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RECA Education: An initiative to bring astronomy to Colombian schools

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Abstract

One of the main objectives of the educational node of the Network of Colombian Astronomy Students (RECA) is to establish links with educators from different schools in the country to develop activities related to astronomy that can be incorporated into the curriculum. Since 2021, RECA Education has been working with schools in Colombia, building relationships with teachers to provide these educational resources focused on astronomy. Through these programmes, RECA aims to encourage students to pursue scientific careers, supporting their academic growth. An overview of the activities carried out by RECA Education is presented, as well as their preliminary impact.

1 Introduction

The Network of Colombian Astronomy Students (RECA[1]) is an association dedicated to fomenting and strengthening connections between Colombian astronomy students and Colombian professional astronomers. In order to achieve its goal, RECA generates spaces that foster the exchange of ideas and meaningful experiences among its members, promoting mutual support for a wide range of academic and social impact projects.

The network was established in 2012 at the III Congreso Colombiano de Astronomía y Astrofísica, COCOA (Colombian Congress of Astronomy and Astrophysics), as a response to the identified needs of physics and astronomy students. Since 2021, the network has been part of the Comunidad de Astrónomos de Colombia, AstroCO[2] (Community of Colombian Astronomers), which is affiliated with the Academia Colombiana de Ciencias Exactas, Físicas y Naturales, ACCEFYN (Colombian Academy of Exact, Physical and Natural Sciences).

Currently, RECA comprises 231 members from a diverse range of institutions across Colombia and internationally. Among its members, 41.1% are women, 58.4% are men and 0.4% are non-binary. Its members are at different stages of their scientific career, from undergraduate and master students to PhD students, postdoctoral researchers, professors and research staff. One of the aims of the network is to disseminate and communicate information about events, conferences, workshops, and research and employment opportunities in astronomy and space science. Additionally, it seeks to support the research training of students to facilitate their transition into the professional astronomy community or the wider job market.

Another key objective is to broaden access to astronomical knowledge from the earliest stages of education, such as elementary and high school, through the support of educators. To achieve these objectives, RECA is organised in specific nodes that promote multiple initiatives: Internship Node, Mentoring Node, Communications Node, Institutional Relations Node, Census Node, Educational Node and Organisational Node.

The operational structure of RECA is horizontal, and each node is aligned with one of the main projects of the network, which emphasises a supportive environment, especially for early career researchers.

2 Main Activities of the educational programme

The RECA educational[3] node was established in 2021 with the objective of introducing astronomy to schools in all socio-economic contexts (rural and urban) in Colombia. Its aim is to facilitate collaboration between professional astrophysicists and schools, and to encourage scientific enquiry from an early age.

The educational node's activities initiated with an accompanying schools' programme, which is centered on school clubs. In Colombia's major cities, where schools have greater resources to implement programmes outside the general curriculum, some educators have

[1] https://www.astroreca.org/
[2] https://accefyn.com/microsites/nodos/astroco/
[3] https://www.astroreca.org/en/educacion

initiated astronomy clubs. However, many schools lack the knowledge required to access resources for activities, which is where the RECA Education Node can provide assistance. For instance, we have collaborated closely with the Abraham Maslow School in Bogotá[1], which boasts an observatory equipped with two 12-inch and 16-inch telescopes, as well as a weather station. We have conducted motivational talks for primary and secondary school students, encouraging them to utilise these resources within their academic studies. Furthermore, we have provided guidance to the astronomy curriculum teacher, assisting in the integration of ideas and resources within the classroom.

Furthermore, the educational node's activities with educators in schools include the *Astronomy goes to your School* programme, collaboration with *Shadow the Scientist*, the organisation of a drawing contest *Pintando el Universo*, and the *BARCo* project. Our first activities showed us that it was necessary to further focus on activities to reach out to schools with limited resources and/or with poor internet access, as well as those in areas affected by armed conflict. By extending our reach to all corners of the country, we are able to engage more children with astronomy and science in general. The core activities of the node are outlined in the following section.

2.1 Astronomy goes to your School

The "Astronomy goes to your School"[4] programme provides an opportunity for schoolchildren to interact with an astrophysicist or attend a talk related to various topics in astronomy and achievements of women in science. In addition to the principal objective of the activities of the education node, the intention is to create role models with whom the students can identify, and at the same time we encourage these talks to be given by Colombian women astrophysicists to promote the presence of girls in STEM fields. This program has been offered between 2021 and 2023 and allows students from different regions of Colombia to participate in live virtual meetings with Colombian astrophysicists.

In 2021, 14 talks were given in different public and private schools in cities such as Bogotá, Medellín, Cali and Bucaramanga. Despite the number of talks requests, only 64% of the scheduled talks were completed. The primary challenge was communication with educators and the use of virtual platforms such as Zoom or Meet, which were not readily accessible to the educational community at the time. During this edition, it was possible to identify that the primary mode of communication with educators was via WhatsApp. Indeed, during the period of the pandemic COVID-19, students were required to attend classes and submit assignments via this platform. From that point onwards, we began utilising WhatsApp Business for communication and planning activities.

As a result, in the 2022 edition, we observed a 14% increase in the number of talks given in comparison to the previous year, due to the change in communication methods with educators. Of the requested talks, 30 (78%) were conducted in different regions of Colombia, including five schools in rural areas. The RECA education team and the educators faced a significant challenge in conducting these talks, as internet access was unavailable in the schools. Therefore, the sections were recorded on weekends. However, there were still a

[4]https://www.astroreca.org/en/colegios

number of issues and delays in the final meeting between the astrophysicist and the school due to a lack of connectivity.

In the 2023 edition, 52 talks were conducted, representing a 17% increase in the number of talks held. A total of 96 talks were given by 72 professional astrophysicists over the course of the three editions of the "Astronomy goes to your school" programme. There was a notable increase in the number of talks requested, as well as the number of talks conducted. This resulted in a broader reach, with the programme being presented in more cities across Colombia and in 18 of the 32 Deparments[5] of Colombia.

2.2 Collaboration with Shadow the Scientists

With the goal of presenting new proposals to schools, especially those with better internet access and the means to set up online conferences, we started a collaboration with Shadow the Scientists (StS)[6]. This initiative was created to connect the public to scientists engaging in authentic scientific experiments, such as astronomy observing experiences with professional astronomers on world-class telescopes. StS immerses participants in a 100% authentic scientific research experience. StS sessions have been thrilling for the participating students and educators because of the opportunity for them to connect with scientists, understand what they are passionate about, and learn about the underlying science. In the context of this activity, a Colombian astrophysicist, in addition to acting as translator, meets with the schools beforehand to give a preliminary explanation to the students about the science of what they will observe and the telescope, making the experience more enriching. The live sessions are approximately 2 hours of interaction, with questions from the students, who are joined by the observer, the StS organizers, the Colombian astrophysicists, and RECA Education members. To date we have hosted two sessions in 2023[7] and one session in 2024.

2.3 Drawing contest "Pintando el Universo"

To expand the reach of our astronomy activities and to reinforce ties with Colombian and Spanish astrophysicists, with whom we collaborate on other RECA projects (e.g. mentoring and internship programme), we proposed the project "Pintando el Universo"[8] to the Colombian Embassy in Spain.

The objective of this programme is to introduce astronomy to schools in all 32 Colombian Departments by means of a talk that inspires primary school students to make a draw that relates astronomy and Colombian culture and society. The talks were carried out by 32 Spanish and Colombian astrophysicists, who presented their work and career path. In recognition of the students' work, a jury selected one drawing per Colombian Department to be awarded with two astronomy books, kindly donated by Editorial Planeta. At the same time, two additional books were donated to the library of each participating school, to provide

[5] Political and administrative division of Colombia
[6] https://shadow.ucsc.edu/
[7] https://www.astroreca.org/en/observaciones-remotas
[8] https://www.astroreca.org/en/concurso-dibujo-2024

all children with material to encourage their scientific vocation. The selected drawings are available on the RECA website and were exhibited at the Madrid Planetarium in December 2024 and January 2025.

2.4 BARCo: Bringing Astronomy to Rural Communities of Colombia

The project "Astronomy goes to your school" demonstrated the efficacy of internet-based communication in achieving our objective of introducing astronomy to schools in Colombia. However, despite our best efforts, only 10 of the 42 schools in rural areas that approached us requesting a live virtual talk with an astronomer were reached and some of these were pre-recorded. It became evident that relying solely on current communication channels would present significant challenges in reaching these populations. In Colombia, approximately 57% of the population lacks internet access[9], particularly in rural areas. It was therefore necessary to create alternative channels to reach these communities.

The "Bringing Astronomy to Rural Communities of Colombia" (BARCo) initiative, financed by the IAU through its Office of Astronomy for Development (OAD)[10], is enhancing science education in rural Colombian schools by providing activities that use readily available resources, despite the lack of internet connectivity. We designed a BARCo kit, in which we provide resources and guides built by professional Colombian astrophysicists so that educators can successfully develop activities with their students. We have reached 104 rural schools, engaging with a single class of approximately 25 children aged 5 to 16 at each school, impacting a total of around 2,500 children. Our reach, however, is set to grow, as several schools have shown interest in using the kit with additional classes and at other campuses, potentially extending the impact to around 10,000 children.

The BARCo kit consists of a box with materials for fundamental astronomy activities, games, and a USB memory stick with written and recorded instructions. The general astronomy didactics package comprises an activity booklet and physical materials for six activities. Each activity is fully detailed with the necessary materials, step-by-step instructions, feedback questions and answers, as well as supplementary materials to support each activity.

In particular, the bingo game about astronomy in Colombia includes instructions for the game, 16 cards and three cut-out pages featuring 21 characters, events and locations related to astronomy in Colombia. The card game "Mujeres que Inspiran", comprises the detailed instructions, 35 cards featuring the history of Colombian women scientists, six jokers representing areas of research, 19 challenge cards (easy, medium and hard) and a constellation board. A glossary has been included for further clarification. The accompanying booklet provides key definitions and unit tables to clarify any technicalities and accompany the activities. Likewise, throughout the BARCo project's development, RECA members have provided a constant guidance and support to educators to ensure the optimal execution of activities.

All the materials included in the boxes are available for download from our website[11]. The digital materials allow the activity to be reprinted and distributed to other local schools,

[9] https://www.dane.gov.co/files/operaciones/TICH/bol-TICH-2022.pdf
[10] https://www.astro4dev.org/bringing-astronomy-to-rural-communities-of-colombia/
[11] https://www.astroreca.org/en/barco-astronomia-rural-colombia/kit-barco

extending the reach of the project and ensuring its continuity for years to come.

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