Approaching astronomy at nursery school: a reflection on pupils conceptions and their evolution

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Abstract. Children are interested in astronomy from early age. Numerous studies have been carried out to analyze teacher's and student's representations of astronomy. The first one focused by Piaget was concerning children and their development. Another one was carried out by Sharp in 1995. but no study has yet focused on nursery school pupils. We are therefore proposing an approach to astronomy with pupils aged 4 – 5 years to highlight their initial representations and how the activities contribute to the acquisition of scientific knowledge.

Introduction

Astronomy is of interest to everyone, from an early age. Today, children and adults alike have access to comprehensive information on the solar system via television, social networks, family or school. This acculturation contributes to the development of a scientific culture. However, according to Kanli [1], the many experiences of astronomy have led to misconceptions that contradict scientific realities. One of the first studies of children's ideas about the solar system was carried out by Sharp [2]. The sample, made up of 20 boys and 20 girls aged 6 - 7, was used to characterize representations of the shape of the Earth, the relative size of the stars, the phases of the Moon, the alternation of day and night, and the way in which these phenomena and objects are perceived by children. Other studies have been carried out with elementary school pupils, secondary school pupils, students and teachers in training. However, no studies have been carried out with primary school key stage 1 (K1), children 3 – 6 years , apart from the one on the origin of the stars described by Piaget in 1925 [3].

As part of a collaborative project involving teachers and researchers and focusing on astronomy in primary school , we are here interested in pupils aged between 4 and 6 from the same class. . After collecting conceptions about "space", the teachers envisaged daily observations of the sky and the Sun.

The aim of these teaching sessions is to approach astronomy in primary school K1 from the point of view of a celestial body: the Sun.

Theoretical framework and research questions

To analyze the activities proposed by the teacher, we will draw on the Didactic Situations Theory (TSD) developed by Guy Brousseau [4] in mathematics didactics. We question whether the devices envisaged by a teacher modify students' perception of the Sun. Our research questions are: How the teacher introduce astronomy to her students ? Do these situations help to build students' knowledge? To answer the second question, we analyze the evolution of student

conceptions in a class , by studying drawings at the very start of a sequence and after teaching sessions corresponding to different didactic situations.

Methodology and results

A primary K1 teacher asked her pupils to draw "what's in the sky". Each pupil drew a captioned picture with the help of their teacher. Adult dictation followed the activity. The pupils' productions were analyzed and categorized with the help of the researcher. Analysis of these conceptions revealed the existence of mental models in these 4-5 year-old [5], with the majority of learners neither naming nor representing the Sun. This finding led to a discussion of teaching methods to promote the Sun in their mental models of the sky.

The teacher chose to observe the Sun twice a day (in the morning and early afternoon), to have students draw a picture of the sky, noting the Sun's presence in a dedicated notebook, and to work on shadows using observations and model (students' shadows are projected onto a screen using a light source). The sessions were recorded and transcribed.

Analysis of these teaching situations shows that the devolution process is well underway, and that learners can be said to be interacting with the environment. The institutionalization phases envisaged enabled students to verbalize the knowledge they had collectively learned. To investigate whether children's conceptions have evolved, a new drawing or "post-test" is planned for early April: it will enable us to perceive whether these different activities have had an impact on the pupils' conceptions.

Conclusion

This project, which began in 2023, will continue with sessions focusing on lunar observation and a discovery of the planets of the solar system. At the end of this preliminary work, an introduction to a human Orrery system [6] will be considered as part of a collaborative project. This case study, being part of a collaborative research engaging teachers and researchers, enables us to reflect on approaches conducive to learning, and to design training systems for primary school teachers. What's more, as primary K1 teaching is structured around learning areas rather than school disciplines, we need to think about the curriculum: Scientific and Technological Education, interconnected with other areas, would thus enter into a dynamic based on the study of the curriculum, in line with the work of curricular didactics.

References

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