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Juruá Astronomy for Indigenous Communities

Exploring the cosmovisions of the moon

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Abstract. The Juruá Astronomy outreach project (IF-UFRGS) seeks to develop intercultural educational activities associated with cultural astronomy. The objective of the work is, quoting Masakata Ogawa, to present western science as a foreign culture in relation to the traditional knowledge of indigenous peolple. We persue to relate symbols of the indigenous cosmovision with western astronomy, in order to address western scientific knowledge, complying with the Indigenous School Guidelines and the school teaching plan, but also contemplating and legitimizing the ancestral knowledge. The project's activities focus on the indigenous public school Nhamandu Nhemopu'ã, located at Pindó Mirim village, in Rio Grande do Sul, a Mbya Guarani ethnic group, and it's a joint action of the project team. The project's activities were directed to the passage of time, given by cosmological markers, such as constellations and Moon phases. We proposed activities related to the time of year in which the project was carried out, October. The first meeting explored Mbya and Western constellations associated with the end of Old Time (autumn/winter) and the beginning of New Time (spring/summer), as presented in the study by Geraldo Moreira and Wanderley Moreira. The second meeting, which is the focus of this work, had two moments, one expository and the other manual. Based on the playful conduct of storytelling, inspired by the research of Walmir Cardoso, we brought tales associated with the Moon, such as the Greco-Roman myth of Selene, the Japanese tale "The Rabbit on the Moon" and indigenous stories about the creation of the Amazon River and pororocas and the Twins Sun and Moon. Afterwards, concrete materials were used, such as Moon phases simulators made with the students. This approach made it possible to introduce the western scientific perspective of the Earth-Sun-Moon movement and the relationship with the Moon phases. The students showed little participation during the expository part, but were engaged with the manual activities, showing mastery on the topics presented in class. A difficulty associated with linguistics was observed, as some of the students only speak Guarani and understand little Portuguese.

Resumo. O projeto de extensão Astronomia Juruá (IF-UFRGS) busca desenvolver atividades educativas interculturais associadas à astronomia cultural. O objetivo do trabalho é, citando Masakata Ogawa, apresentar a ciência ocidental como uma cultura estrangeira em relação aos saberes tradicionais dos povos originários. Buscamos relacionar símbolos da cosmovisão indígenas com a astronomia ocidental, de modo a abordar os saberes ocidentais, cumprindo com as Diretrizes Escolares Indígenas e o plano de ensino escolar, mas também contemplando e legitimando os saberes ancestrais. A atuação do projeto focaliza-se na E.E.I.E.F Nhamandu Nhemopu'ã, localizada na aldeia Pindó Mirim, RS, de etnia Mbya Guarani, sendo esta uma ação conjunta da equipe do projeto. Direcionou-se a atuação do projeto à passagem do tempo, dadas por marcadores cosmológicos, como constelações e fases da Lua. Propusemos atividades relacionadas à época do ano de atuação do projeto, ou seja, outubro. Explorou-se, no primeiro encontro, constelações Mbya e ocidentais associadas ao fim do Tempo Velho (outono/inverno) e início do Tempo Novo (primavera/verão), conforme apresentado no estudo de Geraldo Moreira e Wanderley Moreira. No segundo encontro, e foco deste trabalho, tivemos dois momentos, um expositivo e outro prático. Partindo da conduta lúdica de contar estórias, inspirados na pesquisa de Walmir Cardoso, trouxemos contos associados à Lua, como o mito greco-romano de Selene, o conto japonês "O Coelho na Lua" e as histórias indígenas sobre a criação do rio Amazonas e pororocas e dos Gêmeos Sol e Lua. Após, usou-se de materiais concretos, como simuladores de fases da Lua feitos junto dos alunos. Essa abordagem possibilitou a introdução da perspectiva científica ocidental do movimento Terra-Sol-Lua e a relação com as fases da Lua. Os alunos mostraram-se pouco participativos durante a parte expositiva, mas bastante engajados com as atividades manuais, demonstrando domínio dos assuntos tratados. Observou-se uma dificuldade associada à linguística, visto que parte dos alunos falam apenas guarani e compreendem pouco do português.

Keywords. Teaching of Astronomy – History and philosophy of astronomy – Sociology of Astronomy

1. Introduction

The Juruá Astronomy outreach project, from the Physics Institute of the Federal University of Rio Grande do Sul (IF-UFRGS), seeks to develop intercultural educational activities associated with cultural astronomy. The objective of the work is, citing Masakata Ogawa (1986), to present Western science as a foreign culture Ogawa (1986) in relation to the traditional knowledge of the indigenous people, aiming to incorporate multiculturalism in the activities developed. We seek to relate symbols of the indigenous cosmovision with Western astronomy, in order to address Western scientific knowledge, complying with the Indigenous School Guidelines and the school teaching plan, but also contemplating and legitimizing ancestral knowledge.

The project's activities focus at the indigenous school Nhamandu Nhemopu'ã, located in Pindó Mirim village, RS, a Mbya Guarani ethnic group, and this is a joint action of the project team. See Figure 1. Astronomy, treated here as a result of the cultural construction of different folks, is conceived through the valorization and legitimization of indigenous peoples as astronomy makers, based on ancestral knowledge related to the sky and the oral tradition. The sky provides stories to humanity, and humanity tells stories through the sky. This paper

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Figure 1. Juruá Astronomy outreach project team with the Nhamandu Nhemopu'ã indigenous school team and indigenous leaders of the village

will report an experience of an activity about the phases of the Moon held in October 2023 with students from the Nhamandu Nhemopu'ã indigenous school. It stands out that students in the initial years speak only in Guarani, going through the literacy process in Portuguese within the school.

2. The Cosmovisions of the Moon and the Activity

The goal of the activity about moon phases, held in October 2023, was to introduce contents about the phases of the moon and the passage of time, associated with cosmological markers. In compliance with the school teaching plan and the Indigenous School Guidelines, but still contemplating and legitimizing the ancestral knowledge of indigenous astronomy, a playful approach to this theme was chosen. The activity began with a brief introduction about the importance of the phases of the moon in different cultures, as temporal markers and as cultural markers. This initial approach aimed to establish an intersectionality between different cultures in different parts of the world, outlining the common fact that astronomy, in its origins, is directly connected to human spirituality and its customs. Stories from Greco-Roman culture were told, such as the myth of Selene, the indigenous story of the creation of the Amazon River and the tidal bores, the Japanese story of the rabbit on the moon, and the indigenous story of the twins Sun and Moon. The stories were told in a playful way, seeking to highlight differences and similarities between the ways of conceiving the night sky.

After this first moment, the Moon phases were discussed from a scientific-Western perspective of astronomy, where the explanation for the existence of phases of the Moon was presented, as the names associated with each of the phases and the rotation movement of the Moon around the Earth. This expository class was accompanied by the construction of a Moon phase simulator in cardboard boxes along with the students (Figure 2).

Combining the knowledge from the lecture on the phases of the Moon and the assembly of the box, we used the simulator to do a brief and simple guided study. By observing the inside of the box through any of the four holes available on the sides, depending on the position of the LED light, it was possible to identify the new, full, crescent and waning phases. Based on this, the students were asked to observe the inside of the box through specific holes and report the phase of the Moon observed. In general, they were able to report correctly as taught in class.

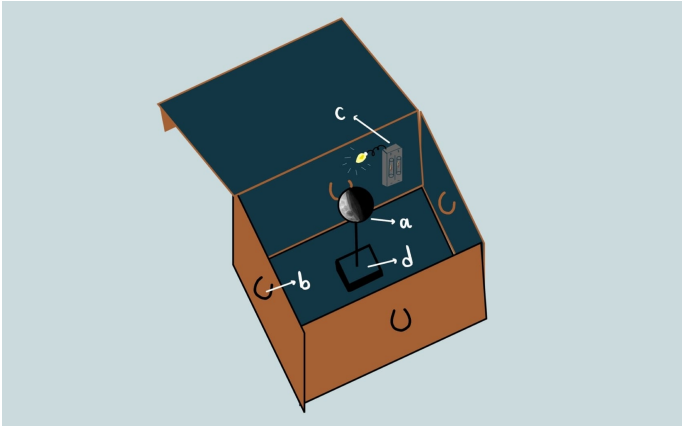

Figure 2. Assemble of the moon phase simulator in a cardboard box. The simulator operates with the box closed, all the internal surfaces of the box were painted black. In **a -**representation of the Moon in a Styrofoam ball; **b -** holes with covers on the sides of the box to allow viewing the components inside the box; **c -** LED light simulating the sun light; **d -** Styrofoam support for fixing the Moon using a barbecue stick;

3. Conclusions

The students showed little participation during the expository part of the lecture, but were engaged with the manual activities, showing mastery of the topics covered after we asked investigative questions using the Moon phase simulator. On the other hand, as explained in the Introduction, there is an intrinsic difficulty associated with linguistics, which permeates any technical-scientific difficulties that emerge in the classroom, especially in relation to students in the early years, who have little understanding of Portuguese. Furthermore, when students in the final years are encouraged to answer questions about the activity, they often end up avoiding the questions by speaking in Guarani with their classmates and giving vague answers in Portuguese.

The activity developed on the phases of the Moon was one, among several other activities, that aimed to implement multicultural teaching in classes of mandatory content of the school teaching plan, also complying with the Indigenous School Guidelines. All activities carried out are developed in partnership with the village leaders and the school community. As a perspective, the objective is to build a bilingual Portuguese/Guarani tellurium, to be built in association with the school's students and with the translation help of the village's indigenous leaders.

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