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A study on childhood animism and artificialism in children's representations of constellations

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Abstract. This study investigates manifestations of childhood animism and artificialism, according to Jean Piaget, in children's representations of constellations developed during visits to a non-formal astronomy education space. The research was conducted with four children aged 7 to 9 years following a visit to a Mobile Planetarium. Data were collected using the Piagetian Clinical Method through open-ended interviews, as well as drawings and the manipulation of concrete materials for constellation representation. The data were qualitatively analyzed using Content Analysis. The results reveal the presence of animistic conceptions, such as attributing intentions and emotions to stars, and artificialistic explanations related to the deliberate creation of constellations by external agents. Children's explanations integrated personal experiences, cultural references, and school influences. Greater familiarity was observed with culturally prominent constellations, such as the Southern Cross. The study concludes that non-formal educational spaces promote fascination and interest in astronomy; however, alternative conceptions persist, highlighting the importance of teacher training to effectively integrate these experiences into formal science education.

Resumo. Este estudo investiga manifestações de animismo e artificialismo infantil, segundo Jean Piaget, nas representações de constelações elaboradas por crianças visitantes de um espaço não formal de ensino de Astronomia. A pesquisa foi realizada com quatro crianças de 7 a 9 anos, após visita a um Planetário Itinerante, utilizando o Método Clínico Piagetiano por meio de entrevistas abertas, além de desenhos e manipulação de materiais concretos para representação das constelações. Os dados foram analisados qualitativamente com base na Análise de Conteúdo. Os resultados evidenciam a presença de concepções animistas, como a atribuição de intenções e emoções às estrelas, e artificialistas, associadas à criação deliberada das constelações por agentes externos. As explicações infantis revelam a integração entre experiências pessoais, referências culturais e influências escolares. Observou-se também maior familiaridade com constelações culturalmente difundidas, como o Cruzeiro do Sul. Conclui-se que espaços não formais favorecem o encantamento e o interesse pela Astronomia, embora as concepções alternativas persistam, reforçando a importância da formação docente para articular esses saberes ao ensino científico formal.

Keywords. Teaching of Astronomy

1. Introduction

Jean Piaget's study on children's representation of the world is highly relevant for understanding human development. Through animism and artificialism, characteristic ways of interpreting the natural world become evident. In astronomy education, children frequently develop alternative conceptions about celestial objects, according to Bartelmebs & Figueira (2021) and Langhi (2011), revealing interpretations that go beyond formal scientific knowledge, especially when exploring how conceptions about celestial bodies are formed within children's imagination. According to Ghirardello (2020), celestial representations in the form of constellations have been, and continue to be extremely relevant to humanity.

The conception that celestial bodies have a partially, and later entirely, natural origin appears in the second and third developmental stages. Children with an average age of 10 to 11 years already understand the origin of celestial bodies as natural. The natural explanation that develops across these stages partially eliminates animism in children; however, in some cases, celestial bodies are still perceived as conscious entities.

Regarding students' understanding of astronomy content, many formulate their own interpretations of scientific phenomena (Bartelmebs & Figueira 2021), which are known in academic discourse as alternative conceptions in astronomy (Langhi 2011). This non-scientific knowledge can create obstacles to the learning of school content, since such interpretations are often based on everyday experiences. Nevertheless, these personal interpretations are meaningful and play an important role in fostering the development of ideas in teaching contexts, especially when exploring how conceptions about celestial bodies are formed in children's minds.

In antiquity, the observation of the sky led people to develop the alternative conception that stars remained fixed relative to one another on a celestial sphere. This phenomenon motivated the creation of subjective representations, known as constellations, which facilitate the identification and memorization of celestial patterns. These imaginative constructions were often associated with mythical narratives as a way of explaining and attributing meaning to stellar patterns. The practice of observing the sky not only endured over the centuries but also continued to serve as a means of connecting human beings to the cosmos, transmitting ancestral knowledge that provides a sense of harmony.

The aim of this study was to establish a connection between Piaget's notions of childhood animism and artificialism applied to celestial bodies and the representations of constellations produced by children visiting a non-formal astronomy education space.

2. Materials and Methods

The study was conducted with four children aged 7 to 9 years, following informed consent from their guardians and approval by the Research Ethics Committee. The materials used included

Figure 1. Example of a drawing produced by one of the interviewed children.

paper, colored pencils, audio recordings, and a set of cards foam stars for constellation representation.

Data collection followed the Piagetian Clinical Method (Piaget 2005) using interviews with open and flexible questions that allowed the exploration of different types of children's beliefs. The interviews lasted approximately 30 minutes, were conducted in a quiet environment, and took place after a visit to a Planetarium at Astronomical Observatory of São Paulo State University (UNESP). The transcribed statements were qualitatively analyzed using Content Analysis (Bardin 1977).

3. Results and Discussion

The interviews revealed data on how children understand celestial phenomena. It is noteworthy that many statements expressed typical elements of animism, such as the belief that stars move of their own will to form shapes in the sky, or that they experience emotions, as in statements like "the stars want to make the sky prettier." Some children also demonstrated artificialism through statements such as "God created the stars in the shapes of animals."

In all cases, the children presented explanations that integrated personal experiences, cultural references, and school influences, along with attempts at rationalization within their own cognitive repertoire. It was also observed that the most commonly recognized constellations were Três Marias (Orion's Belt) and the Southern Cross. Manipulation of concrete materials facilitated the expression of ideas.

Finally, the interviewed children reported fascination and enthusiasm regarding the visit to the Mobile Planetarium, which motivated them to talk about the subject during the interviews; however, they still developed alternative conceptions about the topic.

4. Conclusions

The responses were concentrated on spontaneous and triggered beliefs, aligned with Piaget's categories (Piaget 2005), which reinforces the importance of investigative approaches that respect the inherent logic of childhood, while also considering the imaginative narratives that reveal the affective and cultural role of constellations (Bartelmebs & Figueira 2021).

Thus, visits to non-formal educational spaces can stimulate children's interest not only in constellations, but in astronomy as a whole. However, for the acquisition of scientific knowledge, as stated by Langhi & Nardi (2010), it is essential that teachers receive training in astronomy content, so that visits to non-formal environments can be effectively integrated into formal educational settings.

Within this training, encouraging teachers to use the clinical method as a diagnostic tool and Content Analysis as an interpretative framework may allow the identification of ways in which prior knowledge and new knowledge are articulated, enabling astronomy education that respects children's cognitive trajectories and their meaningful value, while guiding them toward conceptions closer to scientific thinking.

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