Proceedings for the
4th Shaw-IAU Workshop
on Astronomy for Education

Leveraging the potential of astronomy in formal education

15 – 17 November, 2022

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The following is a collection of summaries from the 4th Shaw-IAU workshop on Astronomy for Education held 15 – 17 November, 2022 as a virtual event. The workshop was organised by the IAU Office of Astronomy for Education. More details can be found on: https://astro4edu.org/shaw-iau/4th-shaw-iau-workshop/.

The IAU Office of Astronomy for Education (OAE) is hosted at Haus der Astronomie (HdA), managed by the Max Planck Institute for Astronomy. The OAE's mission is to support and coordinate astronomy education by astronomy researchers and educators, aimed at primary or secondary schools worldwide. HdA's hosting the OAE was made possible through the support of the German foundations Klaus Tschira Stiftung and Carl-Zeiss-Stiftung. The Shaw-IAU Workshops on Astronomy for Education are funded by the Shaw Prize Foundation.

The OAE is supported by a growing network of OAE Centers and OAE Nodes, collaborating to lead global projects developed within the network. The OAE Centers and Nodes are: the OAE Center China–Nanjing, hosted by the Beijing Planetarium (BJP); the OAE Center Cyprus, hosted by Cyprus Space Exploration Organization (CSEO); the OAE Center Egypt, hosted by the National Research Institute of Astronomy and Geophysics (NRIAG); the OAE Center India, hosted by the Inter-University Centre for Astronomy and Astrophysics (IUCAA); the OAE Center Italy, hosted by the National Institute for Astrophysics (INAF); the OAE Node Republic of Korea, hosted by the Korean Astronomical Society (KAS); OAE Node France at CY Cergy Paris University hosted by CY Cergy Paris University; and the OAE Node Nepal, hosted by the Nepal Astronomical Society (NASO).

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Foreword

4th Shaw-IAU Workshop on Astronomy for Education

What would you need to know to be able to strengthen the role of astronomy in schools? You might want to look at how curricula are created in the first place, and you will want to profit from the experiences of those who have already been successful in including astronomy in their countries' curricula. You would likely be interested in the various roles that astronomy can play in practice, in both primary and secondary schools. You might turn to astronomy education research for answers to questions about what fosters student interest in the STEM subjects science, technology, engineering and mathematics — and since at least part of the answer appears to be that cutting-edge results, such as those involving black hole shadows or exoplanets, are of particular interest to numerous students, you might want to look into including those topics in school teaching. Last but not least, you might look for synergies between astronomy and raising awareness for one of the most pressing challenges of our time: climate change.

That, at least, were our assumptions when we considered which sessions to include in this year's Shaw-IAU Workshop, and from the feedback received so far, we seem to have hit the mark. The workshop itself was truly global, with 600 participants from more than 90 countries. We particularly salute those participants who had to make special efforts to attend, circumventing state-imposed restrictions on international communication. With these proceedings, as well as the videos and posters from the workshop that are available online, we make the various contributions available beyond the confines of the workshop itself.

Although the total count is only up to four, the Shaw-IAU Workshops have already become something of an institution. Their genesis, of course, is directly linked to the International Astronomical Union's establishment of its Office of Astronomy for Education in late 2019, hosted at Haus der Astronomie and the Max Planck Institute for Astronomy in Heidelberg, Germany, and the evolution of the Shaw-IAU Workshops has paralleled the building of the OAE as a whole. The online format started out in 2020 as a pandemic necessity. But we soon realised that the kind of online meeting the Workshops provided was a highly accessible format that would allow us to make these workshops truly global, and to set the threshold for participation as low as possible. We acknowledge that there still *is* a threshold – since internet access with sufficient bandwidth is required – and we will continue to look for ways of increasing accessibility even further. Perhaps the hybrid format pioneered by the OAE Center China-Nanjing this year, which combined the virtual and international Shaw-IAU Workshop with an in-person teacher workshop (as well as a nation-wide online workshop) is a model for the future?

On the part of the Office of Astronomy for Education, we hope that these proceedings will help you to make better and more effective use of astronomy in support of primary and secondary school education. It's a big universe out there — let's encourage students to explore it!

Markus Pössel
Director, IAU Office of Astronomy for Education
Heidelberg, December 2022

Contents

Organising Committees

Local Organising Committee:
Asmita Bhandare, Ankit Bhandari, Sigrid Brummer, Niall Deacon, Natalie Fischer, Esther Kolar, Anna Ladu, Tshiamiso Makwela, Carmen Müllerthann, Eduardo Penteado, Markus Pössel, Bhavesh Rajpoot, Saeed Salimpour, Gwen Sanderson, Rebecca Sanderson, Anna Sippel, Tilen Zupan.

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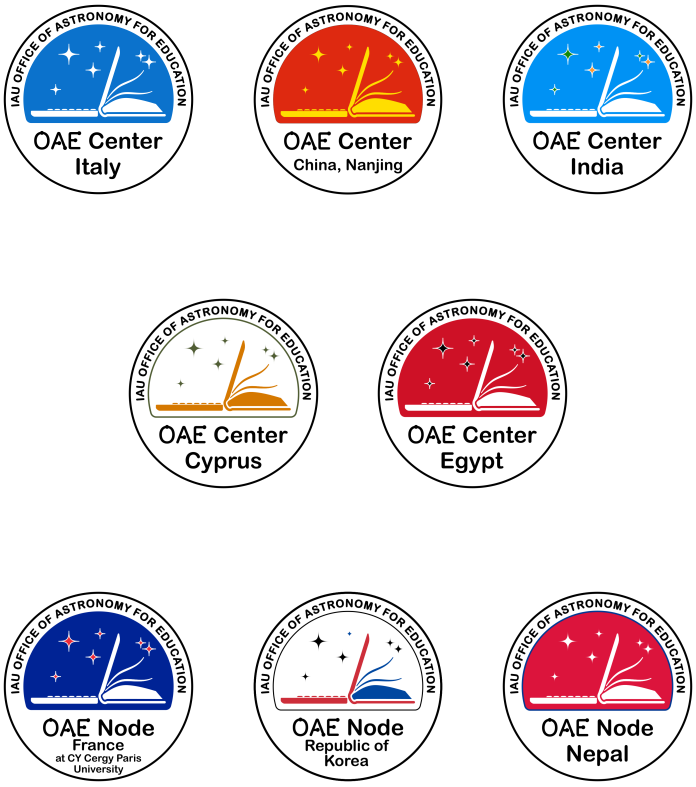
In addition to the efforts from the OAE office in Heidelberg, Germany, the following OAE Centers and Nodes made key contributions to organising this event:



Portuguese-Speaking Community Discussion

Session organisers: Eduardo Penteado (OAE Heidelberg), Rosa Doran (NUCLIO, NAEC Portugal) and Thomson Mucavela (NAEC Mozambique)

Discussion summary

The Portuguese language is one of the most spoken in the world, estimated to be the native or second language of more than 270 million people worldwide, as well as the official language of several nations. Given its scope, it is natural that there is a relevant potential of collaboration regarding educational experiences among these countries. By gathering representatives of astronomy education from Portuguese-speaking countries in a round-table format event, this session aimed to promote discussions, foster exchange of experience and stimulate interaction and collaboration among all those interested in astronomy education.

As part of the discussion panel, there was: Eduardo Monfardini Penteado (coordinator at the IAU office of Astronomy for Education, as chair of the session, Brazil), Rosa Doran (co-chair, President of the executive council of Núcleo Interativo de Astronomia e Inovação em Educação and National Astronomy Education Coordinator for Portugal), Josina Nascimento (Brazil), Lara Rodrigues (Brazil and Chile), Sara Anjos (Portugal), Alvaro Folhas (Portugal) and Marcos Rincon (Brazil). Although the focus was astronomy education in Portuguese speaking countries, and therefore enrolled exclusively in the Portuguese language, representatives only from Brazil and Portugal were present. Nevertheless, this session also accounted for the presence of participants from other countries, totalling 15 participants.

Each of the participants presented their view about astronomy education in their countries, presenting also some parallels with other countries, such as in Chile, and their projects currently being developed. It is a consensus that astronomy carries a huge potential to foster high quality education although it still needs to be further developed in order to reach its full potential. The main bottleneck relies on the teacher formation. Since astronomy is not always present in their formation process, teachers often have some difficulties bringing astronomy to their students. Therefore, and although the presence of astronomy in the school curriculum is gradually increasing, making astronomy reach out to the students is still a structural problem, which requires efforts from different natures to be solved. For instance, projects such as teacher training could be more common and should take diversity according to regions (such as rural areas, undeveloped neighbourhoods, etc) and specific needs (such as accessibility, access to internet, etc) into account.

Citizen science projects also play an important role as these projects help both teachers and students to feel like science is something reachable and enjoyable, fostering a feeling of belonging, mitigating common stereotype views of science being made by eccentric people isolated in their labs. However, other issues not directly connected to astronomy education also play a role in the quality of science being taught in schools. We could cite the bureaucracies in which the school system is involved, and therefore difficulties to update curriculum; a huge workload and the responsibilities of teachers, the need to follow a strict curriculum; teacher devaluation such as low salaries; lack of investments on infrastructure, just to cite a few. This said, we can also recognise efforts being made and progress being reached. It is necessary, however, to reach out to government agencies to present possible solutions and to promote and strengthen international and institutional collaborations.

As a take home message, those present came up with the idea of creating a channel of communication to be used by teachers, astronomy education researchers, project coordinators and anyone else from the Portuguese speaking countries to keep sharing their experiences, ideas and difficulties in an attempt to help each other to solve problems and advance astronomy education in their countries.

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