

## DEDOSCOPIO: AN INCLUSIVE PROJECT DEDICATED TO BRING TACTILE ASTRONOMY TALKS

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### ABSTRACT

Dedoscopio have developed outreach activities focused on people with visual disabilities since 2018 in Chile. The initiative uses homemade low-cost tactile materials as a medium to represent astronomical concepts and physical phenomena. During the quarantine time, we started a Audio-Reading Club with blind and visually impaired children from two parts of Chile. It was such a success that it crossed the borders and we were able to reach Bolivian children.

### RESUMEN

Dedoscopio ha desarrollado actividades de divulgación, especialmente para personas con alguna discapacidad visual, desde 2018 en Chile. La iniciativa usa material táctil hecho en casa y de bajo costo para representar conceptos astronómicos y fenómenos físicos del Universo. Durante el tiempo de cuarentena empezamos un Club de Audio-Lectura con niños y niñas de dos partes de Chile. Fue tal el éxito que logramos traspasar las fronteras y llegamos a un grupo de niños y niñas con distintas discapacidades de Bolivia.

*Key Words:* astronomy outreach — inclusive astronomy

### 1. THE BEGINNING

Chile has a very important role in the development of astronomy due to the excellent observing conditions in its northern region. Outreach activities have increased in Chile in the last 10 years. Public and private entities started to invest in scientific outreach to encourage interest in astronomy. Dedoscopio Project, over four years, offered astronomy talks focused on Blind and Visually Impaired (BVI) audiences around Chile, thus, contributing to make a more inclusive society through astronomical multisensorial talks. Different materials stimulate differently the sense of touch (Salinas 2013), associating different textures to different concepts and physical processes. Each of our talks is complemented by up to six tactile models. These models are handmade with accessible materials such as sugar, wooden sticks of different thickness, black paperboard, cotton, lentils and silicone (Fig. 1).

We have created five tactile astronomy talks with the following topics: Electromagnetic Spectrum; Asteroids; Mars; Black Holes; and Solar Eclipse. For more details see Paredes-Sabando & Fuentes-Muñoz (2021).

### 2. CHARACTERIZATION OF OUR TARGET AUDIENCE

Typically, the BVI Chilean communities meet in small groups of about 12 people between 20 and

63 years old, in their hometowns. Children are immersed into the school system, therefore it is difficult to reach them.

We started our tactile initiative at our home region. Chile is a long and narrow country, divided in 16 regions. The first talk was in Cañete, Biobío region, located at the end of the central zone. Then we visited 6 cities in the same region: Mulchén, Los Ángeles, Concepción, Penco, San Pedro de la Paz, Lebu. But finally we expanded throughout Chile (Fig. 2). For the past three years, we have visited 263 people, mainly adults, divided in 15 groups through 7 regions in our country. Apart from the región del Biobío mentioned above, we have been in La Serena (Región de Coquimbo), Santiago (Región Metropolitana), Rancagua (Región de O'Higgins), Región de la Araucanía: Freire, Loncoche, Padre de las Casas, Lautaro, Pucón, Theodoro Schmith. Panguipulli (Región de Los Ríos), Puerto Aysén (Región de Aysén).

#### 2.1. *Dedoscopio working for and with the community*

Throughout all these years we realized the importance of being able to associate with others institutions so that astronomy reaches the BVI community in a more effective way and science becomes as accessible as it can be.

- Outreach for Teachers: We have visited five teachers schools to show our material and discussed how they can modify them to represent other natural

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Fig. 1. Examples of Dedoscopio handmade materials.



Fig. 2. In red the places visited by Dedoscopio across Chile. Credits: Dedoscopio Project.

phenomena than just astronomical ones. Thus, they are now able to teach a physical process to children that have a particular visual impairment in a tactile low-cost way, and to show to the rest of the class the importance of being inclusive in every stage of their life.

- Outreach for Professional Astronomers: We show our material and work to astronomers in different scientific congresses as a tactile talk or stand, covering their eyes, and ask them to identify astronomy concepts only with their hands. We realised that adding an inclusive activity to their outreach will convey a better understanding of astronomy to everybody, no matter their disabilities.

- Bridging with Other Groups in Accessible Astronomy in Chile: Dedoscopio is not the only project working on accessibility in astronomy in Chile. A lot

of outreachers have created tactile models with different materials and goals<sup>2</sup> over the last six years. We all collaborated and shared material with each other.

### 3. LOCKDOWN ACTIVITIES

We give two main activities during this lockdown period remotely.

#### 3.1. Using Solar Eclipses to Promote Astronomy as an Inclusive Science

For the Total Solar Eclipse in Chile 2020 we carried out “Kit Eclipse Curioso” (Fig. 3), a box of tactile materials that we sent to 142 families (with one or more BVI members) located in the total solar eclipse region (IX and XIV region in Fig. 2). The box contained 5 tactile experiences to represent: sizes and distances of the Moon-Earth, the relative sizes of the Sun and Moon through two feather balls, types of eclipses with three cards with two textured eva rubber, the phases of the eclipse and the *Abre tus Sentidos a los Eclipses: Sudamerica* (Runyon, Hurd & Minafra 2019) book, in the case of children, their kits also contained the *Lightsound* device (Hyman et al. 2019). We contacted them via Zoom or Youtube to explain how to use the materials and answer their questions. That is how public and private entities have helped us to show how astronomy is a great channel for the visibility of the BVI community.

#### 3.2. Audio-Reading Club

In 2015, Dr. Francesco Palla, an Italian astronomer, decided to write a story based on the encounter of the famous “Little Prince” and a fictional character, the Turkish astronomer (Zinnecker 2017). The Turkish astronomer is the discoverer of asteroid B-612, home of the Little Prince. During their encounter, their conversation blooms with the unique imagination of the Little Prince, endorsed by the astronomers knowledge and its scientific observation. The book “Little Prince’s Universe”, published in



Fig. 3. Examples of Dedoscopio handmade materials.



Fig. 4. Screenshot of one of the Audio-Lecture Club sessions, carried out via streaming.

2017 by Dr. Francesco Palla<sup>3</sup>, translated to Spanish in 2018 by Dr. Dominick Schleicher and Dr. Rodrigo Reeves<sup>4</sup> and launch the Spanish version of the audiobook in 2020 by René Verón<sup>5</sup>. This audiobook is available for free in Biblioteca Pública Digital (Digital Public Library<sup>6</sup>) and it has been perfect for entertainment during the pandemic. We developed an Audio-Lecture Club for BVI children, to clear all the doubts they could have while they listen the six chapters of this audiobook. So far, 19 children and teenagers from Chile and 10 children with intellectual disabilities from Bolivia (Fig. 4) have been part of the Audio-Reading Club, where for a better understanding of the astronomical phenomena discussed in these sessions, we used our hands and arms to represent their movements and shapes.

#### 4. CONCLUSION

The material we prepared within the Dedoscopio Project is understandable. For all the important

physical processes we want to highlight in our models, BVI people identified them correctly. And it is not exclusive for BVI people, but to everyone. We realized that BVI people, it is segregated from the society but they are hungry for knowledge on all type of science. They just need a society where the fact of being included is not an impossible matter. Thus, it is needed for public political effectiveness that they allow the inclusion in the access to the information and cultural development.

The Audio-Reading Club started as a solution for the pandemic global situation which limited everybody to non-in-person activities, but we realized it is another way to perform low-cost inclusive activities and it enable us to reach more people around the world.

For more information please visit:  
 Red de Astronomía Inclusiva in Chile social media  
 L'Universo del Piccolo Principe  
 El Universo del Principito  
 Audiobook launch: El Universo del Principito  
 Digital Public Library

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