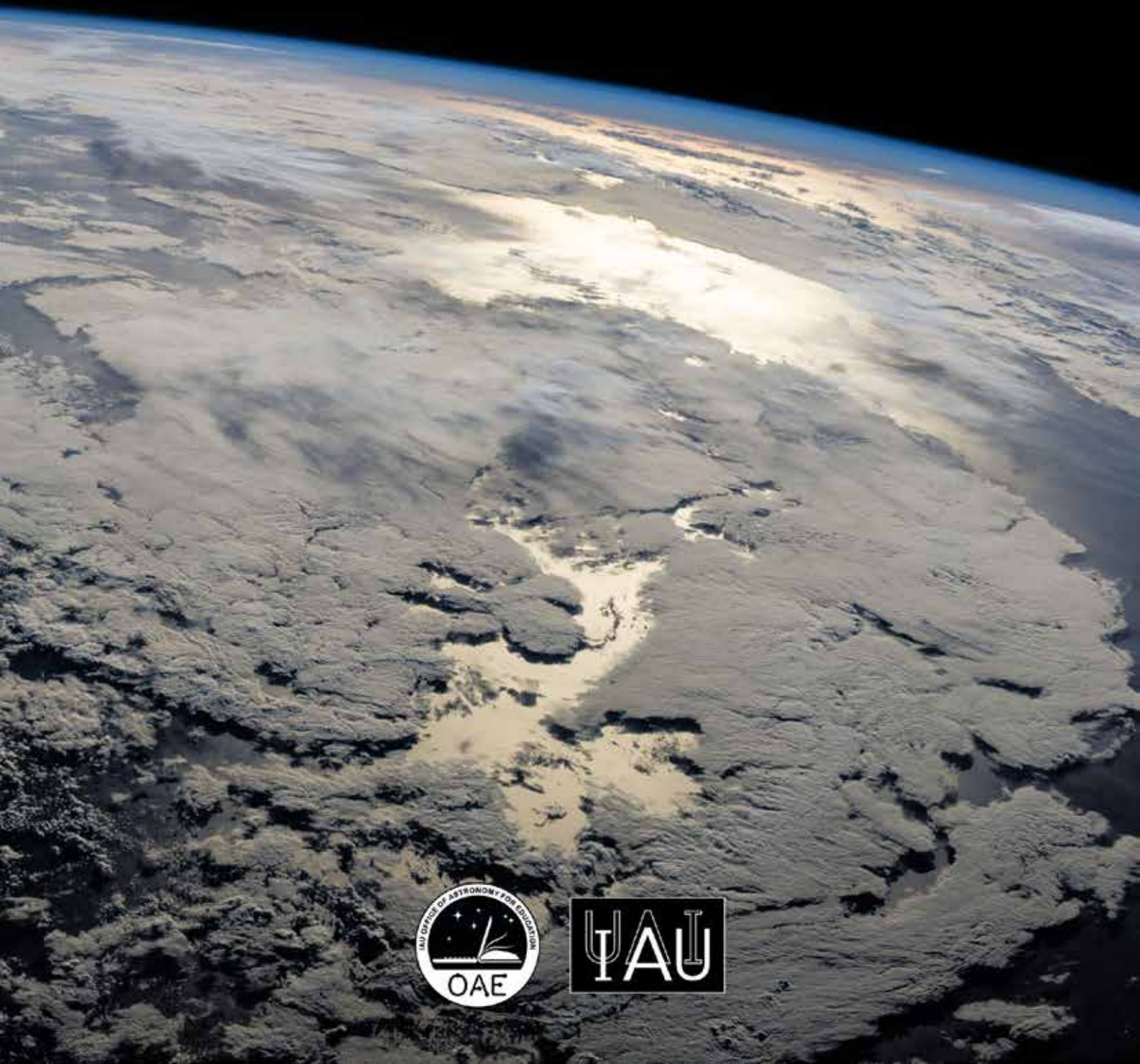
2nd Shaw-IAU Workshop on Astronomy for Education

October 6-9, 2020



Foreword

Just like many other scientific events this year, the Second Shaw-IAU Workshop was forced online by the current pandemic. For us, this change proved fortunate – instead of a workshop on location, which would necessarily have had a much more limited number of participants, the virtual format allowed us to accommodate more than 300 participants from all over the world. And with the funding provided for this series of workshops by the Shaw Prize Foundation, we had the resources to make this workshop a state-of-the-art online event.

For the Office of Astronomy for Education, this opportunity for a virtual meeting came at just the right time: We began building our network of National Astronomy Education Coordinators (NAECs) this spring. By the time of the workshop, we had confirmed 268 NAECs in 78 different countries, and the virtual workshop allowed us to bring those NAECs in contact both with each other and with the wider astronomy education community. With virtual talks by both the NAECs themselves and by stakeholders from the international astronomy education community, we were able to address a number of topics that will play key roles in the upcoming work of the OAE community: diversity, equity and inclusion is one such topic, as is the question of how astronomy education can be made to work in low-tech environments.

Both from our own perspective and going by the feedback of participants, our workshop has reached its goal of strengthening the network of NAECs, connecting stakeholders, and fostering awareness for the OAE and for the key goals we are pursuing in astronomy education, on an international level. With this documentation, we want to make the workshop and its result accessible to a wider community. On its pages, you will find not only descriptions of the workshop‘s sessions, but also QR codes linking to the recordings of the videos of each session‘s talks. For the OAE community, the workshop was the beginning of a longer, common journey. This documentation will enable you to join us aboard.

Markus Pössel and Carolin Liefke
Heidelberg, December 2020

Workshop Concept

We planned the Second Shaw-IAU Workshop to be as inclusive and accessible as we could make it. Our talks and contributions were structured into five sessions. Four of the sessions were repeated, happening in two time slots that were scheduled so as to allow participants from diverse time zones to attend. The opening event and the two sessions on „Astronomy around the World“ were one-off events.

Each session began with a number of talks. All of the talks were pre-recorded and captioned for better accessibility. The event software Hopin, which we used for our workshop, provides chat windows for text-based interaction both for the event as a whole, and for each separate session. During each talk, the speaker was present in the event chat, interacting with the audience in a text-based discussion. The combination of a single video stream with text-based communication was also meant to make the events accessible to participants with low-bandwidth connectivity – leaving text-based comments takes much less bandwidth than joining an event with video and audio.

After the talks, each session featured a moderated panel discussion with the session‘s speakers. Discussions typically took up issues raised in the session chat, plus additional questions from the moderators. The discussion session was live-captioned, with the text available in an extra window.

For several sessions, there were a total of 21 associated „posters“: Either graphical representations or brief videos, with additional contributions to the session topic. Session posters were available in the virtual exhibition area of the event, where participants could browse, and click on, the available contributions. The exhibition area also featured contributions from 51 NAEC Teams, each featuring a brief video showcasing highlights of astronomy education for a specific country, as well as introducing the country‘s NAEC team.

All sessions, except for the final one, were followed by a „Meet and Greet,“ making use of the networking feature that is part of the Hopin event platform. The feature randomly pairs event participants in a one-on-one video chat, allowing participants to connect personally with each other. A number of participants commented that the formal framework, relieving participants of the necessity to actively seek out and contact people they had not previously met directly, was particularly helpful in making diverse contacts – in contrast with talking mostly to those people one had already known previously.

Throughout the meeting, the background, a helpdesk, easily accessible at the click of a button using the software Intercom, provided help to participants with technical issues.

Welcome to the 2020 Shaw-IAU Workshop on Astronomy for Education

Markus Pössel, IAU Office of Astronomy for Education, Germany poessel@astro4edu.org

The opening of the Second Shaw-IAU Workshop doubled as the festive opening of the IAU's Office of Astronomy for Education (OAE) as a whole. After all, while the office itself has been active since the beginning of the year, the Corona pandemic had forced us to cancel the in-person opening meeting we had had planned for July, and gathering so many of our friends, supporters and collaborators for the Shaw-IAU Workshop was the ideal opportunity for having an appropriate virtual official opening.

On behalf of the International Astronomical Union (IAU), participants were welcomed by Prof Ewine van Dishoeck of Leiden University, the President of the IAU. Prof. van Dishoeck gave an overview of the IAU activities that led to the foundation of its office of Astronomy for Education – outlining the IAU's broader mission, which includes astronomy education, and in particular the IAU's Strategic Plan 2020–2030 that outlines the organisation's implementation strategy. A key element of that strategy are the IAU offices: the Office for Young Astronomers that grew out of the organisation's International Schools for Young Astronomers (at Master and PhD level), which have been held since 1967; the Office of Astronomy for Development founded in 2011 and based in Cape Town; the Office for Astronomy Outreach founded in 2015, and based in Tokyo, and, allowing the IAU to "complete this family," the Office of Astronomy for Education in 2019.

Part of a greater strategy

Both for our workshop and for the OAE, Goal 5 of the IAU's Strategic Plan 2020–2030 is key: The IAU stimulates the use of astronomy for teaching and education at school level. The wording is important here, van Dishoeck stressed: We are not talking about teaching astronomy, we are talking about using astronomy for teaching and education at school level. Van Dishoeck proceeded by outlining the OAE's goals as defined in the strategic plan, and giving an account of the IAU's previous activities in education, including successful projects such as the Galileo Teacher Training Programme (GTTP), the Network for Astronomy School Education (NASE), Universe Awareness (UNAWE), Space-EU, and others. She closed by pointing out the role of astronomy as a very-low-threshold gateway into the sciences.

The OAE has only been made possible by the support of three major funding organisations, all of which were represented at the opening. Theresia Bauer, MdL, is the Chairwoman of the Carl Zeiss Foundation Administration, and is also the Minister for Science, Research and Art of the State of Baden-Württemberg. Speaking in both of those roles, but also as a citizen of Heidelberg, Minister Bauer expressed her satisfaction that the IAU had chosen Haus der Astronomy, and Heidelberg, as the new home of the Office of Astronomy for Education. She described the well-known connections of the Carl Zeiss Foundation with astronomy, given the founding companies' roles in the development of planetaria and optical systems, including mirrors for many modern research telescopes.

Astronomy as inspiration – and the foundation of breakthroughs

Minister Bauer also emphasized the Foundation's belief in the deep connection between scientific breakthroughs and inspiring the general public, and young people in particular, to wanting to learn more about science – a perfect fit with the mission of the OAE. The Carl

Welcome to the 2020 Shaw-IAU Workshop on Astronomy for Education

Zeiss Foundation funds the position of Astronomy Education Coordinator at the OAE for five years, with the possibility of continued funding depending on a positive evaluation. Minister Bauer particularly pointed out the importance of digital education, as a key focus of the OAE's network – and as an area that has recently become even more important as education adapts to the conditions of the world-wide pandemic.

Beate Spiegel, Managing Director of the Klaus Tschira Foundation, recounted the founding of Haus der Astronomie (literally "House of Astronomy") by the foundation and its partners in 2011, which is now hosting the Office of Astronomy for Education. She described the special role of astronomy, with its inspirational images, serving as a gateway into the STEM subjects when the initial fascination is transformed into a deeper understanding. Pointing out the current challenges for science communication during the COVID-19 crisis, Ms. Spiegel stressed the importance of making education equitable, fostering diversity and inclusion – not least fostering interest in astronomy independent of social background, and of access to specific technical equipment. The Klaus Tschira Foundation supports the OAE with funding for two positions – with the flexibility to use some of the funds for a visiting scientist programme (pandemic conditions permitting), as well as for creating educational resources.

Creating an international network

The Shaw-IAU Workshops are named for the Shaw Prize Foundation, which supports this series of workshops organised by the OAE. Prof Kenneth Young, Chairman of the Shaw Prize Council and Vice Chair of its Board of Adjudicators, expressed his satisfaction with the laying of the foundations of the OAE's international network at the first Shaw-IAU Workshop in Paris, in December 2019, and the network's growth to encompass the current number of about 250 National Astronomy Education Coordinators (NAECs) across nearly 80 countries – which account for the largest group of participants. Young stressed how this network built bridges in at least two dimensions: reaching across national boundaries, but also linking the community of astronomy researchers and the community of educators – reflected in the diverse attendance of the present workshop.

The goal, Young continued, was not just to advance the cause of astronomy around the world, but for advancing the wider shared values and shared visions for the future of humankind. Further advances in science rest on the genius and dedication of the next generation – and, as Young pointed out, nothing would please the Shaw Prize Foundation more than if the endeavors of the OAE, its network and of the workshop participants were to inspire teenagers who then, twenty, thirty or forty years hence, would go on to win a Shaw Prize in Astronomy!

How the OAE came to Heidelberg

Next up was Prof Teresa Lago, General Secretary of the International Astronomical Union, who was in charge of organising the selection process that, in the end, brought the Office of Astronomy for Education to Haus der Astronomie in Heidelberg. The process began after the IAU's 2018 general assembly with an open call that, by September 2018, resulted in 23 different letters of intent to host the OAE, from all inhabited continents. By the end of February 2019, a high-level committee set up for the purpose had selected a short-list of 9 applicants, who were asked to submit full proposals for hosting the OAE by June 2019.

Welcome to the 2020 Shaw-IAU Workshop on Astronomy for Education

By the deadline, six complete proposals were received – from France, Germany, Italy, the Netherlands, China and India. The evaluation led to a clear ranking, with the proposal presented by Haus der Astronomie in Heidelberg in the first place. The IAU decided to capitalize on the huge interest generated by this process in astronomy education circles around the world to make the concept more inclusive: an IAU Office of Astronomy for Education extended by a worldwide network of OAE Centers and OAE Nodes. In parallel, in April 2019, the IAU and the Shaw Prize Foundation signed an agreement of cooperation that led to the series of Shaw-IAU Workshops on Astronomy for Education. The first such workshop, organised by the IAU Secretariat in December 2019 in Paris, laid the foundation for this wider vision for the OAE, inviting representatives from institutions that had submitted proposals or letters of intent and additional members of the astronomy education community.

Student interest in astronomy

Whereas all previous speakers had pointed out the power of astronomy to fascinate a general audience, but also young people in particular, our keynote speaker, Prof Svein Sjøberg, professor emeritus in science education at the Department of Teacher Education and School Research of the University of Oslo, had the hard data to back up those and related statements. In his keynote, Sjøberg presented selected results from the project ROSE (Relevance Of Science Education), a study of how 15-year old-students in different countries relate to science and technology. For this project, young people from some fifty countries expressed their experiences, attitudes, interests and future plans. The data revealed interesting differences between young people from different countries, as well as large differences between girls and boys.

For astronomy, and in particular for those interested in leveraging astronomy for education, the results of the ROSE study have been quite encouraging: The scientific question that was considered most appealing by the respondents, across genders and countries, was the search for life beyond Earth. For space science overall, student interest follows a more general gender pattern visible in the study, for instance with technology-heavy contexts like the use of satellites for communication, or rockets and space travel, more appealing to boys than to girls. The interest in stars, planets and the universe, on the other hand, shows only small gender differences (at a medium level of overall interest).

Black holes, supernovae and other spectacular objects in space, on the other hand, meet with relatively high interest among both boys and girls, and the same is true more generally for the context “Space and wonder,” denoting topics in astronomy and space at the borders of our current knowledge. Similar statements are true about the context “Space and the unknown,” including topics such as how comets and asteroids may cause disaster on Earth.

Data collection for the ROSE study took place between 2004 and 2006, and currently, education researchers are preparing for its successor, ROSES (ROSE Second) as a follow-up – an announcement by Sjøberg that immediately prompted discussion among the NAECs about possibilities for participating, or for initiating similar studies tailored more specific to astronomy.

The session ended with organisational remarks by OAE Director Dr Markus Pössel, who had also been the session’s moderator. All in all, an auspicious beginning to our workshop!

Sessions distributed in different Time Zones

Tuesday 6th October			
Time UTC	**Time UTC +2**	**Duration**	**Topic**
14:00 – 15:30	16:00 – 17:30	1h 30mins	Opening Session

Wednesday 7th October			
Time UTC	**Time UTC +2**	**Duration**	**Topic**
07:00 – 08:40	09:00 – 10:40	1h 40mins	Session 4 – Astronomy education resources
10:25 – 12:15	12:25 – 14:15	1h 50mins	Session 2 – Astronomy Education within the IAU
14:00 – 15:40	16:00 – 17:40	1h 40mins	Session 1 – Making astronomy education equitable, diverse and inclusive
17:25 – 18:55	19:25 – 20:55	1h 30mins	Session 3 – Astronomy education in low-tech environments: Challenges and solutions

Thursday 8th October			
Time UTC	**Time UTC +2**	**Duration**	**Topic**
07:00 – 08:40	09:00 – 10:40	1h 40mins	Session 1 – Making astronomy education equitable, diverse and inclusive
10:25 – 11:55	12:25 – 13:55	1h 30mins	Session 3 – Astronomy education in low-tech environments: Challenges and solutions
13:40 – 15:00	15:40 – 17:00	1h 20mins	Session 5 – Astronomy education around the world
16:45 – 18:35	18:45 – 20:35	1h 50mins	Session 2 – Astronomy Education within the IAU
20:20 – 21:40	22:20 – 23:40	1h 20mins	Session 5 – Astronomy education around the world

Friday 9th October			
Time UTC	**Time UTC +2**	**Duration**	**Topic**
07:00 – 08:40	09:00 – 10:40	1h 40mins	Session 4 – Astronomy education resources
08:40 – 10:10	10:40 – 12:10	1h 30mins	Wrap-up session

Opening Event:
Tuesday, October 6th, 2020, 14:00 UTC

Markus Pössel
IAU Office of Astronomy
for Education, Germany

Ewine van Dishoeck
President of the International
Astronomical Union (IAU),
Leiden University,
The Netherlands

Theresia Bauer, MdL
Chair of the Carl Zeiss Foundation
Administration, Minister for Science,
Research and Art of the State of
Baden-Württemberg, Germany

Beate Spiegel
Managing Director of the
Klaus Tschira Foundation,
Germany

Kenneth Young
Chairman of the Shaw Prize Council
and Vice Chair of the Board of
Adjudicators, Shaw Prize Foundation,
Hong Kong

Teresa Lago
General Secretary of the IAU,
Portugal

Opening Event on Youtube
https://youtu.be/-QWvjRLAB2Q

Opening Event:

Tuesday, October 6th, 2020, 14:00 UTC

Astronomy And Space Science: On Top Of Children's Interest

Svein Sjøberg, Professor in Science Education,
Department of Teacher Education and School Research, University of Oslo, Norway
svein.sjoberg@ils.uio.no

The talk presents selected results from the ROSE-project (Relevance Of Science Education), a study of how 15 year old students in different countries relate to science and technology. Young people from some 50 countries expressed their experiences, attitudes, interests and future plans. Data reveal interesting differences between young people from different countries as well as large differences between girls and boys. Astronomy comes out in a most positive way. A follow-study of ROSE is being planned and is open for participation.

https://youtu.be/-QWvjRLAB2Q

About Svein Sjøberg

Svein Sjøberg is professor emeritus in science education at Oslo University, Norway. He is educated as a nuclear physicist (cand.real), later in education (MA) and in educational psychology (PhD). He became the first professor in the field of science education in the Nordic countries. Svein has worked with children's conceptual development, with gender and science education and education in developing countries. His current research interests are the social, ethical and cultural aspects of science education, in particular the impacts and influence of large scale assessment studies like PISA and TIMSS. He has worked with international and comparative aspects of science education through e.g. UNESCO, OECD and the European Union. He has won several international prizes and awards for his research, teaching and promotion of science literacy and public understanding of science. He is a member of editorial boards of several academic journals and book series, has written numerous books and articles, and has supervised many PhD-students in different counties. He organized the ROSE project (The Relevance of Science Education) in the period 2002- 2014, with participation from some 50 countries. Svein is an elected member of The Norwegian Academy of Science and Letters and represents the Academy in international policy matters regarding science education, for instance in ALLEA (the European Federation of Academies of Sciences and Humanities).

Session 1:
Making astronomy education equitable, diverse and inclusive

Moderator: Natalie Fischer, IAU Office of Astronomy for Education, Germany
nfischer@astro4edu.org

To make Astronomy equitable, diverse and inclusive it is important to understand what these terms mean in the context of education and not exclusively in the context of people with disabilities:

Diversity in education brings together and celebrates the individuality that exists within and amongst students. There are various factors that contribute to diversity, these include but are not limited to biological, cultural, socio-economical, socio-cultural, lived experiences and personal circumstances. *Inclusion* in education is perhaps best defined as a process that enables students to “experience a positive sense of belonging, identity, safety, learning, and societal contribution”. Some scholars prefer using the phrase “inclusiveness in educational processes”, and propose that inclusion in education is in part a commitment to social justice in education. *Equity*, or equitable education can be defined as fair rather than equal. At its core equity relates to the opportunities and resources each student has to achieve positive outcomes within their schooling and beyond. These opportunities and resources take into account the diversity in students, through an education that is inclusive.

Our first speaker, Amelia Ortiz Gil, from the Astronomical Observatory of the University of Valencia in Spain, showed how materials and activities can be developed according to these standards (notably UDL) and recommended that existing materials should not simply be modified, but should be completely redesigned to meet the standards. Of great interest to the audience in that context were the resources for visually impaired people developed by our session’s final speaker, Ángela Pérez Henao, from the Planetario de Medellín in Colombia. She agreed that it takes a long way from the first idea to a good set of resources. How and why socio-economic factors influence the educational efforts in a country was shown impressively in the talk by Tawanda Chingozha, from the Stellenbosch University in South Africa. He also pointed out that, in the context of education for girls in some African countries, the challenge is to promote positive cultural attitudes as well as catering for the needs of girls e.g. during outreach events (safety etc.). That boys and girls still have different levels of education was also shown very clearly in the talk by Joanna Molanda-Zakowicz, from the University of Wroclaw in Poland. A number of participants reported similar observations in their countries and pointed out that it is very important to create an inclusive setting to successfully address girls in particular.

Summarizing, this session showed that many variables need to be considered to foster equitable, diverse and inclusive education. But we are taking the first steps in the right direction.

Equity, Diversity and Inclusion in Astronomy Education

Amelia Ortiz-Gil, University of Valencia Astronomical Observatory amelia.ortiz@uv.es

Everybody benefits from an inclusive and accessible outreach and educational environment, not only people with disabilities. Inclusive resources and tools that include publics with functional diversity make astronomy more accessible and fun to everyone regardless of their physical condition. In this talk I will dwell a little on the benefits of inclusion and I will show some examples that have been successful in the field of astronomy outreach and education.

https://youtu.be/quafVUuBkqY

About Amelia Ortiz-Gil: Amelia Ortiz-Gil has a PhD in Physics (University of Valencia, Spain) and has carried her research on the topics of the Carte du Ciel photographic catalogue, the intergalactic medium and the physical properties of galaxy clusters at different research centres around the world. Lately she has focused on the field of astronomy outreach, in particular the development of inclusive activities for all publics. She is the coordinator of the project “A Touch of the Universe” which has developed tactile models of planetary bodies specially designed for the blind. She is currently the Chair of the International Astronomical Union Working Group on Astronomy for Equity and Inclusion. She was awarded the 2019 Europlanet Prize for Public Engagement with Planetary Science.

Impact of Racial Inequalities on African Development

Tawanda Chingozha,
Post-doc fellow (Stellenbosch University), Development Economics Fellow (OAD)
tchingozha@gmail.com

Racial inequalities in Africa mainly manifest in the economic exclusion of black people. Such economic exclusion transcends across the socio-economic fabric and limit education investments that parents can make on their children so that they can enroll into higher education and into STEM careers (including astronomy). The seeds of economic exclusion were sown by colonialism. Although a lot of progress has been achieved post-colonialism, a lot of challenges still persist.

https://youtu.be/Kjwm0L9_dR8

About Tawanda Chingozha
Tawanda Chingozha is a development economist whose primary area of work involves the application of quasi experimental techniques in estimating the effects of policy interventions on socio-economic outcomes. His research has a strong focus on land tenure issues in sub-Saharan Africa (SSA) and how they affect agriculture and other social economic outcomes. He also has considerable expertise in GIS, the use of remotely sensed datasets and land use classification through machine learning and citizen science. Tawanda Chingozha has worked on various local and international consulting projects – mapping and analyzing both small area and household level data and providing key policy insights.

Astronomy: Why so Exclusive?

Joanna Molenda-Żakowicz, University of Wroclaw molenda@astro.uni.wroc.pl

It may seem that these days pupils in developed countries have equal access to education and that modern technique and various media make astronomy as inclusive and accessible as never before. The results of a survey carried out by me in 2019 among more than 1000 pupils from secondary schools in Poland show that there are large groups of pupils who are undereducated and not interested in science. That problem is very complex but also clearly linked to the pupils' gender and place of location. Those results show that a lot has to be done to make astronomy as equitable, diverse and inclusive, as it should be in the XXI century.

https://youtu.be/AZELz6LO1gc

About Joana Molenda-Zakowicz

Joanna Molenda-Żakowicz is an astrophysicist at the University of Wroclaw in Poland. Her professional career is focused on spectroscopic and photometric ground-based observations of stars, and determination their physical properties. She works mainly on stars which were observed by the Kepler space mission. Joanna is also involved in various educational activities of different forms, targeting audience of different age and background. Her free time, she likes to spend close to nature.

Astronomy and Inclusion with Astronomy with all senses project

Ángela Patricia Pérez Henao, Planetario de Medellín angela.perez@parqueexplora.org

Astronomy with all senses, is a traveling exhibition specially designed for people with physical disabilities in order to let them know about astronomy and other space science to inspire them with the wonders of the universe. However, it is also a wonderful material from being used by people without disabilities to remind them about the importance of all senses. We are running the second stage of this itinerant material.

https://youtu.be/ta6WXX4SlwE

About Ángela Patricia Pérez Henao

Preschool Education Graduate of the Universidad Pedagógica Nacional, Master Degree in Astronomy and Astrophysics and Master Degree in Education. She is an experienced designer of educational proposals which aim to facilitate the daily activities of preschool and elementary school teachers. These proposals focus on science teaching as a foundation for developing the content for these age groups. Astronomy promoter with a wide experience working with children, young and adults. Professional with excellent analysis, decision-making, planning, organization and team work skills. Author of the books Lo que hijos y padres deben saber de 2012, Publisher Panamericana, Bogotá –Colombia, 2011, and Astronomía a través del arte, Publisher EU-Unawe, Leiden, Netherlands, 2012; La Tierra, el cielo y más allá, Publisher Secretos para Contar, 2016. Nowadays I am Coordinator in the Planetarium of Medellín.

Session 2:
Astronomy Education within the IAU

Moderator: Juan Carlos Muñoz-Mateos, IAU Office of Astronomy for Education, Germany
munoz@astro4edu.org

The session on Astronomy Education within the IAU featured five talks, giving us an overview of the IAU's structure and strategic plan for the next decade. The session began with Teresa Lago, the current IAU General Secretary, explaining how the four IAU offices tackle the IAU's long term goal of promoting astronomy in its multiple facets: research, communication, education, and development.

Afterwards, Lina Canas, the International Outreach Coordinator of the Office for Astronomy Outreach, described how the OAO coordinates activities in 131 countries through a global network of National Outreach Coordinators. Among these activities are virtual meet-ups between IAU astronomers and students, and the distribution of telescopes to underserved regions.

Next, Kevin Govender, the Director of the Office of Astronomy for Development, explained how the OAD uses astronomy to tackle the 17 Sustainable Development Goals (SDGs) established by the United Nations. Thanks to its multidisciplinary nature, astronomy can directly address some of these goals, which Kevin demonstrated with specific examples of OAD projects.

Then, Markus Pössel, Director of the Office of Astronomy for Education, outlined how the OAE will address the challenges of bringing astronomy into primary and secondary education. He specifically referred to resources like OAE Reviews on specific topics, and regional Schools for Astronomy Education. He also highlighted the key role of the OAE's National Astronomy Education Coordinators (NAECs) in reaching out to the local education communities in their countries.

Paulo Bretones closed the session with a comprehensive summary of the history and activities of the C1 Commission on Astronomy Education and Development, which he presides. Paulo stressed the need to establish a new Astronomy Education Journal, a point that triggered interesting conversation in the comments.

The talks were followed by a lively panel discussion. The issues addressed included if and where undergraduate studies might fit within the scope of the IAU offices; the collaboration between astronomers and other scientists to better tackle some SDGs; and the challenges of building NAEC teams that are diverse in terms of gender, geography, and experience in primary/secondary education.

The IAU's global strategy for astronomy

Teresa Lago, General Secretary of the IAU IAU_GS_2018@iap.fr

The IAU Strategic Plan 2020-2030 offers a comprehensive overview of the IAU and its long-term objectives. IAU focuses on advancing knowledge and promoting research in astronomy through international cooperation. In partnership with organisations around the world, the IAU created four offices, with clear mandates: training, communication, education, and development. The Office of Astronomy for Education fulfils the IAU's goal of using astronomy as a stimulus and tool for teaching and education, from elementary to high school, in all country.

https://youtu.be/k5DRo_mDQ94

About Teresa Lago

Full Professor of Astronomy, University of Porto (UP), Portugal (retired). Responsible for setting-up/coordinating the 1st Astronomy Degree in Portugal (1983), the European Inter-university Masters Degree (1994), the "European Astrophysics Doctoral Network" involving 33 European Universities (1986) and the Astronomy Doctoral Program (2004). Author of the "National Plan for the Development of Astronomy" (1987), founder of the Centre for de Astrophysics (1988) that she directed for 18 years, and of the Porto Planetarium (1998). Prepared the Association of Portugal to ESO (1989) and was National Delegate to the ESO Council until 2013. Chaired the national Scientific Council for "Earth & Space Sciences".

The IAU Office for Astronomy Outreach: building bridges through international cooperation

Lina Canas, IAU Office for Astronomy Outreach, IAU/NAOJ lina.canas@nao.ac.jp

The IAU Office for Astronomy Outreach (OAO) goal is to engage the public in astronomy through access to astronomical information and communication of the science of astronomy. Our work focuses on building bridges between the IAU and the global astronomy community of outreach practitioners, educators, and the general public, and through international cooperation, to make astronomy accessible to all. Here we present the collaborative framework of our programmes in alignment with the IAU Strategic Plan 2020–2030.

https://youtu.be/eTO9oIXWr9I

About Lina Canas

Lina Canas has been working for the International Astronomical Union (IAU) Office for Astronomy Outreach (OAO) since 2015, first as Assistant Outreach Coordinator and in 2019, as International Outreach Coordinator. With a background in astronomy and geophysics, for the past fifteen years, she has worked in astronomy outreach and education, including scientific content production, project management and community building in international networks, with a strong component on accessibility. She is based at the National Astronomical Observatory of Japan (NAOJ) in Tokyo.

The IAU Office of Astronomy for Development

Kevin Govender, IAU Office of Astronomy for Development kg@astro4dev.org

Since its establishment in 2011 the OAD has coordinated 160 projects targeting over 100 countries, with 11 regional offices and language centres forming part of global management structure. Flagship projects include (i) Stimulating economies with astronomy e.g. astro-tourism; (ii) Science diplomacy e.g. astronomy for peace; (iii) Knowledge and skills from astronomy e.g. data science training. This talk describes how we are working towards the OAD vision of “Astronomy for a better world”.

https://youtu.be/zxNNil24HJ8

About Kevin Govender

Kevin Govender is a physicist by training and founding Director of the Office of Astronomy for Development. He was previously Manager of the Southern African Large Telescope’s Collateral Benefits Programme at the South African Astronomical Observatory, and Fast Neutron Scientist at Necsa. He was awarded the Edinburgh Medal in 2016, jointly with the International Astronomical Union, for his current work, “which integrates the pursuit of scientific knowledge with social development for and with those most in need”.

The IAU Office of Astronomy for Education (OAE)

Markus Pössel, Office of Astronomy for Education / Max Planck Institute for Astronomy
poessel@astro4edu.org

What is the newly-founded IAU Ofice of Astronomy for Education (OAE), how does it fit within the structure of the International Astronomical Union, and what are its specific goals? The talk addresses these questions and also presents the resources the OAE has at its disposal to accomplish its mission of fostering astronomy education world-wide, through international cooperation, with the help of the network of National Astronomy Education Coordinators and the future OAE Centers and OAE Nodes.

https://youtu.be/XgY_L2Tt_gg

About Markus Pössel

Markus Pössel is a relativistic astrophysicist, managing scientist of the center for astronomy education and outreach Haus der Astronomie in Heidelberg, and director of the IAU’s Office of Astronomy for Education.

IAU Commission C1: Astronomy Education and Development

Paulo Bretones, Universidade Federal de São Carlos, São Paulo bretones@mpc.com.br

https://youtu.be/FIceZD8SB10

This presentation starts mentioning the history of Com. C1, formerly Com. 46 based on the published Newsletters. The results show meetings, courses, teaching materials, book reviews, papers, phenomena and projects such as: International Schools for Young Astronomers (ISYAs), the travelling telescope, WGs, travels, triennial reports, education sessions and business meetings during the Gas from many countries for all school levels. The current activities mention the efforts of WGs, meetings, the journal and other projects.

About Paolo Bretones

Paulo Bretones holds a degree in Chemistry and a PhD in Astronomy Education Research from the State University of Campinas. He is currently an Associate Professor at the Federal University of São Carlos. He was coordinator of the Teaching and Dissemination Section of the Iberoamerican Astronomy League, and Coordinator of the Teaching and Dissemination Commission of the Brazilian Astronomical Society. He is co-editor of the Latin American Journal of Astronomy Education, and President of the C1 Commission (Astronomy Education & Development) of the IAU.
He has authored books like “The Secrets of the Solar System” and “The Secrets of the Universe”, and coordinated the book “Games for the Teaching of Astronomy”. Moreover, he has imparted lectures and courses aimed at students, teachers, and the general public. He has also written numerous articles in newspapers and magazines, as well as participated in radio, and TV/Video programs.

Session 3:
Astronomy Education in low-tech environments: Challenges and solutions

Moderator: Niall Deacon, IAU Office of Astronomy for Education, Germany
deacon@astro4edu.org

The 2nd Shaw-IAU Workshop on Astronomy for Education was held online. In order to watch the talks, participants needed a device such as a computer, smartphone or tablet. They also needed access to infrastructure such as electricity and some form of internet connection. These are things that are often unavailable in many educational environments. This session focused on astronomy in such low-tech environments and on the ingenious solutions astronomy educators have found to take the universe to children in some of the most challenging circumstances.

Our first speaker was Olayinka Fagbemiro from Astronomers Without Borders, Nigeria. She talked about the underfunding of and overcrowding in schools in Nigeria and also showed some astronomy education hubs that she and her colleagues had built in camps for internally displaced persons.

Our second speaker was Nasser Alkadi from the Syrian Astronomical Association. He discussed how to deliver astronomy education in a war-torn country and how astronomy can inspire even in the darkest times.

Premana Premadi from the Bosscha Observatory in Indonesia talked about astronomy education in some of the remotest regions of her archipelago nation. This included training teachers to work in these areas and producing astronomy broadcasts for the radio.

Finally Daniel Chu Owen talked about the work of the Travelling Telescope in Kenya and its bamboo dome. This provides a sustainable and low-cost solution for building a planetarium for their education and outreach events.

In the panel discussion, Premana answered questions on the cultural elements of astronomy education education in Indonesia. Olayinka talked about working in refugee camps in northern Nigeria and Chu discussed the details of treating bamboo. Finally Nasser talked about the inspirational power of astronomy.

Overcoming the Challenges of Astronomy Education in low-tech environment: The Nigerian Story

Olayinka Fagbemiro, Founder: Astronomers Without Borders (AWB) Nigeria,
Nigeria Public Relations and Education Officer: African Astronomical Society (AfAS)
yinkaojay@gmail.com

This presentation highlights the challenges of Astronomy Education in low-tech environment and the efforts towards mitigating them. Public schools in Nigeria are almost free, but mostly poorly funded and lacking in basic infrastructure such as internet, electricity, etc. Astronomy is not taught at the elementary and Secondary school levels in Nigeria as there is no curriculum for Astronomy at such levels.

https://youtu.be/KE38kbAi3kQ

About Olayinka Fagbemiro

I am Olayinka Fagbemiro, the Asst Chief Scientific Officer at the National Space Research and Development Agency, Abuja, Nigeria and also the National Coordinator of AWB in Nigeria. I have a Postgraduate Diploma in Basic Space and Atmospheric Science and I have been involved in Astronomy Outreach to Elementary and High Schools in Nigeria since 2008. I work with a team of enthusiastic Scientists and Engineers who are very passionate about spreading Astronomy among the young people in Nigeria.

The educational system in our country and its condition

Nasser Alkadi, Syrian Astronomical Association (SAA) n.kadi57@gmail.com

The educational system in our country and its condition. There is no steady internet connection, no computer infrastructure and using manual Telescopes ... etc, So how do we face these challenges and teach the space sciences to others. What the major subjects that we focus on in astronomy, and how to engage with people to teach them and share knowledge. The challenges and opportunities .. how we use all materials that we have to do the best without professional tools. People With special needs, students, blindness, deafness ... etc with simple ideas you can make them see and touch the universe.

https://youtu.be/xc6382P4LIQ

About Nasser Alkadi

Office coordinator at SANAD team for development. Studying Applied Chemistry at Damascus University (4th grade) Inventor, I have patented in 2019 about Smart Mixer Machine. Volunteering in many Organizations such as Bright Inventors, JCI, Member of the jury for “Dar Al-Fikr” competition for reading and creativity. Member of Syrian Astronomical Association Director of educational and youth projects. One of worldwide network of National Astronomy Education Coordinators (NAEC’s team) Member of Scientific Research Committee and Astronomical Observatory, and Youth Initiatives Team I was Coordinator for Astronomy Day in School event, 100 hours of Astronomy and the international night for Observing the moon ... etc.

Astronomy Education in a low-tech environment

Premana W. Premadi, Bosscha Observatory premadi@as.itb.ac.id

https://youtu.be/L2FvxGdn-EE

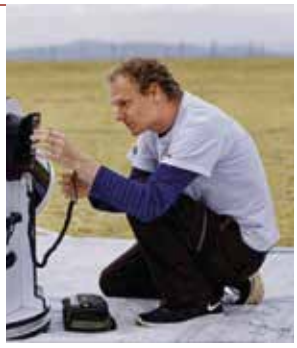
For years Indonesia has made the first 9 year of education compulsory. Yet the quality of it varies, with the lowest being at the least developed regions. For astronomy this is an interesting case: the least developed regions often have the clearest darkest night where one can see beautiful sky. We try to combine the introduction to astronomy with environmental protection in our educational material for school children. The main idea is to improve their learning experience without relying much on technology and use their natural resources instead which often inspire creativity. Our strategy involves empowering their teachers and local facilitators (local university students and STEAM-related industries). Our Bosscha Observatory develops the educational material as well as provides trainings for the teachers and local facilitators.

About Premana W. Premadi

I am a faculty staff member of the Department of Astronomy of the Institut Teknologi Bandung (ITB), Indonesia, with specialty in cosmology and relativistic astrophysics. Currently I am the Director of Bosscha Observatory. I am a part of the international Universe Awareness for Children programand founded the Universe Awareness Indonesia. With a number of ITB alumni, I am quite active in STEAM teacher training.

The Nairobi Planetarium: A model for a sustainable, low cost, natural dome

Daniel Chu Owen, The Travelling Telescope chu@travellingtelescope.co.uk



https://youtu.be/_vhd56l0tlg

Traditionally a planetarium is an expensive building to construct, with very specific skills only known by a small number of specialised professionals. Our approach differs in that we have built a dome using bamboo harvested from our compound, with a few tips found online such as treating the bamboo against insects and mould we hope to have found a way of building a planetarium which can last for many years - and is even moveable. We are currently working on making our dome “covid safe”, by opening up the sides so it will be an outdoor/indoor space. My presentation will focus on this bamboo dome and our plans to keep it safe during the pandemic.

About Daniel Chu Owen

Daniel Chu Owen is Chief Technical Director of The Travelling Telescope, he brings experience in telescope operations and astrophotography. He started sharing his passion in astronomy through public events in early 2000s in the United Kingdom, where he is originally from. He studied film and video production at University of Surrey. He is a music producer & performer and a talented photographer & artist, and contributes to the development of creative content for the company. Art plays a huge role in communicating science to the public and therefore the addition of the “A” in “STEAM” is a great way to engage people into astronomy. Through his leadership we have produced film and music content and plenty of photographs that showcase the beautiful unpolluted equatorial Kenya skies. He is also creating online content that can be easily consumed by school kids and other interested parties during the pandemic.

Session 4:
Astronomy education resources

Moderator: Carolin Liefke, IAU Office of Astronomy for Education, Germany
liefke@astro4edu.org

Resources – from basic resources like images and animations that are free to use up to fully-fledged activities appropriate for different age groups –, their reliability and availability in different languages are crucial for astronomy education. This session highlighted some of the fundamental resources developed by the astronomy education community. Our first speakers, João Retrê from the Institute of Astrophysics and Space Sciences in Portugal and Pedro Russo from Leiden University in the Netherlands, are the main contributors of the *Big Ideas in Astronomy* definition of astronomy literacy, which is now under the auspices of the OAE. João and Pedro gave an overview of the content of the document and were also able to announce that the 2nd edition will be published soon, together with a number of translations.

Next up was Michael Fitzgerald from Edith Cowan University in Perth in Australia, who is Editor-in Chief of the astroEDU platform of peer-reviewed educational materials. astroEDU was created in 2013 by the Working Group on Astronomy Education Resources within Commission C1 of the IAU. It is meant to become one of the central resource repositories of the OAE, and Michael provided an update on the current status of the platform. In particular, astroEDU is now aiming to include material for more diverse age groups. One goal is to eventually have activities related to all topics of the Big Ideas in Astronomy.

One of the fundamental resources that the OAE aims to establish is a curated multilingual glossary of the essential astronomy terms for primary or secondary school level. In his talk, Hidehiko Agata from the Public Relations Center of the National Astronomical Observatory of Japan showcased Japan's National Astronomical Glossary, which is based on 277 terms used in the Big Ideas document. Already existing glossaries in different languages like this one will be the predecessors of the multilingual OAE version, which will be a considerable and sustained community effort.

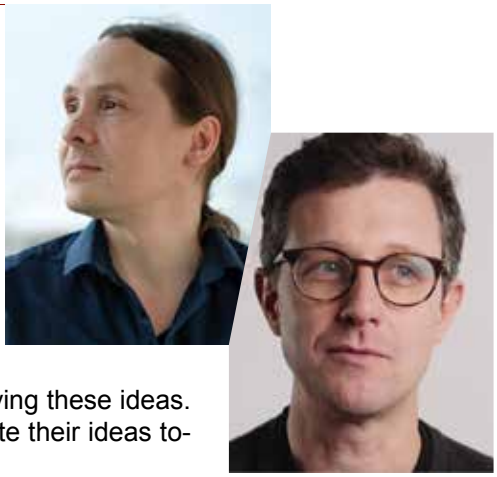
Our last speaker was Cecilia Scorza from the Faculty of Physics at the Ludwig-Maximilians University in Munich in Germany. As one of the initiators of the Universe Awareness programme, Cecilia developed the „Universe in a Box“ set of materials and hands-on activities for primary schools that is now in use worldwide. The success story of „Universe in a Box“ as told by Cecilia highlighted the importance of international collaboration, feedback and systematic evaluation to develop useful and effective materials.

In the panel discussions following the presentations, our speakers unanimously agreed that putting astronomy in an interdisciplinary context and incorporating topics of societal relevance, like the current climate crisis, will be crucial for astronomy education.

Big Ideas in Astronomy

João Retrê, Institute of Astrophysics and Space Science, Portugal
jretre@iastro.pt

Pedro Russo, Leiden Observatory and Department of Science Communication & Society, Leiden University
russo@strw.leidenuniv.nl



Many people who are active in public outreach have practical experience of the kinds of astronomical knowledge commonly held by the general public. Until last year, however, there had not been a systematic evaluation and a clear definition of what astronomical literacy means. The “Big Ideas in Astronomy” booklet, was released with the aim of clarifying these ideas. In this talk we will present the booklet and involve participants to contribute their ideas towards the current and next steps for the project.

https://youtu.be/JGonrw0PvEE

About João Retrê

João Retrê is a science communicator that works at the Institute of Astrophysics and Space Sciences, Portugal, as the coordinator of the Science Communication Group. With about 20 years of experience in the area, João has led, developed and participated in several projects, national and international, which aim to make science, in particular Astronomy, accessible and close to everyone. As part of his work, he develops strategies to involve young students and researchers in science communication and education, with the aim of creating an early awareness of the importance of this area. João is the IAU’s national outreach coordinator for Portugal and also leads the IAU’s sub-Working Group for “Hospitals, Children Homes, Nursing Homes and Prisons”, as part of the Working Group of the Executive Committee for Equity and Inclusion.

About Pedro Russo

Pedro Russo is University Professor in Astronomy & Society at Leiden University, the Netherlands. Dr. Russo was the global coordinator for the International Year of Astronomy 2009. Pedro obtained his University degree in applied mathematics, physics and astronomy from the University of Porto, Portugal. Pedro was a research fellow at the Max Planck Institute for Solar System Research in Germany. Pedro is involved with several international organisations, like the European Astronomical Society, Europlanet (European Planetology Network), the International Astronautical Federation. His work has received several awards, such as Seeds Special Award 2009, Scientix Best Educational Resource in 2015 and 2016, Most Innovative Educational Activities in 2017 and 2018 by HundrED and 2018 Leiden University’s K.J. Cath Prize.

astroEDU: an astronomy activity repository. Developments over 2020

Michael Fitzgerald, Edith Cowan University Perth psyfitz@gmail.com

astroEDU has been reviewing and publishing activities since 2013. In 2020, the repository has been in the process of being transferred over to being administered by the OAE. As this has been happening, it has made sense to take stock of what activities are available and for whom, what we know is taught in schools worldwide, what constitutes astronomical literacy and whether all of these are in alignment. After an overview of astroEDU itself, what activities are available and what activities we will be asking for in the coming months will be presented.

https://youtu.be/WSBo78CMGHw

About Michael Fitzgerald

Michael is a Senior Research Fellow in the School of Education. His research interests encompass STEM education, with a particular focus on astronomy education, as well as pure astronomy research. He has a particular interest in encouraging the use of remotely accessible telescopes to support authentic research and educational activities in the classroom as well as professional learning for high school teachers. He holds many leadership roles in astronomy education worldwide, including being the current Secretary of the International Astronomical Union's Commission C1 for Education and Development.

Considerations on the importance of building a national astronomical glossary: the Japanese case study

Hidehiko Agata, National Astronomical Observatory of Japan (NAOJ) h.agata@nao.ac.jp

I will introduce “the Internet Encyclopedia of Astronomy”, compiled and provided by the Japanese Astronomical Society (ASJ). In the native languages of developing countries, it is often the case that there are no basic terms for astronomy and in some cases, basic terms are misunderstood for the concepts they mean. So, my suggestion is to work with OAE and their NAECs to develop and publish national astronomical terms. In the “Big Ideas in Astronomy”, 277 astronomical terms appear. First, let's translate them into multiple languages, and then publish national editions of the Big Ideas.

https://youtu.be/Q894WPDWYoc

About Hidehiko Agata

I study science education, science communication and public relations in Public Relations Center(PRC), NAOJ. PRC was created in 1998 to share the latest research results of astronomy with the public. We communicate and promote research breakthroughs in a manner that is understandable, relevant, and exciting. For this purpose, we over a range of services and deliver amazing scientific information through a variety of media including the Web and scientific readings. We also have built an effective partnership with dissemination experts working for public observatories, science museums, and planetariums.

The making of the Universe in the Box

Cecilia Scorza, LMU Faculty of Physics Munich C.Scorza@physik.uni-muenchen.de

https://youtu.be/QfNf1m7yKSk

The Universe in the Box is an educational kit developed for teachers willing to bring astronomy to 4–10 year old children around the world. It contains 40 practical activities and it is currently used successfully in more than 60 countries. This Box is based on a prototype that I developed and tested 2005-2008 during my work with children in Germany, Venezuela and Colombia. During this talk I will give insights on how the materials and first pilot programs were developed and implemented.

About Cecilia Scorza

Cecilia Scorza has a PhD in extragalactic astronomy from Heidelberg University. After years of research, she devoted herself to educational and public outreach activities. She is one of the initiators of the “Universe Awareness Programme” (UNAWE), for which she developed the “Universe in the Box”. She coordinated numerous activities for the International Year of Astronomy 2009. Currently she coordinates the public outreach and school contacts at the Faculty of Physics at the Ludwig Maximilian University of Munich. Recent projects include the development of educational materials for the “Climate Change: Understanding and Acting” and Pale Blue Dot (PBD) projects.

Session 5:
Astronomy Education around the world

Moderator: Markus Nielbock, IAU Office of Astronomy for Education, Germany
nielbock@astro4edu.org

The speakers of this session came from eight countries with different languages, backgrounds and cultures. The initiatives presented involved teachers, pupils, and the public, with the latter mostly comprising children and young adults.

One challenge in formal education is that, quite often, only basic astronomical concepts appear in the curricula, or none at all. Some countries offer astronomy as a separate subject or as part of composite subjects in STEM education. Another major issue is the implementation of newly acquired knowledge from educational science into school syllabi and class activities. During the discussions, participants suggested the creation of review articles that summarize recent developments for distribution among teachers.

While a lot of teaching materials already exist, language barriers prevent them from being shared freely between countries. Cultural differences in teaching methods can be additional obstacles which cannot be overcome by linguistic translations alone. One speaker proposed to gradually expose students to new learning methods within unusual environments.

Informal education may make up for some of the deficits we encounter in school settings. It is commonly offered by particularly motivated individuals. Incorporating local aspects such as cultural heritage or recent scientific results is commonly viewed as a promising tool to raise interest and to improve approachability.

Especially in rural areas, travelling to reach the audience often seems to be unavoidable. In some regions, this can be a challenge in its own right, whether because of poor infrastructure or high crime rates. Participants voiced their concern that isolated visits to disadvantaged communities may not be very effective, or even counterproductive, when trying to inspire children with astronomy.

One talk focused on the teaching method of storytelling, which sparked subsequent lively discussions in the chat. In the context of astronomy education, storytelling uses narrative arts like literature or theatre as a vehicle to convey space topics. In the chat, several participants expressed their appreciation of the technique’s potential to overcome barriers and to stimulate the children‘s imagination and thus encourage them to reflect and discuss the science involved.

Altogether, this session was successful in exchanging various approaches and challenges in connection to astronomy education. Judging from the feedback, the discussions have been lively, engaging and inspiring.

Bridging the gap between different learning cultures

Matipon Tangmatitham, National, Astronomical Research Institute of Thailand
matipon@gmail.com

Having experienced education in multiple countries, I've come to appreciate how each culture has a different approach to education. More importantly, I've come to realised that there is no "one solution fits all" approach that would work on everyone and that education is highly context dependent. A lot of my work over the year involves adapting effective strategies from one culture into another, mostly trying to introduce a more inquiry-based learning more common in the west to the largely lecture-based culture in the east.

https://youtu.be/m-O4H6Txjh4

About Matipon Tangmatitham

I work at the outreach department for the National Astronomical Research Institute of Thailand (NARIT). At NARIT, we employ a rather "top-down" approach when it comes to astronomy (and science outreach). This requires us having to do a little bit of everything outreach-related: teacher and student workshops, press release, science camp, etc. My particular area of expertise is in project-based learning where I've advised many students to embark on months-long astronomy research projects every year.

Creating awareness and promoting Astronomy education in Ethiopia

Jerusalem Tamirat, ESSTI jerrytamirat21@gmail.com

Astronomy is not much covered in Ethiopia'sprimary and secondary school curriculum. Therefore, conducting different activities such as training, outreach and summer school programs became our best option to promote astronomy throughout the country. Thesedays the activities are paying off. Students are very interested in astronomy education and space science. The demand for astronomy education is highly increasing. A lot of students are asking for different reading materials, training and schools to get more knowledge about astronomy and space science. We employed various methods to address different schools and regions like stargazing, space camps, astrobus, summer school programs, etc. Nowadays the activities are not only catching the public's eyes, but it is also taking the attention of the government. Sharing our experience of how we are promoting and creating awareness for astronomy education in our country will help and benefit others, especially for those countries who just started working on it.

https://youtu.be/4m6WXQSBOU0

About Jerusalem Tamirat

Ms Jerusalem Tamirat is an assistant researcher and MSc student in the Astronomy and Astrophysics Department at the Ethiopian Space Science and Technology Institute. She completed her BSc degree in Physics from Bahir-Dar University in 2018. Currently, she is working on her thesis with Dr Mirjana Pović on quasars, whichare highly luminous active galaxies. She is passionate about space science activities and participates in indifferent voluntary works such as space science awareness or outreach programs.

AstroBilgi Astronomy Teacher Training Workshops in Turkey

Aysegul Teker Yelkenci, Istanbul Kultur University a.teker@iku.edu.tr / iau-naec@tad.org.tr

The AstroBilgi workshop series focuses on training teachers and applying these skills to developmental problems. It began in 2006 and has accomplished 55 workshops in various cities throughout the country, carried outin coordination with the Turkish Astronomical Society (TAD). In each setting, at least 50 teachers were trained. The workshops comprise a multi-stakeholder model that maintains sustainability over the years. The local organisers are usually the provincial directorates for national education of the cities, state schools, private schools or science-arts centres, which is an official unit established by the Ministry of National Education for informal education. The local municipalities also provide financial support on some occasions.

https://youtu.be/1WTFXDDgNvA

About Aysegul Teker Yelkenci

Dr Yelkenci studied undergraduate education at Istanbul University Science Faculty Astronomy and Space Sciences Department. She completed her PhD in 2009 in which she investigated the properties of metallic Am stars as a visiting researcher at The Citadel University in Charleston, USA. Now, she is an assistant professor at the Department of Physics at İstanbul Kültür University, studying stellar physics. Besides, she is engaged in activities and projects to popularise science through astronomy and its didactics. Between 2012 and 2018, she worked as the IAU National Outreach Contact. From 2016 until 2018, she wasthe general secretary of the TAD. She is currently a member of the TADPublic Outreach Committee and the NAEC chair and contact person. She has been organising teacher training events since 2006.

The Importance of Local Digital Dome Content in South Africa

Sally Macfarlane, UCT/Iziko sallymac@gmail.com

Due to the immersive nature and unique capabilities of modern planetaria, they are often effective and accessible tools to expose and educate a diverse range of people about astronomy and other STEM fields. Therefore, the IDIA VisualisationLab in collaboration with the Iziko Planetarium and Digital Dome (IPDD) combine forces to visualise and interact with large multidisciplinary research datasets (as part of the Data2Dome initiative), a locally-produced full-dome film that celebrates South African astronomy achievements and innovative research as an educational tool in schools and undergraduate studies. In the current political and economic climate of the country, we hope that by producing local digital dome content we can create a greater sense of pride in the country's scientific achievements and therefore work toward harnessing a more positive and understanding social environment.

https://youtu.be/n2IuDNPsrZE

About Sally Macfarlane

Dr Sally Macfarlane (NAEC South Africa chair) is currently working as an astrophysics post-doctoral fellow and part-time lecturer in the Department of Astronomy at the University of Cape Town, South Africa. As an energetic supporter of science engagement and the development of South African Astrotourism, she also works as a part-time planetarium presenter and educator. Through her post-doctoral work and the production of a full-length locally produced planetarium film, she aims to promote the importance of local digital dome content to popularise and expose South African astronomy to the public.

Storytelling to create a positive learning environment

Stefano Sandrelli, INAF, Italy stefano.sandrelli@inaf.it

https://youtu.be/rssehhFTYYg

Thanks to storytelling, the human being wonders about the meaning of stars and trees, nature and beauty, love and imperfection, itself and the others. The art of narration allows us to make experiments, to test hypotheses, to change the point of view. Science shares the same internalisation process: storytelling can be suitable to get a sense of science and freely play with it, especially for children. In 2014, I conceived a fictional character, Martina Tremenda, to create a storytelling framework for 8-12-year-olds, taking into account the gender issue, too. It includes astronomy-related activities provided by the Italian National Institute for Astrophysics (INAF) under the collective name of “Astrokids”. A play was written and performed more than 20 times in one year – before covid emergency obliged us to cancel it. In my talk, I wish to share our experience and discuss how such an approach can support interdisciplinary education in schools, starting from recent discoveries in astrophysics, and how it could be further implemented in the future.

About Stefan Sandrelli

INAF technologist at the Brera Astronomical Observatory. He was national head of Didactics and Dissemination for the INAF Communication Office from 2016 to 2020. Lecturer of the course “New ways to communicate astronomy” for the MACSIS master, Bicocca University. Collaborator of the magazine “Sapere”, for which he writes the section “Spazio alla scuola”. From May 2000 to December 2015 he edited for the European Space Agency (ESA) over 500 episodes of a television column broadcast by Rainews24 and RAI 3.

Astronomy Education as the ‘Academic Ether’ in Bolivia

Gabriel Andres Jaimes Illanes, San Agustin Educational Foundation (F.E.S.A.), Bolivia
g.jaimes.illanes@gmail.com

https://youtu.be/e6g6WWuF6zQ

Tools, opportunities and experiences. Some key features for building the future of Astronomy & Space Sciences in Bolivia. Considering an analogy in terms of ‘ether’ definition, it can be found that Bolivia’s Astronomy present passion for science, ancestral background and big potential on students, teachers and community that is involved with educational, outreaching and future initiatives for the development with big challenges to a front.

About Gabriel Andres Jaimes Illanes

Gabriel Jaimes is a young Bolivian who completed the Master in Space Technology Applications Program from Beijing University of Aeronautics and Astronautics (BUAA). Currently, he is the Team Leader for National Astronomy Education Coordinators (NAEC) in Bolivia. He is a member of the San Agustin Educational Foundation (F.E.S.A). Since 2011 and during his engineering bachelor studies, he worked as an educator for sciences with young students, being decorated by the Government of Cochabamba with the “Jaime Escalante” resolution for teachers in STEM. He developed proper material for education in astronomy with the book “Astronomy and Astrophysics for Scientific Olympiads” in collaboration with San Agustin School. In 2019, he was selected as one of the winners for the IAU100 MoonLanding50 Telescope Contest by “Star Shine for Everyone” Project (SSVI) and International Astronomical Union (IAU). In the same year, he implemented the first IAU100 free teachers workshop “Open Astronomy School” project. He also developed outreach activities for various stakeholders.

Astronomy in the land of avocados

Anahí Caldú, Instituto de Astronomía, UNAM, Mexico a.caldu@astro.unam.mx

Michoacan is a state in Mexico which faces important security problems, mostly due to narcotraffic. That implies that many towns and small cities are practically isolated and do not have easy access to the state's capital city, Morelia, where most of the educational and cultural activities take place. The Institute of Radioastronomy and Astrophysics of UNAM implemented two projects to try to bring astronomy to people who do not have easy access to it. The first project was in a neighbourhood very close to the university, but still far apart in practical terms. The second project was for communities outside the city. Astronomy workshops were put together in a kit which included audiovisual and written support materials for teachers to be able to implement them in their schools.

https://youtu.be/hx2EJvRcku0

About Anahí Caldú

Anahí Caldú completed her PhD in Astrophysics at the Max Planck Institute of Astronomy studying molecular gas in other galaxies. For the last three years, she has been fully dedicated to science communication. She returned to Mexico to be in charge of the communication office of the Institute for Radioastronomy and Astrophysics of UNAM. She was then invited to be Director of Outreach of the National Council for Science and Technology (CONACYT) where she worked for a year. Since January she is back at an office of communication, this time at the Institute of Astronomy of UNAM.

Astronomical education research papers in Japan: the never-changing and the ever-changing, and the challenge of returning the research results to teachers

Akihiko Tomita, Wakayama University, Japan atomita@wakayama-u.ac.jp

NAEC Japan team will present some statistics on peer-reviewed astronomical papers published in academic journals in Japanese for the past decade. While the dificulty in teaching the phases of the moon is the general topic regardless of the country, a large fraction of educational research in Japan is focused on elementary school topics. Recent trends, such as citizen science-based education research, will be also presented. School teachers rarely look at these papers, and the challenge is that the research results have not reached school teachers suficiently. However, classroom research in schools relates well to the content of these papers and efforts should be made to prepare reviews that bridge between them. For the exchange of domestic and international astronomical education research, translation is also necessary.

https://youtu.be/fd4-xjgftcA

About Akihiko Tomita

Professor of Wakayama University, Graduate School of Teacher Training Universe Awareness, Japan contact person Doctor of Science, Kyoto University, 1996, galactic astronomy, especially dwarf irregular galaxies Recent activity: early childhood astronomy education, astronomy education for visually-impaired children.

Low/tech didactics of Astronomz in Argentina

Néstor Camino, Complejo Plaza del Cielo – CONICET-FHCS UNPSJB

I will show many didactical resources and actual experiences related to naked eye astronomy, developed with children, teachers and elder people. Horizontal reference system, phases, seasons, day and night, movement of night sky, measurements of orbital parameters and of objects of Earth-Moon-Sun system will be presented, as well as methodologies and instruments utilized, all of them hand made by the participants of the activities.

Astronomy Education in Bangladesh

Farseem Mohammedy, Bangladesh University of Engineering and Technology (BUET)

https://youtu.be/TlpR7lRBj4Q

Bangladesh lacks any infrastructure regarding Astronomy education. There is no university program on astronomy, in none of the 107 private and 46 public universities. While the school curriculum is appropriate for general science education, it lacks proper treatment on astronomy as a subject. The school science textbooks have one chapter in each grade though, from grades 4 to 12, with exceptions in grades 9 and 11. With such scanty curriculum coverage, we attempt to keep astro-lover students and laymen by introducing 10-day, 3-day workshops or even 1-day intense workshops tailoring for different needs. This talk will discuss issues, workshop coverage of topics and feedbacks from our 11 years‘ experience. Also the future plan of a possible open-ended Astronomy 101 course that could be attended by any interested student of science and engineering will be discussed. This proposed course could work as a guideline in the absence of a proper astronomy program with some endorsement. Furthermore, an ongoing research work will also be discussed: a seamless course-book from grade-1 to grade-12 on astronomy to fill-in the gaps of space and astronomy related learning in Bangladeshi curriculum.

Diversity, Equity and Inclusion in Southern Brazil

Alan Alves-Brito, Brazilian Astronomical Society

I will briefly present some of our key projects developed in Porto Alegre focused on the promotion of diversity, equity and inclusion in Astronomy.

Classroom under the stars

Ángela Patricia Pérez Henao, Planetario de Medellín

The content of the teacher training will leave a digital book about pedagogical and didactic reflections in relation to the teaching of astronomy at school. Also will be important to announce the results and experiences of the Meeting in the regions at all levels.

https://youtu.be/zWo9-SdPniA

Low-tech Astro activities in Croatian schools

Danijela Takač / Ana-Marija Kukuruzović,
HAD (Croatian astronoical society), Organizational board for national astronomy contest

We meant to make a poster about different activities in Kindergarden, Elementary and high school that are non technological. The poster will have a general introduction, than activities, than conclusion and results.

Astronomy Education in low-tech environments: Ethiopia

Nebiyu Suleyman, Ethiotelecom

In many parts of the world, there are no advanced astronomical instruments or tools available to the public mainly because of budget shortage. As a result, people get discouraged and have limitations to make space activities and thus stick to only the theoretical approaches. However, there are many effective low-tech solutions that can be done with simple and cheap materials. Hands-on activities are very important to help students and teachers to understand the significance of Astronomical observations and phenomena. It creates a link between physical principles with everyday observations that leads to many of the more abstract and remote ideas to become more familiar. These activities will teach the students to focus on the experience and skills developed by using critical thinking. They are designed to be worked individually or in a group. These may include activities such as stargazing using free software or mobile apps, laboratory experiments, developing of tools & instruments and watching documentary videos. In most cases, Mathematics plays an important role in modeling these activities, and finally, the analysis is needed to arrive at the conclusions. Specifically, with these methods, there are some suggested traditional activities designed for collaborative learning in class or outreach programs such as constellation studies, lunar phases, modeling scales of distances, and sizes of celestial objects and planetary orbits.

Astronomy education and teacher training: the example of CLEA in France

Frédéric Pitout,
Astronomy education and teacher training: the example of CLEA in France

French pupils learn many astronomical concepts during their school years, from seasons and eclipses in primary and middle school to gravitation laws and stellar physics in secondary school. Yet, teachers are not well prepared to teach astronomy, especially the primary school teachers. To fill the void left by the educational authorities, the Teachers and Astronomers Liaison Committee (CLEA in French) was founded in 1977. CLEA is a non-profit association devoted to astronomy education and more specifically to teacher training. It promotes observation- and inquiry-based teaching (learning by doing). Practically, CLEA brings together professional astronomers, teachers and educators to create resources, organise training sessions and summer schools, and publish a quarterly about astronomy education. We shall share the 40-year old experience of CLEA.

https://youtu.be/KtuKXsSrbIw

Hands-on Astronomy activities using simple and affordable local materials

Sarah Abotsi-Masters, Ghana Planetarium

The poster will showcase some of the hands-on activities we use to demonstrate astronomy concepts, for students in after school astronomy clubs, and teachers during teacher training sessions.

Astronomy Education in Greece

Vasiliki Pavlidou, Department of Physics, University of Crete, Greece

In the Greek education system, astronomy appears as a transversal topic in various science subjects throughout primary and secondary education. Unfortunately, there are no dedicated astronomy courses. In this poster we describe three sample activities aimed at filling this gap: ‚Journey to the Universe‘, a Massive Open Online Course designed by NAECs Vasiliki Pavlidou and Konstantinos Tassis; an e-course offered by the Orion Amateur Astronomy Club of Patras; and an in-person Astronomy School organised by the Society for Astronomy and Space in Volos.

Refraiming Pedagogy: Teaching Astronomy through steam innovation

Exodus CL Sit, Starrix Hong Kong

This talk explores the reframing of promoting Astronomy as popular science, inspired by the COVID-19 pandemic. Through STEAM Innovation, integrating science and arts, such as Astro-Music and Space Art, would be a case in point of forced association. It redefines our methodology of Astronomy education and encourages the engagement of teachers from other disciplines. Supporting with user-centered design thinking, this pedagogy contributes effectively to the interactive teaching for solving real-life problems related to Astronomy.

https://youtu.be/soKa5KZq4XM

Technology in School Classroom: is it scalable?

Aniket Sule,
Homi Bhabha Centre for Science Education Tata Institute of Fundamental Research

In the last two decades a lot of case studies have been presented across all sciences where technology interventions in school classrooms have a net positive gain in learning. Typically these studies measure success of technology interventions through improvement in subject competency (pre-test-post-test or control-experiment) or increased student engagement, better visualisation or feedback from teachers. However, these case studies rarely touch the larger questions which need to be answered about viability and scalability before technology in the school classroom is advocated as the future of learning. These include availability of stable electric supply, internet, computer hardware etc. The situation is unlikely to change drastically in a timescale of 5-10 years.
Thus, a focus on learning in a low-tech environment is essential. If the intervention is planned with care, almost all goals of technology based interventions can be achieved without invoking the technology. One needs to realise that the purpose of technology intervention in the classroom is not to jazz up the learning process, but good interventions start with core educational objectives. If one is able to analyse objectives behind such an intervention, it is possible to design low-tech interventions with exactly the same learning gains. This last point will be illustrated through an example.

The Working Group of Gender Equity (WGGE) in India

Kuntal Mishra, Aryabhatta Research Institute of observational sciencES (ARIES)

The Astronomical Society of India (ASI) is the first professional society in Asia to constitute a committee, Working Group for Gender Equity (WGGE), to work for gender equity and address relevant issues within the Astronomy and Astrophysics community of India. Since its inception, WGGE has organised annual sessions to raise awareness in the community and highlight the hindrances faced by women researchers. It was noted that the continuing gap between the fraction of Ph. D. women students and women faculties members remains a cause for concern. WGGE stresses the monitoring of gender statistics routinely and should be collected from various astronomy research institutions and universities across the country which can guide the way for a more diverse and inclusive environment. In this talk I will present the activities of WGGE and how this is changing the perspective of the community.

Hands-on Astronomy activities using simple and affordable local materials

Daniel Chu Owen, The Travelling Telescope

https://youtu.be/4vW9awFILVA

Traditionally a planetarium is an expensive building to construct, with very specific skills only known by a small number of specialised professionals. Our approach is different in that we have built a dome using bamboo harvested from our compound, and with a few tips found online such as treating the bamboo against insects and mould we hope to have found a way of building a planetarium which can last for many years - and is even moveable.
We are currently working on making our dome “covid safe”, by essentially opening up the sides so it will be an outdoor / indoor space. After a number of potential designs we’ve now settled on one we feel can work. My presentation will focus on this bamboo dome and our plans to keep it safe during the pandemic.Traditionally a planetarium is an expensive building to construct, with very specific skills only known by a small number of specialised professionals. Our approach is different in that we have built a dome using bamboo harvested from our compound, and with a few tips found online such as treating the bamboo against insects and mould we hope to have found a way of building a planetarium which can last for many years - and is even moveable.
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Astronomy in low tech environments: Madagascar

Ando Ratsimbazafy,
Haikintana Astronomy Association / Ecole Normale Supérieure of Antananarivo

Madagascar is well known for a special tourist destination and its unique fauna and flora. Astronomy is starting to gain interest in schools, universities, and the public. This is not because Madagascar just recently updated its internet to the fast broadband, optical fiber, in the result of the East African Submarine Cable System (EASSy). The interest in the astronomy field raises because of the incorporation of the subject at the universities and schools, and the existence of the various outreach groups. Despite what appears to be a technological advantage, Madagascar's high-speed internet hardly erves its population. Only 13 % of its 25 million inhabitants have access to electricity and only 2.1 % of the population has access to the internet. In this talk, I will discuss the challenges the teachers and students are facing when it comes to astronomy.

Astronomy Education in Morocco

Zakaria Belhaj, HPS Foundation

Astronomy education in Morocco is currently limited to masters and doctoral programs. There are four universities that offer graduate programs in the space sciences (Casablanca, Marrakech, Rabat and Oujda). Research interests focus mainly on helioseismology, astroclimatology, astroparticles, cosmic radiation, near Earth objects and exoplanets. There are just 4 small observatories in the country.
In the science curricula of elementary and middle schools, astronomy is almost absent. It appears only in the middle school physical sciences course (8th grade), where students have their first acquaintance with astronomy through a single short chapter titled “Elementary notions about astronomy”.
So far Astronomy education is ignored in the Moroccan science curricula, even though is the key that would enhance the scientific skills of the students. It could also play a major role in increasing kids and youth interest in physics, mathematics and technology.
In that situation HPS Foundation started a project to contribute to the popularization and development of astronomy in Morocco. Our objective is to introduce interactive astronomy in the Moroccan elementary and middle schools curriculum in order to improve students observational and data analysis skills, and to increase their interest in science and technology. We believe that introducing astronomy at this level will boost the development of the space sciences in the country.
In 2020 we start using data shared by the IASC search campaign project to detect asteroids with students of a middle school . Next year we will start to have access to an automated telescope, students will be able to investigate the universe without being at any observatory. Last year we organized astronomy hands-on activities for a class of elementary school, every month, we worked with a program proposed by Mad Science and NASA about : Planets and moons, Atmosphere and beyond, space phenomena, sun and stars, rocket science, space travel, living in space.
During the talk, we will share our experiences following our workshops with elementary and middle schools about the IASC search campaign and Mad Science projects and the perspectives and Foundation projects to contribute to the popularization and development of the space sciences in Morocco.

AMT/NOVA mobile planetarium project in Namibia

Joanna Holt, Netherlands Research School for Astronomy (NOVA), Univ. of Amsterdam

The Netherlands Research School for Astronomy (NOVA) runs a network of mobile inflatable planetariums which have been visiting schools in The Netherlands for the last 10 years reaching more than 300,000 school children. In 2019, NOVA joined forces with astronomers from the Radboud University in Nijmegen (Netherlands), the Africa Millimetre Telescope (AMT), the University of Namibia (UNAM) and the Rössing Foundation and spent a week on the road with one of the NOVA-domes, visiting schools in remote areas in northern and eastern Namibia. After this successful pilot visit, a new educational project was born. Once the corona-crisis is over, a dedicated inflatable mobile planetarium will travel around Namibia and aims to visit every school in the country within the next 5 years.

https://youtu.be/6bHzKEYB1Y8

Perspectives in Astronomy Education of a Future School of Astronomy in the National University of San Marcos

Victor Vera, Seminario Permanente de Astronomía y Ciencias Espaciales de la Universidad Nacional Mayor de San Marcos

The first School of Astronomy creation project in Peru considers in its organization chart the Department of Astronomy Education and Cultural Astronomy. One of its main goals is to train future astronomers in seeking systematic techniques and pedagogical research in astronomy education, considering the geography and national reality of Peru. In this talk I will introduce the main ideas and perspectives of the future School and specially of the Department, which could contribute significantly to introduce astronomy into our Peruvian basic education.

How Astronomy Olympiads and the International Olympiad on Astronomy and Astrophysics can help with Astronomy Education

Greg Stachowski, University of Cracow

About my experiences with the International Olympiad on Astronomy and Astrophysics (a competition for senior high-school students) in which I have been involved since it started in 2007.
We have currently about 45 countries participating with varying levels of astronomy education and preparation. I can talk about how the olympiad has motivated students and teachers in various countries, how organising the olympiad has impacted professional-amateur-teacher collaboration and what kind of support and materials the olympiad has resulted in which can be useful for teaching.

The School on Wheels Project

Ana Naghi, Romanian National Astronomy Committee

Main objective: The sky seen through astronomical instruments (telescope). Target group: Students from rural areas, who do not have internet access in Suceava County. Activities: During a week (annually in August) four volunteer professors of the Cygnus Scientific Society, with their own cars, with 4 telescopes, crossing 6 distant Romanian villages, 80 children.
a. the optical instruments, their utility were presented
b. astronomical observations were made identifying palnets, constellations, other celestial objects.
Results: Development key math and science skills and development of teamwork and communication.

Astronomy Education Research: towards teaching for diversity and inclusivity in South Africa

Tshiamiso Makwela, University of Cape Town (UCT)

COVID-19 pandemic has changed our understanding of promoting popular science. My main focus would be related to STEAM Innovation and Interactive Learning, such as Astro-Music (Integrating Science and Art) and User-Centered Education.

Astronomy in low-tech environments in Tunisia

Abdelhafidh Teyahi, Astronomical Society of Tunisia

As Tunisian astronomical Society, we organize and support activities to enhance public knowledge and education of astronomy. Various activities are taking place in Tunisia, these activities vary to fit target audience in simple practical workshops to better understand their world. With abundant materials such as piece of wood or plastic, some school supplies (such as a compass, pencil, pen, ordinary lamp, terrestrial globe, etc.), a treated tennis ball, a planetarium and a telescope, we could practice our passion with young people and volunteers from different ages.
Here are some practical workshops designed for young people:
- making artisanal Spectroscopes in hands-on workshops for children: Using cardboard tubes and cd Rom, we build spectroscopes to observe the solar spectrum
- Altosol workshops: to determine the height of the Sun, we measure shadow lengths of a triangular wooden piece
- Moon phases, Lunar and solar eclipse observation
- Planetarium sessions to introduce fundamentals in astronomy and to present the elements of the universe.
- Exhibitions: Participation in national and internat. astronomical and educational events.
- Solar and stellar observation with a telescope equipped with an H-alpha filter and a C8 or C9
- Making different types of Sundials (with wood in schoolyards)
- Using The wooden model of Astrolabe, participants figure out where they are after identifying and locating the stars and the sun

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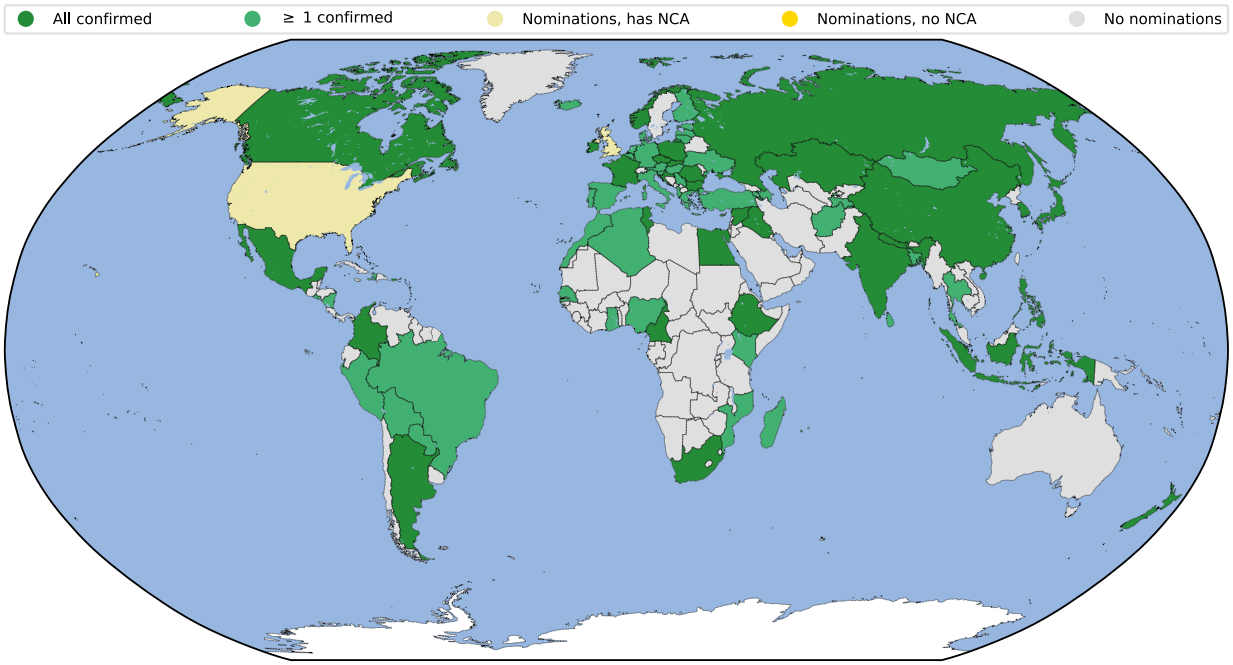
Exhibition Area

NAECs in October 2020



Where the attendees of the Workshop came from