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Juruá astronomy for indigenous communities

Exploring cosmovisions of constellations

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Abstract. This work presents the activities carried out during one of the initial meetings held at E.E.E.I Nhamandu Nhemopu'ã, located in Tekoá Pindó Mirim, Itapuã, Viamão - RS. Through the Astronomia Juruá extension project, we engaged with the Tekoá community to facilitate an exchange of knowledge between academia and the traditional Mbya-Guarani culture. The goal was to introduce astronomy concepts from the perspective of Masakata Ogawa, who views science as a foreign culture in non-Western societies. A schedule of activities was developed, guided by ancestral knowledge of the night sky. This schedule included activities that combined expository and practical sessions, inspired by the approach of narrating stories from both Western and Indigenous mythology, based on the work of Walmir Cardoso. The approach sought to respect Indigenous School Guidelines and highlight the importance of ancestral knowledge for the preservation of traditional culture. The project was based on the final course work of Indigenous leaders Geraldo Moreira and Wanderley Moreira, which focused on constellations and the passage of time. We presented the stories of the Tudja'í (Old Man) constellation, which shares stars with the Orion constellation and represents the arrival of Ara Pyau (New Time), and the Maino'i (Hummingbird) constellation, which shares stars with the Corvus constellation and symbolizes the arrival of Ara Ymã (Old Time). Following this, we collaborated with students to build small projectors representing the Tudja'í-Orion and Maino'i-Corvus constellation pairs. Additionally, during a second community meeting, workshops were held involving stories about the Moon, where students participated in constructing lunar phase simulators. The project will continue in 2024, focusing on the passage of time and planning the creation of an astronomical tellurion that draws parallels between constellations and the Guarani concept of time.

Resumo. Este trabalho apresenta as atividades realizadas em um dos primeiros encontros feitos na E.E.E.I Nhamandu Nhemopu'ã, localizada na Tekoá Pindó Mirim, em Itapuã, Viamão - RS. A partir do projeto de extensão Astronomia Juruá, atuamos na Tekoá realizando uma troca de saberes entre a academia e a cultura tradicional Mbya-Guarani. Com o objetivo de apresentar conceitos de astronomia por meio da perspectiva de Masakata Ogawa, na qual a ciência é vista como uma cultura estrangeira em sociedades não ocidentais, foi elaborado um cronograma de atividades pautado pelos conhecimentos ancestrais do céu noturno. Neste cronograma, planejamos atividades que combinam momentos expositivos e práticos, baseadas na proposta de narrar histórias da mitologia ocidental e indígena, a partir do trabalho de Walmir Cardoso. A abordagem buscou respeitar as Diretrizes Escolares Indígenas e a importância dos conhecimentos ancestrais para manutenção da cultura tradicional. O projeto foi elaborado partindo do referencial do Trabalho de Conclusão de Curso das lideranças indígenas Geraldo Moreira e Wanderley Moreira sobre constelações e a passagem do tempo. Apresentamos as histórias das constelações de Tudja'í (Homem Velho), que possui estrelas em comum com a constelação de Orion e representa a chegada de Ara Pyau (Tempo Novo), e a constelação de Maino'i (Beija-flor), que possui estrelas em comum com a constelação do Corvo e cuja passagem pelo céu representa a chegada de Ara Ymã (Tempo Velho). Na sequência, construímos junto com os estudantes pequenos projetores dos pares de constelação Tudja'i-Orion e Maino'i-Corvo. Também foram realizadas, em um segundo encontro na comunidade, oficinas envolvendo histórias sobre a Lua na qual realizamos a construção de simuladores de fases da Lua junto aos estudantes. O projeto continua em 2024, abordando a passagem do tempo, planejando a construção de um telúrio astronômico que faça um paralelo entre constelações e a passagem do tempo Guarani.

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

1. Introduction

The Astronomia Juruá extension project (IF-UFRGS) aims to develop intercultural educational activities related to cultural astronomy in Tekoá Pindó Mirim, a Mbya-Guarani community located in Itapuã, RS. Through participation in the Estadual Indgena Nhamandu Nhemopu ' Escola Estadual Indgena and gradual collaboration between project members and indigenous leaders of the village, we have been designing workshops, activities and field trips focused on astronomy for school students. Currently, in partnership with school and community leaders, we are developing an approach to science education, particularly Western astronomy, that ensures that indigenous ancestral knowledge, integral to their culture and spirituality, is neither diminished nor disrespected. The outlined objective aligns with the perspective of Masakata Ogawa (1986), where Western science is presented as a foreign culture relative to the traditional cultures of non-Western peoples. Throughout this work, we have sought to connect Indigenous cosmological symbols and entities with their western astronomical counterparts, recognizing their equal importance. Astronomy is introduced through celestial movements and the passage of time, adhering to the Indigenous School Guidelines and the school's curriculum. The school's classes are mixed, comprising students of varying ages within the same group. In addition, the work involved both elementary and high school students, reflecting a collective effort by the project team. It is worth noting that some younger students are not fluent in Portuguese, as Guarani is their first language. Astronomy is approached here from a multicultural perspective,

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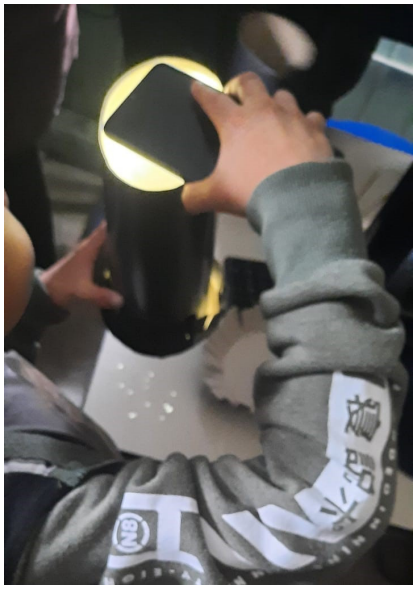

Figure 1. Homemade constellation projector.

emphasizing and legitimizing the knowledge of Indigenous peoples while acknowledging them as contributors to the field of astronomy. Western astronomical knowledge is presented as the cultural construct of different societies, and the activities were designed to draw upon oral traditions and ancestral knowledge of the sky. This report focuses on an activity that is conducted through storytelling about the shared sky.

2. Worldviews of Constellations

The night sky serves as a canvas for the creation of symbols across various cultures. These interpretations are often tied to temporal markers, environmental changes, spirituality, and collective practices. The establishment of constellations by various cultures illustrates a vital part of their history and beliefs, forming the basis for calendars and cyclical rituals (Moreira, 2015). It is essential to emphasize that each culture has its own worldview, reflecting unique ways of perceiving, understanding, and relating to the night sky. The concept of time, marked by cosmological indicators such as constellations, was the foundation for the activities conducted at the school. Putting emphasis on storytelling, a tradition deeply rooted in cultures that transmit knowledge across generations orally, we introduced stories associated with the Mbya-Guarani constellations, seeking to align the school curriculum with indigenous cultural traditions. The narratives presented revolved around the constellations of Tudja'í (Old Man), which shares stars with the Orion constellation and symbolizes the arrival of Ara Pyau (New Time), and Maino'i (Hummingbird), which shares stars with the Corvus constellation and marks the arrival of Ara Ymã (Old Time) (Cardoso, 2015). Due to the differing positions of these constellations throughout the year, the activities were closely tied to the specific season of October in the Southern Hemisphere. After narrating the stories of both constellation pairs (Tudja'í-Orion and Maino'i-Corvus), we used visual aids through tablets connected to a television to display images from astronomy software for students. Following this, we collaborated with the students to construct low-cost constellation projectors (Figure 1). These devices were used to project constellation shapes onto the school ceiling and to demonstrate their movement across the night sky (Figure 2).

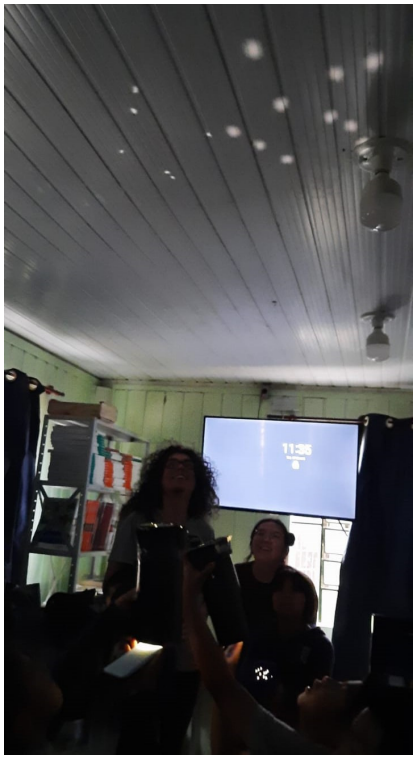

Figure 2. Projection of constellation on the ceiling.

3. Conclusions

The students at Nhamandu Nhemopu'ã School were attentive during the storytelling sessions and particularly engaged in constructing constellation simulators during classroom activities. In subsequent lessons, lunar phase simulators were built, complemented by field trips to observe constellations in the night sky and a visit to the UFRGS planetarium. The project will continue into 2025, aiming to construct an armillary sphere (or tellurium) marked with symbols associated with the Mbya worldview. This initiative is being developed in partnership with the village leaders to create a bilingual and multicultural tellurium. We hope that the construction of this bilingual tellurium will bridge western knowledge and traditional wisdom while also facilitating the learning process for young students whose first language is Guarani.

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