

Division C WG Key Initiatives in Education, Outreach and Development — Functional

Chair: Beatriz García

Co-chair: Rosa M. Ros



Introduction

The Key Initiatives is a very young WG depending on the IAU Division C.

The main purposes are act as

- an anchor to link the Programs with the IAU
- a structure to involve the successful programs which were maintained for a long time, that have several successful stories, and which can serve as inspiration for the new proposals.

In this sense and during the first year of existence, the KI-WG followed some main objectives and some of them are:

- Assure continuity to link the programs with the IAU.
- Be a Forum to establish and discuss about key programs and to identify new ones
- Propose tools for evaluation
- Coordinate and provide the tools for exchange between the programs avoiding overlap
- Advice about inclusion and equity.

Into this framework, the special projects which are part of the WG, are working in an independent way, enlarging their own goals and producing new and amazing tools, projects, programs and supporting specific lines of work, locally or globally, which, in some cases, were born as part of the IAU initiatives for the IYA2009, as is the case of the GTTP and NASE.

Structure

The KI-WG initiated its activity with 4 main programs:

- [Galileo Teacher Training Program \(GTTP\)](#)
- [Network for Astronomy School Education \(NASE\)](#)
- [Pale Blue Dot](#) (Astronomy for Global Citizenship and Environmental Awareness)
- [Universe Awareness \(UNAWE\)](#)

During 2022 two very successful programs were incorporated:

- [Eratosthenes Experiment](#) (Greece)
- [Proyecto Eratóstenes](#) (Argentina-America); [La Tierra es redonda](#)

At the moment, the KI-WG is organized through an EC, integrated by [Rosa M. Ros \(Co-Chair\)](#) [Rosa Doran](#), [George Kildare Miley](#) and [Gustavo de Araujo Rojas](#), 4 advisors: [Itziar Aretxaga](#) (ISYA Director), [Lina Isabel Pires Canas](#) (OAO Director), [Kevindran Govender](#) (OAD Director) and [Markus Pössel](#) (OAE Director), and 23 members.

Activities along the 2021-2022 period

Along the first period, the main activities deployed by the KI-WG was connected with the invitation to participate of the proposal to new groups and new members.

On the other hand, each Program inside the WG, report their own successful stories along the year. It is very interesting that the new Programs (Eratosthenes America and Eratosthenes Greece) in permanent contact with the chairs of the WG.

One of the goals of this WG is to show the different proposals on the Globe, some tome not very well known by others astronomers, professional or amateurs.

In the following items, we summarize the main activities and results reported by the chairs of each program

A. Eratosthenes experiment 2022 -Greece

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The Eratosthenes Experiment was organized on the 21st of March and the 23rd of September 2022 by Ellinogermaniki Agogi's (EA) Research and Development Department in collaboration with the Hellenic Mathematical Society. The event received a a great response, as 389 schools from 63 countries all over the world participated in this celebration of science and education, calculating the circumference of the Earth by using e-Learning educational tools and simple instruments. The success of 2022's implementation can be confirmed through the traffic in the Eratosthenes website (<http://eratosthenes.ea.gr>):

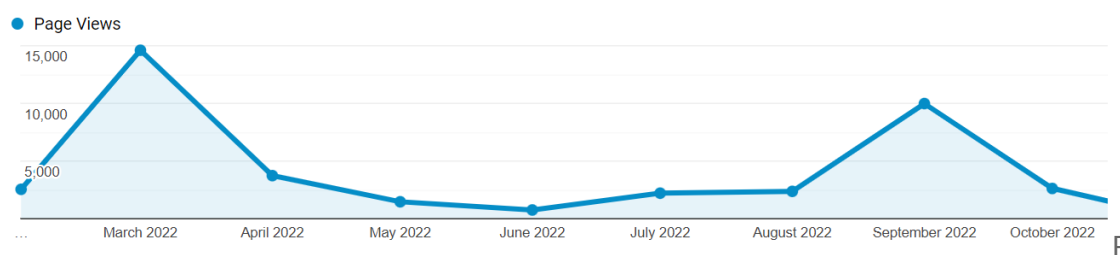


Figure 1. Page views in the Eratosthenes experiment website for the 2022 events: More than 12,500 users did more than 40,000 page views.



Figure 2. Schools participating in Eratosthenes experiment 2022

Eratosthenes Photo Contest

In addition to the experiment, the Eratosthenes annual photo contest was launched for teachers with more than 25 participants who submitted pictures capturing their schools' involvement in the experiment.



Figure 3. Winning Photo of the Eratosthenes Experiment March 2022 Photo Contest

The winner of the 2022 contest, Mr. Francis Murillo Emralino from the Philippine Science High School CALABARZON Region Campus (Philippines), won a scholarship for the European School Innovation Academy's summer courses 2022 held in Greece.

Eratosthenes Live event

The 2022 experiment was further flanked by the organization of a live online event in which students of the 1st grade of High School of Ellinogermaniki Agogi in collaboration with students from Bloemfontein and the University of the Free State of South Africa calculated the circumference of the Earth within 3% of the nominal value.

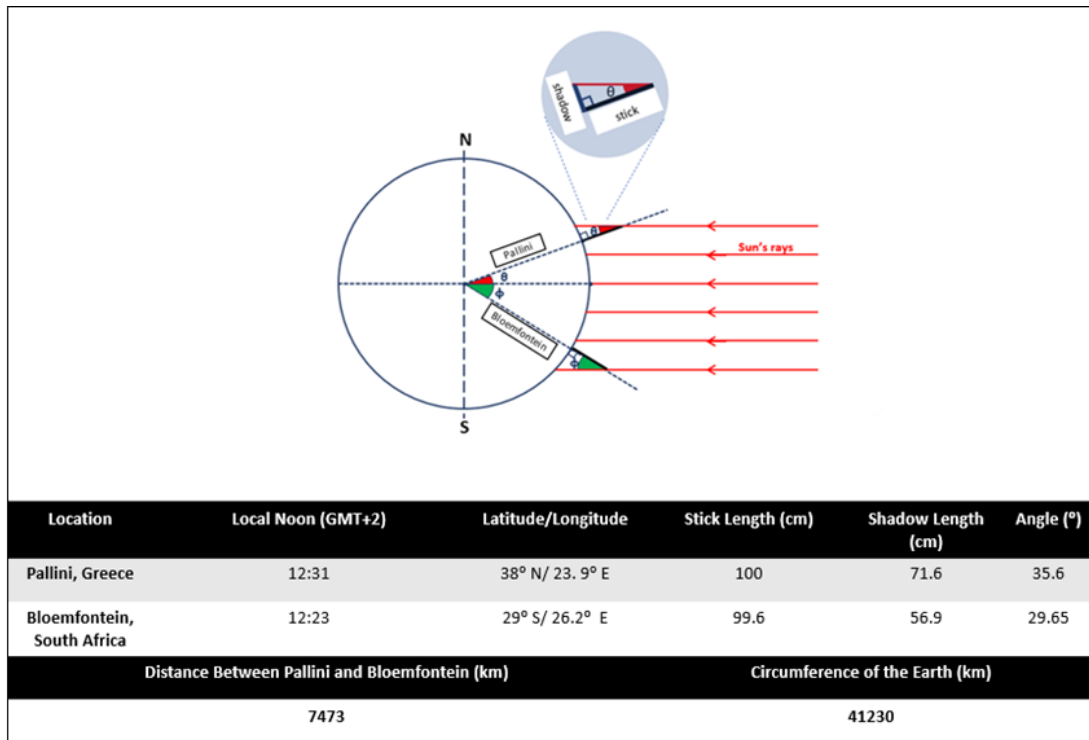


Figure 4. Measurement of the circumference of the Earth in the live event.

The enthusiasm of the participating students and professionals was high, as, despite the pandemic crisis they were given the opportunity to participate in this interactive, didactic and collaborative international experience.

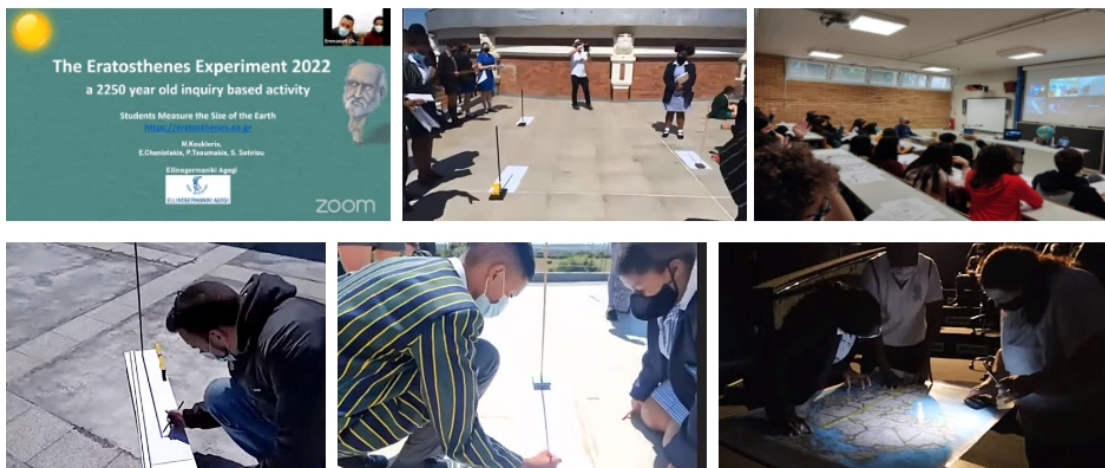


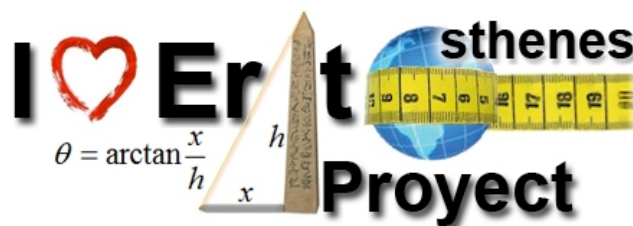
Figure 5. Photos from the 2022 live event

The recording of the live event together with the program, measurement results and relevant material can be found in the event's page: <https://eratosthenes.ea.gr/content/main-event-2022>

B. The Eratosthenes Project America



Devoted to Middle / high school students from all the World measure the size of planet Earth with sticks, shadows, mathematics and imagination.



Organized by:

- Guillermo Mattei (Contact: gmattei@df.uba.ar), Department of Physics, Faculty of Natural Sciences, University of Buenos Aires.
- Beatriz Garcia, Pierre Auger Laboratory and National Technological University (Regional Mendoza).
- Edgardo Bonzi, Argentine Physical Society.

Each year, a new "lema" is selected. In 2022 Version the lema was in touch with The International Year of Basic Sciences for Sustainable Development.

Report of results

- 72 schools participated from Argentina, Brazil, Colombia, Spain, Italia, Nicaragua, Paraguay, Perú, Romanía and Uruguay.
- Students involved in the activity were approximately 5000.
- Measurements were taken between 9/12/22 and 9/30/22 at solar noon.
- With the results reported by schools performed the analysis "Optimizing the NS component of distance and measurement day".
- Pairs of schools maximizing the NS component of distance were chosen and considering who carried out the measurements on the same day. Thus 163 pairs of schools were selected. Radii obtained are calculated from the measurements reported by schools and 78 data were discarded because they clearly away from the values obtained for the rest.
- The average value of the data is $R = 6.310\text{km}$ and standard deviation $S = 784\text{km}$.

- The standard error of mean S_p , S obtained by dividing by the square root of the number of measurements, it turns $S_p = 60\text{km}$.
- FINAL RESULT : $R=(6.310\pm 60)\text{km}$

Only statistical errors were considered, it was not asked schools to report on the estimates of the errors of their measurements. Indeed, in many cases the schools did not discuss this issue, considering that has a level of complexity too high to discuss in class. According tabulated values the Earth's radius is $R = 6371 \text{ km}$, very close to the value obtained.

More information in: <https://df.uba.ar/es/difusion/102-difusion-eventos/8342-eratostenes-2022>

C. NASE – Network for Astronomy School Education

Contact: Rosa M. Ros (rosamariaros27@gmail.com)

The NASE program continues with the proposal of training teacher on Didactics of the Astronomy. In 2022, a new website for the program was released (<https://www.naseprogra.org>), with new and improved materials.

In the map (Figure 6), It is possible see the expansion of the program on the Planet.

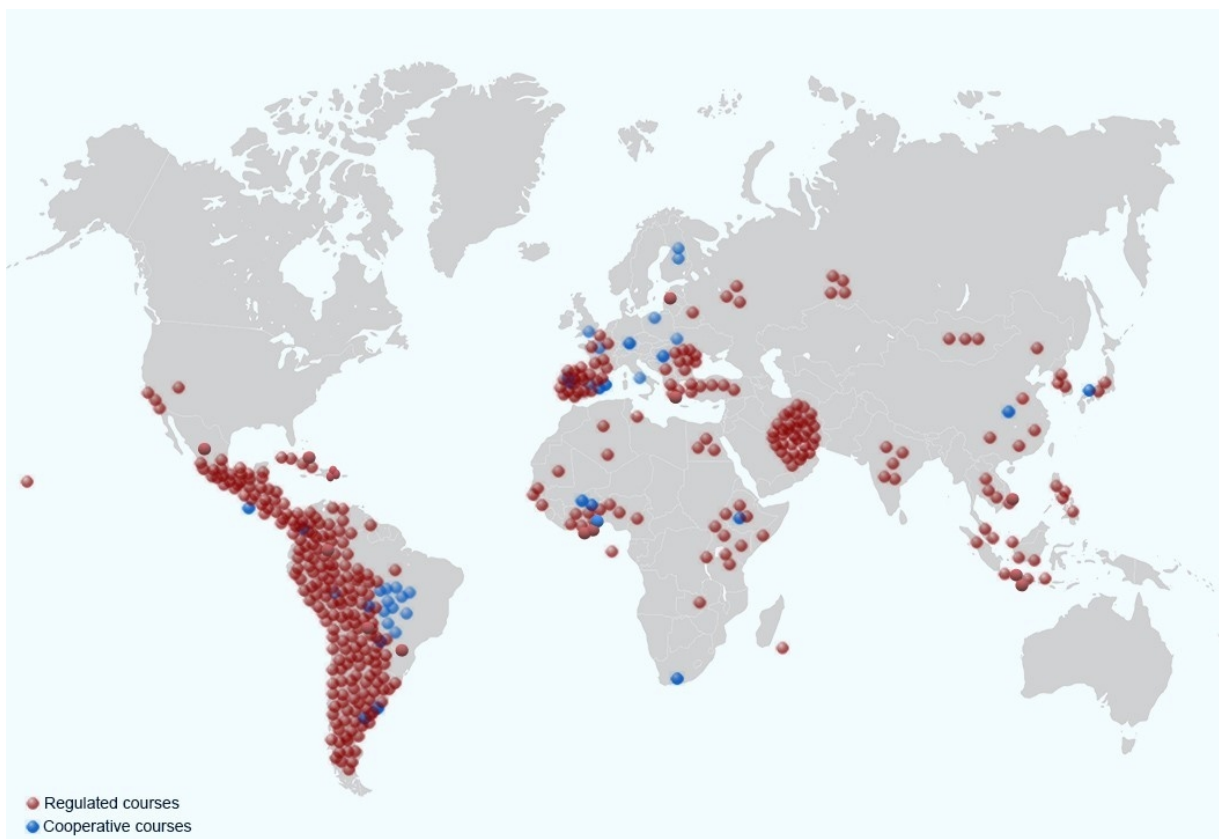


Figure 6. NASE courses Map (end 2022)

1. Courses

It is important to mention that during 2020 and 2021 all the NASE courses were completely online, synchronous. It was not very difficult to adapt the workshops to the pandemic reality, because NASE had the full set of activities transformed into the virtual version of the program. This new approach was named as *NASE Boxes online*. In this sense, new materials, new videos and a re-designed YouTube channel, helped to make this activity very successful.

Beyond the pandemic and as part of the innovation in NASE offer, the virtual version of the course, is still available, and many places on the planet decided to develop the course in this format, completely online or hybrids with professors and participants online, to avoid the very expensive travels and to assure the participation of more teachers.

Between December 2021 and December 2022, the courses carried out were:

2022

- Guatemala (Guatemala) November 14-18 -2022
- Guatemala (Guatemala) November 14-18 -2022
- Hanoi (Vietnam)- November 11-12,2022
- Athens (Greece) – November 5, 2022
- Guadalajara (Mexico) – October 6-7, 2022
- Asunción (Paraguay) – September 5-30, 2022
- Tunja (Colombia) – September 15-23, 2022
- Porto-Novo (Benin) – August 25-26, 2022
- Santiago de los Caballeros (Dominican Republic) – August 13, 2022
- Campo Mourão (Brasil) – August 12-13, 2022
- Conakry (Guinea) – June 28-29, 2022
- Ulaanbaatar (Mongolia) – June 21st-22nd, 2022
- Cairo (Egypt) – June 21-22, 2022
- Dar es Salam (Tanzania) – June 18, 2022
- Fars (Iran) – January 18-19, 2022
- Charcas (Mexico) – June 9-11, 2022
- Dili (Timor-Leste) – May, 28 – June, 11, 2022
- Istanbul (Turkey) – May 24-27, 2022
- Lahijan (Iran) – April, 30 – May, 1, 2022
- Neuquen (Argentina) – April, 29 – May, 21, 2022
- Orihuela (Spain) – April 29-30, 2022
- Mendoza (Argentina) – April, 26 – May, 19, 2022
- Istanbul (Turkey) – April 25-30, 2022
- Layton (United States of America) – April, 21 – May, 6, 2022
- Ardabil (Iran) – April 18-19, 2022
- Tachira (Venezuela) – April 2-24, 2022
- Arba Minch (Ethiopia) – March 24-25, 2022
- Orihuela (Spain) – March, 16 – April, 30, 2022
- Orihuela (Spain) – March 16-26, 2022
- Mobarakeh (Iran) – March 5-6, 2022
- Porto (Portugal) – March 5-19, 2022
- Paris (France) – March 2-9, 2022

- Barcelona (Spain) – March, 2 – May, 30, 2022
- Delhi (India) – February, 13 – March, 6, 2022
- Porto (Portugal) – February 12-19, 2022
- Yekaterinburg (Russia) – February 8-11, 2022
- Fars (Iran) – February 8-9, 2022
- Barcelona (Spain) – February 7-9, 2022
- Coclé (Panamá) – February 7-8, 2022
- Réunion (France) – February 2-9, 2022
- París (France) – February, 2 – March, 16, 2022
- Yekaterinburg (Russia) – February 1-4, 2022
- Tehran (Iran) – February 1-2, 2022
- Delhi (India) – January, 29 – February, 6, 2022
- Bucharest (Romania) – January 27-28, 2022
- Istanbul (Turkey) – January 20-22, 2022
- Hanoi (Vietnam) – January 17-20, 2022

2021

- Barcelona (Spain) – November, 17, 2021 – February, 16, 2022,
- Delvar (Iran) – November, 18, 2021,
- Orihuela (Spain) – November, 19 – December, 2, 2021,
- Istanbul (Turkey) – November 23-25, 2021,
- Vitebsk and Moscow (Belarus and Russia) – November 23-25, 2021,
- Shahre Rey (Iran) – November, 28-29, 2021,
- Terengganu (Malaysia) – December, 11-12, 2021,
- Fars (Iran) – December, 16, 2021,
- Dolna Mitropolia (Bulgaria) – December 16-18, 2021,
- San Salvador (El Salvador) – December 17-18, 2021

2. Project with UNESCO: Bridges between Cultures: International Day of Light (https://www.naseprogram.org/categoria_curso/online-events/)

To commemorate the International Day of Light (IDL) convened by UNESCO annually, NASE proposes to all its participants and instructors to carry out a simple experience but of great educational interest. Although the day of light is May 16, it is proposed to all participants to do it throughout the half year, from the March equinox to the September equinox. It is not limited to May 16 because, as is well known, this day falls within the rainy season in some countries. For this reason, interested teachers can be carried out with their students for half a year. We request that you send us some testimonial photos and the data in the observations obtained during the development of the experience. The table in the introductory material to read to prepare for the experience. Good luck and have a cloudless day or night to do so.

[Link to the UNESCO website there all works are \(the project NASE appears at the end, in “worldwide”\)](#)

In 2022 the project was **Latitude for traveling and navigate**, NASE's proposal is included in the International Day of Light, which remembers the day when a laser beam created by human beings was turned on for the first time, it is about calculating the latitude where the participants are any day between March 20th and September 23rd, 2022, and fill the final table with data requested.”.

More information in: https://www.naseprogram.org/iau-unesco-projects/latitude_traveling_navigate/

3. NASE + : the closure of the Bridges Between Cultures

As part of the end of the UNESCO project for each year, a new hybrid meeting was proposed by NASE: NASE+.

As the name indicates, this new proposal is devoted to joint NASE members with the specialist in the topic selected for the IDL, but also invites to think in the adventure of Science in an interdisciplinary way.

The information is at: https://www.naseprogram.org/categoria_curso/hybrid-events/

The summary of the *1st NASE+ Road maps*, is at:

<https://www.naseprogram.org/wp-content/uploads/sites/10/2022/12/pdf8octunido2.pdf>