

## Session 2



# Basics of Astrophysics in primary school: Marvel, play and learn

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**Abstract.** In this poster is presented the development and testing of a pilot project to teach basics of astronomy to primary school students. This is a learning program that bases on the interdisciplinary nature of astronomy with amusing and playful activities. The objective of the programme is to engage children in astronomy and make them aware of the importance of the development of science and technology for society. The program has been tested a small non-government-funded school in the state of Puebla, in Mexico. Due COVID-19 lockdown the classes had to switch from face-to-face to online. Over 80% of the students that completed the course had considerably increased their knowledge of astronomy and requested to continue with the classes on the next school term.

**Keywords.** Education, Astronomy teaching, Elementary school, etc.

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## 1. Introduction

It is well known among the scientific community that Astronomy can be used as a tool for development in school and in life (van Dischoeck *et al.* 2020). Still, Astronomy is not included as one of the basic subjects in the elementary school plans worldwide. This project aims to create an elementary school astronomy program that allows children to practice the skills they need to perform successfully in their life for the coming years. In this part of the project only school children between 5 and 8 years old are targeted. The objective of the program is to marvel and inspire interest in science, while providing children with astronomical basic concepts.

## 2. Building up the astronomy teaching program

The project began with the study of Mexican government elementary education free textbooks (CONALITEG 2019) and analysis of outreach and education material from astronomy institutes, science museums and independent science communicators (e.g. REDPOP, Network for the Popularization of Science and Technology in Latin America and the Caribbean). Teachers and experts in education were also interviewed in order to identify children learning skills and knowledge at different ages (e.g. Allen and Kelly 2015; Norris *et al.* 2019).

The information collected guided the design of the programs to include the use of didactic material, games and hands-on activities to make the learning process fun and engaging, while developing children's motor and cognitive skills. The school-year program consisted in thirty-nine weekly one-hour classes. The classes consist of a short presentation or audiovisual exposition by the professor, followed by a hands-on activity or team game performed by the children in a 30-minute period, and a summary and closure. The designed activities are flexible enough as to be performed indoors, outdoors, individually

or in teams. Finally, Kindergarten to third grade elementary school curricula, class activities (e.g. comparing the Sun's evolutionary stages and human's life cycle, giant planet's ring toss game, designing and drawing an imaginary monster from a rocky or gaseous planet) and low cost DIY didactic material (e.g. bottles filled with rice to compare the mass of the planets, scaled models of the Solar System) was created for each education level.

### 3. Implementation & testing

The pilot program was implemented and tested on the 2019-2020 school year in a Mexican non-government-funded small school, Fundación Colegio Le Bret, oriented towards families with lower-middle or middle socioeconomic level. The astronomy classes were given to the fifty students between Kindergarten to 3rd grade, distributed in four groups (one for each grade level). On the first class of the course an astronomy lottery game was played in the four groups. This activity revealed that twenty-six students were aware that astronomy studies objects in the sky and eighteen showed strong interest in the subject.

From August to March 2020 the classes were given weekly in the school classroom and playground. COVID-19 lockdown forced to continue the classes through zoom recurring group meetings and off-line video assisted activities. Thus needing to modify some of the previously planned activities. Nevertheless, children were always marvelled by Hubble Space Telescope images, the exploration of the Moon, properties of the stars and astronomy technology transfer. Even shy students reluctant to use zoom joined the class whenever they could to continue learning about the Universe with astronomical images, cartoons (e.g. Paxi cartoon from ESA Kids) and by drawing and creating astronomy themed hand-crafts.

At the end of the year through an online multiple choice evaluation it was concluded that the thirty-nine students that could complete the course had achieved the expected knowledge. The student's general opinion was that they had enjoyed the course and were keen on taking more astronomy classes. The general comments from the student's parents were that their children had increased considerably their interest in astronomy and sciences in general.

### 4. Conclusions & Future work

Marvelling images, active participation and joyful activities lead to successful learning experience. Games, physical activities and handcrafts are eagerly performed by the students and raise student's focus on the class. The program has been updated to be fully virtual for 2020-2021 school-year. The next steps include video tutorials, student's workbook and learning log, teacher's guide and the 4th to 6th grades programs.

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