p. 28). This knowledge was used as a basis for local organization policy, understanding of fertility, agricultural systems, and mystical rituals.

It should be highlighted that throughout the centuries, these people have created their own field of astronomical study in order to meet their daily needs. The knowledge acquired over time "was transmitted orally to successive generations through daily activities, legends, and traditions, which over time were modified and adapted until they became what they are today" (JALLES;

NEVES; NADER, 2013, p. 11). These knowledges have been researched and conceptualized in the scientific community based on the new branch of science called Archaeoastronomy. From this perspective, we can reflect and discuss the reorganization of this knowledge for teaching and learning of science in the school environment, while this branch of science aims to understand the sense and meaning of Astronomy for ancient peoples and indigenous people.

In this article, Archaeoastronomy is conceived as the science that studies Astronomy disseminated by ancient civilizations, and among these civilizations are the indigenous people. There is also the sub-science of Ethnoastronomy, which "investigates the astronomical knowledge of contemporary ethnic or cultural groups" (AFONSO apud GARCIA et. Al., p. 8, 2016). Therefore, this branch of knowledge analyzes monuments and temples, investigates how these peoples understand the Solar system, how they perceive celestial mechanics, how they relate this area of knowledge to their beliefs and customs, thus creating their own celestial myths.

Furthermore, the facts constructed throughout the history of Astronomy lead many to mistakenly believe that CA is dormant, however, it continues in full force, being passed down from generation to generation, especially by indigenous people. According to Capozzoli (2011), many indigenous ethnic groups have been occupied with investigating the sky and continue to do so today. Thus, CA is part of the culture of the indigenous and traditional people of this land, to know it is to know how important nature is to these people, it is to have knowledge that they have a particular way of perceiving celestial bodies and integrating them into their worldview.

No different from other indigenous people of the world, Brazilians have a history, a custom, a peculiarity, and bring with them the diversity of body paintings, social and political organization, hunting and fishing for subsistence, the richness of linguistic diversity, the production of handicrafts, the cultural knowledge of the indigenous, the tradition of rituals, and among these traditions is an intrinsic knowledge, namely CA, also understood as Ethnoastronomy. And since the first record we have knowledge of, "They counted the years perfectly, by knowing the movement of the Sun from one tropic to another and vice versa. They also knew the months by the rainy season and by the time of winds or even by the time of cashew nuts" (AFONSO, 2009, p. 2). Many of these sky readings continue to be part of the daily lives of Brazilian natives, being mainly under the domain of the elderly.

These ancestral and indigenous knowledges, in the case of indigenous people, encompass a set of knowledge understood as cultural, mobilized by habits, customs, traditions, techniques of cultivating or making something, ways of doing certain things, behaviors, and beliefs that are developed by them and passed down through generations through orality and daily practice of a particular activity, constituting both a material and immaterial knowledge.

From the perspective of this broad and complex system of knowledge, and more precisely to understand what Astronomy is and its importance to Brazilian indigenous people, as well as the sociocultural and communal context of this investigation, we need to understand how they learn and pass on these knowledge within their culture and family units.

To understand the universe of knowledge and understanding of Brazilian indigenous peoples about the learning of Astronomy from their readings about celestial bodies, focusing on the skies above them as the study space, it is important to note that many scholars have already pointed out, among them the French Capuchin missionary Claude D'Abbeville (D'ABBEVILLE, 2008), in reports described in the book "History of the Capuchin Fathers' mission on the island of Maranhão and surrounding lands", published in 1614, identifying and documenting indigenous knowledge.

In his work, D'Abbeville (2008) highlighted the knowledge of the Tupinambá indigenous people, located at the time in the state of Maranhão, about the movements of the sunrise and sunset, the movements of the stars on the horizon, the period of breeze and rain. These indigenous people had knowledge that went beyond what had been recognized by science until then, since at that time they already knew that tidal movements were influenced in some way by the phases of the moon. Thus, we can see that observing the sky has always been important and meaningful to indigenous people.

From this evidence of knowledge, the study of Brazilian Indigenous Astronomy (BIA) becomes necessary in order to understand how these individuals perceive the universe, the relationship of this knowledge with their culture and the environment in which they are embedded, given that "indigenous worldview must be considered in the context of their cultural values and environmental knowledge" (AFONSO; MOSER; AFONSO, 2015, p. 182).

This importance is recognized in Law No. 11.645/2008 (BRASIL, 2008), which makes it mandatory to teach the History and Culture of Brazilian Indigenous People in Elementary and High School, in schools throughout the country. It is emphasized here that teaching this content also falls under the responsibility of the Science subjects, and one possibility is the CA theme, which is part of the "Earth and Universe" theme, which allows for thinking about the teaching and learning of BIA.

For Indigenous people, the teaching of BIA is even more important, as it is an original knowledge that fosters the revitalization, maintenance, valorization, and continuity of reading practices of the constituent elements of the sky that are included in their own culture. This ensures that the astronomical knowledge of the elders is not lost over time, and the knowledge about the sky acquired over the years does not fall into oblivion, as "over time, the Indigenous person walks more and more towards 'acculturation,' to the point of no longer recognizing the myths, tales, and the meaning of their songs" (SOUZA *et al*., 2017, p. 1).

In order to contribute to the preservation of indigenous knowledge in the face of direct contact with non-indigenous people and the advent of digital technologies, as well as the relationships between dominator and dominated, it is necessary to teach Indigenous Cultural Astronomy (ICA) in Science classes in elementary schools, whether they are indigenous or non-indigenous schools. As we enter a classroom, we bring with us our experiences, stories, and lived experiences developed in different contexts in which we are a part of (BARROS; OVIGLI, 2014, p. 107). Therefore, this topic is important so that students can come to know these readings and interpretations given to celestial bodies.

When talking about CA, it should be kept in mind that we are talking about cultural multiplicity, so celestial objects known to one people may not be the same in another or may be understood differently because each indigenous people has their own singularity and specificity, as well as linguistic issues.

Therefore, this investigation is justified by enhancing the study of Indigenous Astronomy (IA) and fostering intercultural practices that value indigenous knowledge about different readings and interpretations of the same area of the sky. These understandings assist us in proposing new didactic and pedagogical practices based on a formative document and a reference document, so that both the university and elementary schools can observe other methodological approaches that IA has the capacity to provide learning for Science education.

Following this perspective, this work is based on documentary research, in which the Brazilian National Learning Standard– BNCC (BRASIL, 2017), the National Curricular Parameters – PCN (BRASIL, 1997; 1998a), and the National Curriculum Framework for Indigenous Schools – RCNEI (BRASIL, 1998b) will be analyzed. The main objective is to understand the legal foundations for teaching IA in elementary education I and II in relation to science education for students in indigenous and non-indigenous schools. The article is structured into three parts to obtain a better understanding of the topics covered.

The first part provides an analysis of the Teaching of Indigenous Astronomy (TIA) in Science classes in elementary schools, regarding the thematic unit "Earth and Universe." Then, the methodological paths taken during the research are presented. In the third part of this article, the aim is to demonstrate possibilities for teaching IA in both indigenous and non-indigenous schools, based on the BNCC document (BRASIL, 2017), which all Brazilian education systems must follow, with regard to their pedagogical proposals for science education. Similarly, the PCN (BRASIL, 1997; 1998a) and the RCNEI (BRASIL, 1998b) are also analyzed, with the PCN providing guidance and suggestions for all teachers who teach Science in Basic Education, considering the levels and modalities of education, while the RCNEI is more specific to the teaching of teachers who work in indigenous schools. This last document refers to science education and aims, among other pedagogical and didactic elements, to provide a reflection on how Astronomy classes should be planned and developed in indigenous school contexts. Finally, the final considerations are presented, which address the elements related to IA to be taught in Science classes, especially in indigenous schools.

METHODOLOGICAL APPROACH OF THE RESEARCH

The research takes a qualitative approach, as proposed by Oliveira (2012), since official documents containing guidelines or legislation about teaching Indigenous Astronomy (IA) in elementary school science classes were collected as data, particularly in Indigenous schools. These documents provide a reflection on this type of teaching, and the knowledge of Brazilian Indigenous peoples about celestial objects is brought to the dialogue as a point of reflection.

To collect data, documentary analysis was used, which "seeks to identify factual information in documents based on questions and hypotheses of interest" (CAULLEY, 1981 cited in LÜDKE; ANDRE, 2020, p. 45). Any written materials that

can be used as sources of information are considered documents, including laws, opinions, norms, among others. Data for this type of research can be collected from any document that presents sufficient elements to address a particular topic. It is believed that guidelines and guides developed to orient educators also fall into this category.

From this perspective, relying on authors such as Lüdke and Andre (1986) and Oliveira (2012), the research is understood to be a qualitative and documentary approach using primary sources, based on the Brazilian National Learning Standard (BNCC) (BRASIL, 2017), the National Curricular Parameters (PCN) (BRASIL, 1997; 1998a), and the National Curricular Referential for Indigenous Education (RCNEI) (BRASIL, 1998b). These documents were examined with the aim of seeking evidence for a study on the possibility of teaching IA in science classes, particularly in Indigenous schools.

Knowing that all research arises from questioning, the guiding question for our investigation is presented: What are the recommendations of official documents that can guide the teaching of Indigenous Astronomy for elementary school students?

Therefore, the data obtained during the research were analyzed and described in light of qualitative research, using documentary analysis.

TEACHING OF INDIGENOUS ASTRONOMY (IA): NON-INDIGENOUS SCHOOLS

The BNCC (BRASIL, 2017), the PCN (BRASIL, 1997; 1998a), and the RCNEI (BRASIL, 1998b) are documents that support teaching actions to be developed in Basic Education. However, the PCN (BRASIL, 1997; 1998a) are guiding documents, developed to ensure the coherence of policies for improving the quality of teaching, while the RCNEI (BRASIL, 1998b) is a guide for teachers working in indigenous classrooms. For these reasons, both are not mandatory, as they aim to corroborate with the quality of teaching, guiding teachers in a way that facilitates the choice of content and the most appropriate teaching and learning strategies. Therefore, the BNCC (BRASIL, 2017) is a mandatory document, as it is a Law that was homologated on December 20, 2017, thus, we have a resolution that supports it and, for this reason, it is mandatory, because it is a minimal set of actions and activities that municipalities, states, and the Federal District must guarantee. Having said that, this document unifies what all students in Brazil should know in the scope of Basic Education.

Among the cognitive and socioemotional competencies that students must develop in their education throughout Basic Education provided for in the BNCC, the thematic "Earth and Universe" is included, with skills to be developed regarding different cultures, which allows the teacher to work on the topic of IA in both the first and second phases of Elementary School (see Chart 1 and 2). It is precisely these points that allow the teaching of Brazilian Indigenous Culture in Science education that will be discussed below.

Chart 1 - Knowledge Objects and Skills in Science in Elementary School, according to the BNCC. First Phase: Thematic Unit, Earth and Universe.

Series in which the contents are taught	Knowledge Objects	Skills
1st grade	Time scales.	(EF01CI05) Identify and name different time scales: daily periods (morning, afternoon, evening) and the succession of days, weeks, months, and years; (EF01CI06) Select examples of how the succession of days and nights guides the rhythm of daily activities of human beings and other living beings.
2nd grade	Apparent movement of the Sun in the sky; The Sun as a source of light and heat	(EF02CI07) Describe the positions of the Sun at various times of the day and associate them with the size of the projected shadow; (EF02CI08) Compare the effect of solar radiation (heating and reflection) on different types of surfaces (water, sand, soil, dark, light, and metallic surfaces, etc.).
3rd grade	Characteristics of the Earth; Sky observation; Land use.	(EF03CI07) Identify characteristics of the Earth (such as its spherical shape, the presence of water, soil, etc.), based on the observation, manipulation, and comparison of different forms of representation of the planet (maps, globes, photographs, etc.); (EF03CI08) Observe, identify, and record the daily periods (day and/or night) in which the Sun, other stars, Moon, and planets are visible in the sky; (EF03CI09) Compare different soil samples from the school environment based on characteristics such as color, texture, smell, particle size, permeability, etc.; (EF03CI10) Identify the different uses of land (plantation and extraction of materials, among other possibilities), recognizing the importance of soil for agriculture and life.
4th grade	Cardinal points; Calendars, cyclic phenomena, and culture.	(EF04CI09) Identify the cardinal points, based on the record of different relative positions of the Sun and the shadow of a pole (gnomon); (EF04CI10) Compare the indications of the cardinal points resulting from the observation of the shadows of a pole (gnomon) with those obtained through a compass; (EF04CI11) Associate the cyclic movements of

		the Moon and the Earth with regular periods of time and the use of this knowledge for the construction of calendars in different cultures.
5th grade	Constellations and celestial maps; Earth's rotation; Periodicity of lunar phases; Opticalinstruments.	(EF05CI10) Identify some constellations in the sky, with the support of resources (such as celestial maps and digital applications, among others), and the periods of the year in which they are visible at the beginning of the night; (EF05CI11) Associate the daily movement of the Sun and the other stars in the sky with the rotation movement of the Earth; (EF05CI12) Conclude about the periodicity of lunar phases, based on the observation and record of the apparent forms of the Moon in the sky over at least two months; (EF05CI13) Project and build devices for distance observation (telescope, periscope, etc.), for enlarged observation of objects (magnifying glasses, microscopes), or for image recording (photographic machines), and discuss social uses of these devices.

Source: Brasil (2017, p. 332-341).

Based on the Chart presented, it is possible to understand how Astronomy teaching is present in the BNCC (BRASIL, 2017), starting from the early years of elementary school. Regarding the skills to be developed in the 1st grade, the objects of knowledge are time scales, so the focus of teaching is the knowledge of daily periods.

In the 2nd, 3rd, and 5th grades, the objects of knowledge are related to knowledge about the sky, with the focus on solar knowledge in the 2nd grade. There is no suggestion in the sample in question that the themes should be taught from the perspective of different cultures, so this knowledge should be taught according to Western Astronomy. Therefore, it is up to the teacher, in their planning, to seek interconnections between cultures, peoples, and civilizations, in order to present different ways of reading the celestial bodies to students.

At this stage of education, there is a skill to be developed that allows for thinking about EAI in both indigenous and non-indigenous schools. This is Skill EF04CI11, which states that 4th-grade students should be able to associate the cyclical movements of the Moon and Earth with regular periods of time and use this knowledge to construct calendars in different cultures.

By indicating that students should acquire astronomical knowledge present in different cultures, the BNCC (BRASIL, 2017) allows us to bring an anthropological and historical view of IA through time, starting from ancient cultures to the present day. This can provide students with the contemplation of the sky from the perspective of indigenous peoples in Brazil, regarding both the oldest and most recent knowledge, highlighting mystical and religious explanations in contrast to the scientific approach.

Before such indications, it can be shown to students that over the centuries, Brazilian indigenous peoples developed their own field of astronomical study, used as a basis for agriculture, fertility, politics, and religious rituals.

Next, the BNCC (BRASIL, 2017) was analyzed regarding the second stage of elementary school. It is worth noting that this stage also allows for thinking about TIA during Science classes in non-indigenous schools. In this sense, Chart 2 will be presented, which brings the Objects of Knowledge and Skills provided in the document, which must be taught to students according to the school year they are enrolled in.

Chart 2 - Objects of Knowledge and Science Skills in Elementary School according to BNCC. Second Stage: Thematic Unit, Earth, and Universe.

Series in which the contents are taught	Knowledge Objects	Skills
6th grade	Form, structure, and movements of the Earth	(EF06CI11) Identify the different layers that structure the planet Earth (from the internal structure to the atmosphere) and their main characteristics; (EF06CI12) Identify different types of rocks, relating the formation of fossils to sedimentary rocks in different geological periods; (EF06CI13) Select arguments and evidence that demonstrate the sphericity of the Earth; (EF06CI14) Infer that the changes in the shadow of a stick (gnomon) throughout the day in different periods of the year are evidence of the relative movements between the Earth and the Sun, which can be explained by means of the Earth's rotation and translation movements and the inclination of its axis of rotation in relation to the plane of its orbit around the Sun.
7th grade	Composition of air; Greenhouse effect; Ozone layer; Natural phenomena (volcanoes, earthquakes, and tsunamis); Tectonic plates and continental drift.	(EF07CI12) Demonstrate that air is a mixture of gases, identifying its composition, and discussing natural or anthropogenic phenomena that can alter this composition; (EF07CI13) Describe the natural mechanism of the greenhouse effect, its fundamental role in the development of life on Earth, discuss human actions responsible for its artificial increase (burning of fossil fuels, deforestation, fires, etc.) and select and implement proposals for the reversal or control of this situation; (EF07CI14) Justify the importance of the ozone layer for life on Earth, identifying the factors that increase or decrease its presence in the

		atmosphere, and discussing individual and collective proposals for its preservation; (EF07CI15) Interpret natural phenomena (such as volcanoes, earthquakes, and tsunamis) and justify the rare occurrence of these phenomena in Brazil, based on the model of tectonic plates; (EF07CI16) Justify the shape of the Brazilian and African coasts based on the theory of continental drift.
8th grade	Sun-Earth-Moon System; Climate.	(EF08CI12) Justify, by means of the construction of models and the observation of the Moon in the sky, the occurrence of the phases of the Moon and eclipses, based on the relative positions between the Sun, Earth, and Moon; (EF08CI13) Represent the rotation and translation movements of the Earth and analyze the role of the inclination of the Earth's axis of rotation in relation to its orbit in the occurrence of the seasons of the year, using three-dimensional models; (EF08CI14) Relate regional climates to atmospheric and oceanic circulation patterns and unequal heating caused by the shape and movements of the Earth; (EF08CI15) Identify the main variables involved in weather forecasting and simulate situations in which they can be measured; (EF08CI16) Discuss initiatives that contribute to restoring environmental balance based on the identification of regional and global climate changes caused by human intervention
9th grade	Composition, structure, and location of the Solar System in the Universe; Astronomy and culture; Human life beyond Earth; Astronomical orders of magnitude; Stellar evolution.	(EF09CI14) Describe the composition and structure of the Solar System (Sun, rocky planets, gas giant planets, and smaller bodies), as well as the location of the Solar System in our Galaxy (the Milky Way) and in the Universe (just one galaxy among billions); (EF09CI15) Relate different readings of the sky and explanations about the origin of Earth, the Sun, or the Solar System to the needs of different cultures (agriculture, hunting, myth, spatial and temporal orientation, etc.); (EF09CI16) Select arguments on the feasibility of human survival beyond Earth

Source: Brasil (2017, p. 332-341).

As described in Chart 2, the BNCC (BRASIL, 2017) indicates that students regularly enrolled in the 9th grade should develop Skills (EF09CI15) to relate different readings of the sky and explanations about the origin of the Earth, the Sun or the Solar System to the needs of different cultures (agriculture, hunting, myth, spatial and temporal orientation, etc.) during Science classes, regarding the theme of Earth and Universe.

Thus, by relating different readings of the sky and explaining the origin of the universe, TIA in the second phase of Elementary Education is a way to provide students with access to Cultural elements of indigenous populations of Brazil, so that they understand what these elements represent in the local context in which the school is inserted. Therefore, it will be possible for students to distinguish the diversity of methods used by each people to perceive, interpret and relate celestial objects to their worldview.

Regarding the PCN (BRASIL, 1997; 1998a), the documents aimed at teaching Natural Sciences were analyzed regarding the theme "Earth and Universe," planned for the following cycles: First (1st and 2nd grade), Second (3rd and 4th grade), Third (6th and 7th grade), and Fourth (8th and 9th grade).

Since this is a study that seeks evidence of the possibility of teaching IA in Science classes, it was investigated what traces these documents bring about the teaching of Astronomy, since this is the theme that presents the topic CA, which has the potential to address IA in the context of Natural Sciences classes.

For the first to fourth grade period, the document recommends the teaching of Astronomy:

> The wide variety of theoretical contents of scientific disciplines such as Astronomy, Biology, Physics, Geosciences, and Chemistry, as well as technological knowledge, should be considered by the teacher in their planning (BRASIL, 1997, p. 33).

But the PCN themselves say, "The Earth and Universe block will only be highlighted from the third cycle and will not be addressed in this document, complete only for the first two cycles" (BRASIL, 1997, p. 34). Even though Astronomy is mentioned in this cycle, the document does not provide recommendations for content and approach for the early years, that is, there is no curricular proposal in the "Earth and Universe" axis, consequently, the teaching of CA is not recommended.

The recommended content for the third (6th and 7th grade) and fourth cycle (8th and 9th grade) in teaching Natural Sciences has the theme "Earth and Universe" with suggestions of topics to be taught, as well as the approach. This document points to the possibility of teaching IA within the CA theme.

> As the Sun moves in relation to the horizon, its light casts shadows that also move, varying in length and direction: in the morning, shadows are long; as the hours go by, they get shorter and, at noon, they are minimal or nonexistent. After that, they start getting longer towards the opposite side until the end of the afternoon. Observations like these allowed the construction of calendars by different cultures, reflecting different conceptions of 'Earth and Universe,' a theme to be developed in connection with Cultural Plurality (BRASIL, 1998a, p. 63). The construction of a sundial is an important activity for students to carry out, discussing the size of

> shadows during the day and learning how ancient peoples built their clocks (BRASIL, 1998a, p. 63).
> Students should be guided to articulate information with direct sky observation data, using the same regularities that our ancestors observed for orientation in space and for measuring time, which was possible long before the compass, clocks, and the current calendar but which, along with them, still organize life in society in various cultures today, which can be worked on in connection with the cross-cutting theme of Cultural Plurality. In this way, students build the concept of cyclical time of day, month, and year, while learning to locate themselves on Earth, in the Solar System, and in the Universe (BRASIL, 1998a, p. 40).

Like in the BNCC (BRASIL, 2017), the PCN (BRASIL, 1998a) emphasize the importance of teaching knowledge about Earth and the Universe, from different cultures, our ancestors, and ancient peoples, during Science classes. On the other hand, even when speaking about the "Valorization of knowledge from ancient peoples to explain celestial phenomena" (BRASIL, 1998a, p. 67), the document does not mention BIA.

Right after that, the document emphasizes the importance of this millennial observational science:

> Recording the observation of the sky is very ancient. The monument of Stonehenge, located in England and built about 2500 years BC, reveals a sophisticated method of calculating the calendar, marking solstices and equinoxes with precision (BRASIL, 1998a, p. 92).

As it is known, Brazilian indigenous people are among the ancient peoples who developed astronomical knowledge over the years, using it as a basis for local organization policy, fertility, agricultural systems, and beliefs. Therefore, when teaching CA from different peoples/ancient peoples, there is a possibility of teaching BIA; whether this content will be addressed during Science classes or not will depend on the teacher's interpretation.

That being said, when choosing to teach IA during Science classes, one alternative would be the use of the Stellarium software as a pedagogical and methodological instrument, since it is free and has a planetarium that realistically shows the sky in three dimensions, allowing the option to choose date and time to observe. It is important to emphasize that, when choosing a methodological material, the teacher should take into account the school context.

When teaching Science in non-indigenous schools, it is important for teachers to keep in mind the cultural plurality present in Brazilian school classrooms, given that it is increasingly common to find indigenous people studying in non-indigenous schools. When teaching Astronomy, teachers should take into account the knowledge of these students, to facilitate the teaching and learning process, making it meaningful.

Another point that should be considered when planning an Astronomy class is that by studying AI, we are valuing ancient knowledge and different interpretations of the same region of the sky made by Brazilian indigenous peoples, which helps in understanding the diverse cultures that exist in our country. Thus, as already mentioned, students are provided with the study of Astronomy from the perspective of Brazil's native peoples, in contrast to the scientific approach.

Following the outline of this research, a dialogue on EAI in indigenous schools is presented below, based on the RCNEI (BRASIL, 1998b), with the aim of proposing some possibilities for teaching Science in indigenous classrooms, based on the CA of each community to teach Western Astronomy.

TEACHING INDIGENOUS ASTRONOMY (TIA) IN INDIGENOUS SCHOOLS

Law No. 9,394/1996 (BRASIL, 1996), which establishes the guidelines and bases of national education (LDBEN), a document that regulates Brazilian education, recognizes the differentiation of indigenous schools from other schools, with the purpose of respecting the mother tongue, interculturality and cultural diversity. With this in mind, the Ministry of Education (MEC) provides a material, that is, the RCNEI (BRASIL, 1998b), to assist the work of teachers in indigenous schools.

The RCNEI (Brazil, 1998b) is a formative document that brings a set of reflections on teaching in indigenous schools, suggestions and ideas on how to teach didactic content and dialogues with teachers who work in these schools.

Based on the RCNEI, TIA can be thought of within indigenous schools, to be worked on in a way that re-signifies the knowledge of these students during the Western Astronomy classes (astronomy taught in schools) provided for in the BNCC (BRASIL, 2017) and recommended in the PCN (BRASIL, 1997; 1998a).

For Science teachers, the official document instructs that when starting a content, they should start from what the students already know about the subject, then turn to the knowledge of the elders of the community and school knowledge. Thus, according to the RCNEI, the student will be able to assimilate the new knowledge with what he already knows about what is being taught, and "All people in an indigenous community have a lot of knowledge and are constantly teaching and learning from their relatives and nature" (BRASIL, 1998b, p. 277).

Unlike the BNCC (BRASIL, 2017) and the PCN (BRAZIL, 1997; 1998a), which leave open the type of CA to be taught, the RCNEI makes it clear the importance of teaching IA in schools:

> Much of the mythology of each people is related to the sun, moon, stars, and other celestial bodies. Many of the ideas and stories developed about man and nature are influenced by each people's conception of the Earth, their relationship with the stars (especially the sun and moon) and their position in space. To do a good job in their science classes, the indigenous teacher needs to know the ideas that the elders have about all these things. Working with their students on this knowledge will be useful not only in classes dedicated to this subject, as the type of Universe conception strongly influences all ideas about other natural phenomena, animal behavior and human behavior. The ideas and discoveries of science on this subject are also very important for students to understand a little about the logic of Western thought. Finally, observing the sky, the stories related to the stars, and understanding the movements of the Earth, Moon, and Sun will be a permanent source of pleasure and beauty for all indigenous students (BRASIL, 1998b, p. 276).

Indigenous Astronomy is part of the indigenous identity, so most of these peoples recognize and can locate constellations in the sky, especially the elders of the villages. This is a culture that directly influences seasonal practices and is present in myths, songs, and other customs of Brazilian indigenous peoples.

In terms of teaching Astronomy content in Basic Education, according to the BNCC (BRASIL, 2017), a relationship can be established between Western Astronomy and Amerindian Astronomy (Astronomy developed in indigenous communities that is passed down from generation to generation by the elders of the villages) with the aim of promoting intercultural dialogue in the context of science education, which will favor the understanding of differences as well as possible similarities between traditional and scientific knowledge, helping indigenous school students understand scientific ideas.

Regarding the skills related to themes that aim to develop students' cognitive abilities so that they can come to know, describe, identify, relate, justify, and interpret natural phenomena related to the sky, the Solar System, Climate, Moon, and Sun, we can work with indigenous constellations, focusing on constellations known by the village where the class will be taught. These constellations can be formed by parts of constellations known by different peoples and by constellations of Western Astronomy. Therefore, the teacher can reframe the students' knowledge, highlighting the uncommon points of both constellations, making it possible for these students to see this and relate this new knowledge to the knowledge they already possess.

The Sun and Moon were and are widely used by indigenous peoples as guides in various activities. These peoples observe, study, and use these two natural elements for orientation in seasons, fishing, agriculture, and other activities performed in the environment where they live. Following this reasoning, another possibility would be to highlight the differences as well as possible similarities of this knowledge with the scientific knowledge that will be worked on in the indigenous classroom, always taking into account the cultural knowledge of the school in which the teacher develops their classes. In this perspective, there would be differentiated, intercultural, and interdisciplinary teaching (BRASIL, 1998b).

Thus, there will be respect and appreciation for cultural diversity and an exchange of knowledge between teacher/community, student/older people in the community, student/student, and teacher/student. In addition, the teacher will value what the student already knows so that the student can assimilate the existing knowledge about Astronomy with the new one acquired, and thus, the new information will anchor, making the learning meaningful for the student. In this way, the student will learn more about their own Astronomical Culture as well as Western Astronomy. In the Theory of Meaningful Learning, “Ausubel presents learning in an environment of effective communication, respecting and leading the student to envision themselves as an integral part of this new knowledge through links, familiar terms to them” (PELIZZARI *et al*., 2002, p.41).

Joaquim Maná, an indigenous teacher belonging to the Kaxinawá people, for example, refers to the Moon as an element that allows us to learn more about the solar system. He argues that teaching about the Moon can be discussed and reflected on in different areas of knowledge, such as Mathematics, Physics, and Astronomy (BRASIL, 1998b, p. 61).

It is well known that we live in a country with a wide culture derived from different peoples, where teachers should not teach their classes through closed themes and objects, as students are different and learn in disparate ways, at different times, since they live in distinct daily practices linked to their "self" and the context in which they are inserted. Therefore, it is necessary to know both the environment in which their students live and their reality so that the appreciation of this whole scenario can be a constant in school life.

The teacher of an indigenous school needs to go beyond others, as knowing the students and the environment they are inserted in is not enough. It is also necessary to know other societies, in general, to identify the knowledge of each people so that a curriculum can be developed following the traditional knowledge of the community, always associated with knowledge of other cultures, in order to integrate them. Thus, the student will have both scientific knowledge and knowledge of their people.

It is observed, therefore, that teaching CA is necessary in indigenous schools so that the new generations come to know how their people (especially their ancestors) see and interpret celestial bodies, since such contents are part of the values and mechanisms of traditional indigenous education. And when talking about CA, one must keep in mind that one is talking about cultural multiplicity, so what is taught in one ethnicity may not be taught in another, because each indigenous people have their singularity and specificity.

FINAL CONSIDERATIONS

When teaching science in the classroom, both in indigenous and non-indigenous schools, it is important to avoid teaching as if the student knew nothing about the topic, because they do know something, even if it may not be scientific knowledge. The teacher should consider the knowledge that the students bring with them and contextualize the teaching, as decontextualized education is one of the main problems for student non-learning, since teaching needs to make sense for the student for there to be actual teaching and learning.

On the other hand, the teacher must be careful not to confuse the student, while aiming for understanding without devaluing scientific thinking. Therefore, it is necessary for teachers to investigate and understand what world knowledge, being and existing in the world the students bring with them to the teaching and learning moments experienced in their school routines, specifically.

Observing the sky has always been part of the cultural knowledge of ancient civilizations, including Brazilian indigenous ones. According to authors such as Capozzolli (2011) and Afonso (2014), Brazilian indigenous peoples were occupied with investigating the sky and continue to do so today because for these peoples, the earth is nothing more than a reflection of the sky. Thus, the knowledge of the sky that these peoples bring with them assists them in surviving in society and is linked to Culture as a whole. Indigenous peoples orient themselves by celestial objects, predicting different natural phenomena through these readings. Therefore, like the Astronomy of ancient peoples, that of Brazilian indigenous peoples is an Astronomy with the naked eye.

As mentioned, the BNCC (BRASIL, 2017), the PCN (BRASIL, 1997; 1998a), and the RCNEI (BRASIL, 1998b) are documents that enable thinking about TIA in Brazilian basic education schools, both indigenous and non-indigenous, enabling the construction of a dialogue between knowledge in the teaching of science, with the aim that science classes in Brazilian basic education schools incorporate an intercultural dialogue with the astronomical knowledge of different Brazilian indigenous ethnicities, in accordance with the Operational Guidelines for Basic Education.

In this sense, it is understood that TIA is necessary in non-indigenous schools so that this public can get to know the culture of native peoples in Brazil, understanding how nature is important to them and comprehending that Brazilian indigenous peoples have a particular way of perceiving celestial bodies and integrating them with their worldview. In indigenous community schools, it is a way of revitalizing indigenous astronomical knowledge, as this knowledge runs the risk of being forgotten by indigenous peoples themselves due to the "acculturation" of these peoples.

FUNDAMENTOS LEGAIS E PEDAGÓGICOS PARA O ENSINO DE ASTRONOMIA INDÍGENA NA EDUCAÇÃO BÁSICA

RESUMO

O objetivo desta pesquisa é analisar documentos oficiais, procurando evidenciar pontos que permitam trabalhar a Astronomia Indígena (AI) em escolas indígenas e não indígenas, de modo a questionar: Quais as recomendações dos documentos oficiais que podem orientar o ensino de Astronomia Indígena para o Ensino Fundamental I e II? Para tanto, foram analisados a nova Base Nacional Comum Curricular (BNCC), os Parâmetros Curriculares Nacionais (PCNs) e o Referencial Curricular Nacional para as Escolas Indígenas (RCNEI), para que se pudesse refletir sobre as possibilidades do ensino da Astronomia Indígena. Realizou-se um estudo teórico descritivo e analítico das Habilidades previstas na BNCC a serem desenvolvidas nos processos de ensino e de aprendizagem de Ciências com os estudantes do Ensino Fundamental I e II, tomando como foco a temática "Terra e Universo". Assim, observou-se que a Astronomia Observacional, desenvolvida por diferentes civilizações, serviu como base para a Astronomia Moderna e para o desenvolvimento da Ciência.

PALAVRAS-CHAVE: BNCC. PCN. RCNEI. Astronomia Ameríndia.

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Mailing address: Jannyny de Oliveira Fogaça Rodrigues - jannyny1388@gmail.com