

IAU OAE Annual Report 2020

January 2021



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Overview and Structure

The IAU Office of Astronomy for Education (IAU OAE, or OAE), was established at Haus der Astronomie, Heidelberg, in December 2019, and commenced operations on January 1, 2020. The establishment of the IAU OAE followed from a year-long competitive international application process organised by IAU General Secretary Teresa Lago October 2018–September 2019.

The mission of the OAE is defined by Goal 5 of the IAU Strategic Plan 2020–2030: “The IAU stimulates the use of astronomy for teaching and education at school level.” Following the specific sub-goals laid out in chapter 5 of the Strategic Plan, as well as the strategy laid out in the application of Haus der Astronomie for hosting the OAE, submitted to and approved by the IAU Executive Council. To this end, the OAE has the aim of fostering professionalisation in astronomy education both for educators and for professional astronomers involved in education, to create, curate and translate fundamental resources, to foster the creation of community-wide standards both for astronomical resources and for specific formats such as teacher training workshops, and to foster and support suitable infrastructure for astronomy education.

As per December 2020, OAE staff consists of the following individuals (entry date noted for people newly hired specifically as OAE staff):

1. Markus Pössel as OAE Director
2. Carolin Liefke as OAE Deputy Director
3. Markus Nielbock as OAE Coordinator
4. Juan Carlos Muñoz as OAE Interim Coordinator (since May 1st, until March 15, 2021)
5. Niall Deacon as OAE Interim Coordinator (since June 1st)
6. Gwen Sanderson as OAE Organisational Assistant (since April 1st)
7. Saeed Salimpour as OAE Astronomy Education Research Coordinator (since December 1st)

Funding for those paid directly via the OAE is as a combination of funds from the Klaus Tschira Foundation and the Max Planck Institute for Astronomy for Nielbock, Muñoz and Deacon, via the IAU operating funds for Sanderson, and via the Carl Zeiss Foundation funds for Salimpour.

OAE is operated by Haus der Astronomie, which in turn is administered by the Max Planck Institute for Astronomy in Heidelberg, Germany, part of the Max Planck Society for the Advancement of Science.

OAE strategic planning and operations are supported by the OAE Steering Committee, which consists of Susana Deustua (Space Telescope Science Institute; chair), Coryn Bailer-Jones (Max Planck Institute for Astronomy), Matthias Bartelmann (Heidelberg University), and Teresa Lago (IAU General Secretary). In 2020, the Steering Committee met five times, namely in January, April, July, September and December.

OAE Infrastructure

Web Presence

The OAE website is being built using Django (a website database and content delivery system based on Python, SQL and HTML) with a view to eventual integration with astroEDU (also built on Django). Eventually, the website will incorporate the core OAE pages, NAEC team listings, pages for OAE reviews, pages for OAE workshops & meetings and pages for resources such as the multilingual glossary and Big Ideas in astronomy.

The page for the [Second Shaw-IAU Workshop on Astronomy](#) for Education was already online in time for the meeting itself, of course. The database backend for most of the other functions has been developed but currently lacks the final web design. We are still collecting profile pictures from NAEC teams (see below).

Website work is done by Niall Deacon (OAE Coordinator) and external contractors. Completion of the Web Presence under astro4edu.org is foreseen for Q1/2021.

Newsletter and Social Media

People interested in updates from the OAE like announcements of projects, opportunities for collaboration or events can subscribe to a newsletter. By the end of 2020, the newsletter had 290 subscribers.

In order to provide additional informal opportunities to communicate with the astronomy education community worldwide, accounts on [Facebook](#) and [Twitter](#) have been created. By the end of 2020, these accounts have accumulated more than 500 subscribers on Facebook and 900 followers on Twitter.

OAE logo

The OAE logo was designed by Juan Carlos Muñoz (one of the OAE Coordinators) and Gwen Sanderson (organisational assistant). The central motif brings classic and modern tools of education – book and laptop. The “OAE” font was chosen to be reminiscent of the [astroEDU](#) repository of activities. Following the Office of Astronomy Outreach, we have also designed country-specific logos to be used by the National Astronomy Education Coordinators (NAECs).



Funding applications

Thanks to our supporters, namely Klaus Tschira Foundation, Carl Zeiss Foundation and Shaw Prize Foundation, our foundational funding provides for a strong base for OAE activities. When the occasion arises, OAE will apply for additional, project-specific funding as long as the project is in line with our objectives. In 2020, we had one successful additional such project-specific application, namely the EU-funded Erasmus+ proposal TASTE – Good Practices for Teaching Astronomy at Educational Level, on teaching practices in planetaria (lead: Liceo Scientifico Statale A. Tassoni). Details can be found [here](#) (PDF via Dropbox). This project will provide 87 kEUR over 3 years (late 2020 to mid 2023). The project was kicked off with a virtual meeting in December 2021.

OAE was also asked to be a (minor) partner in additional EU-funded project applications, namely MoonShot, OpenSky, and NASE Teacher Training, none of which received funding. In addition, we applied for a grant to study digital teaching in elementary schools in the COVID-19 quick-reaction call by Volkswagenstiftung; that proposal, however, was also not funded.

At its last meeting, the OAE Steering Committee recommended that in future, OAE funding applications should concentrate on a few core projects where OAE will take the lead, tailoring the application to what is needed for fulfilling the OAE mission.

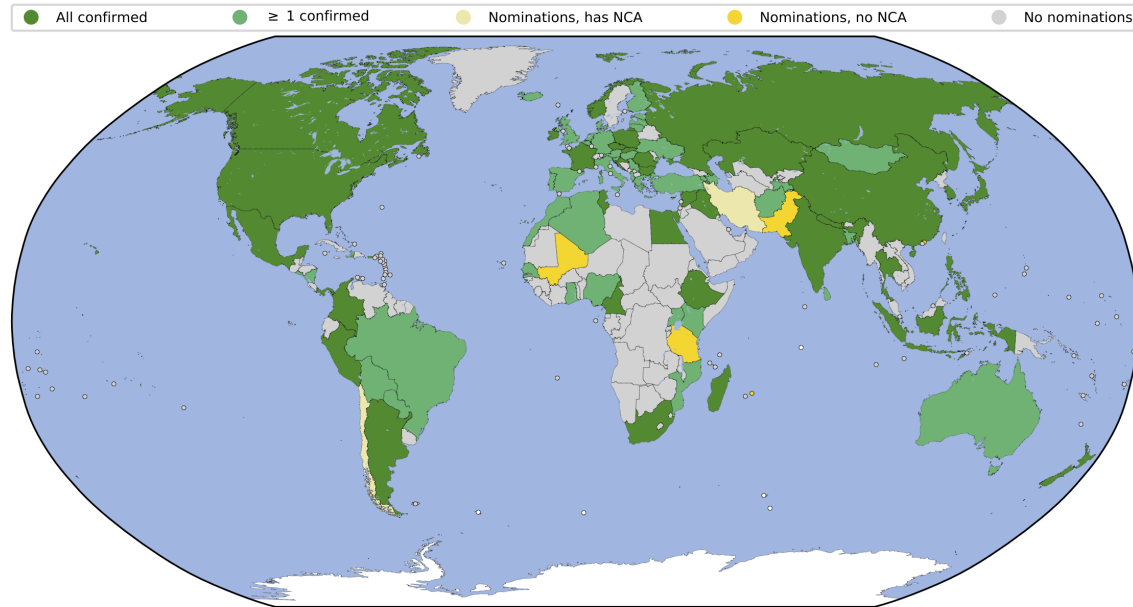
Networking

National Astronomy Education Coordinator Teams (NAEC Teams)

The NAEC worldwide network comprises astronomers and educators with expertise in primary and secondary education. NAECs interface between the OAE and the educational community in their respective countries; they are tasked with identifying local needs in astronomy education, promoting astronomy in national curricula, and developing teaching resources and training events.

Each NAEC team is composed of up to 5 members, covering their country's diversity in terms of gender, geographical distribution, ethnicities and, where applicable, languages. In countries that have a National Committee for Astronomy, the NCA can directly nominate their NAEC team. Individuals can also submit self-nominations; if their country does not have an NCA, the OAE team evaluates their application. The current tally of NAECs is the following:

- **318** Nominations / Self-Nominations from **87** countries
- **300** confirmed NAECs from **82** countries
- **230** NCA- Nominations from **60** countries
- **86** Self-Nominations from **34** countries (of which 9 are awaiting approval)
- **19** Countries have not sent any Nominations.



One of the first tasks of the NAECs is to summarize the role of astronomy in primary and secondary teaching in their countries, using a standardised template. So far, 64 of these country-specific documents have been published.

We have collected profile pictures and biographical information from two thirds of our NAECs. Interaction between the OAE and the NAECs has happened through various means: induction meetings via Zoom, the Shaw-IAU workshop (see below), and the newly established Basecamp team.

OAE Centres and Nodes Applications

In 2020 the OAE launched a [Call for OAE Centres and Nodes](#), aimed at institutions willing to commit specific funds and FTE resources to the OAE, with the goal of solidifying the long-term international reach of the office. Nodes and Centres differ both in scope and amount of resources provided by the host institution. Centres are expected to have similar dedicated staffing and funds as the OAE itself, whereas Nodes are more limited in scope and resources.

We received 12 applications from 11 countries. After a careful evaluation of these written proposals, we conducted Zoom interviews with these teams to probe in more detail specific aspects of their applications. In particular, we explored how they plan to organise Regional Schools of Astronomy Education within their countries or areas of influence, and which OAE Reviews (see below) they can support.

After consultation with the OAE Steering Committee, we agreed to move forward with the following Nodes and Centres, for which Memorandums of Understanding have been drafted and are prepared for signing by the IAU and the applicants:

- **Italy Centre**, hosted by INAF as a partnership of INAF Milano, INAF Bologna, INAF Roma, the Italian Astronomical Society (SAIt, Firenze) and the University of Rome Tor Vergata (TOV). Planned areas of specialization: primary school education, support for astronomy education in the Mediterranean region.
- **India Centre**, hosted by the Inter University Center for Astronomy & Astrophysics, in partnership with the Homi Bhabha Centre for Science Education and the National Centre for Radio Astrophysics. Emphasis on standards of teacher training, and teacher/student competency surveys via concept inventories.
- **China Centre**, hosted by the Beijing Planetarium. Will focus on analyzing astronomy curricula in textbooks, as well as investigating the role of planetaria and science centres in astronomy education.
- **Cyprus Centre**, hosted by the Cyprus Space Exploration Organisation. Will focus on the Middle East and North Africa with a specialisation in upper atmosphere and space physics.
- **Egypt Centre**, hosted by the National Research Institute of Astronomy and Geophysics. Will focus on the Arab world including producing educational material in Arabic.
- **France Node**, hosted by CY Cergy University, Paris. This node will run a school of astronomy education for teachers in Francophone countries and will also specialise in didactics in astronomy education.
- **South Korea Node**, hosted by the Korean Astronomical Society. They have ample experience training teachers overseas, and will focus on developing astronomy resources and sharing their experience systemizing the astronomy curriculum.
- **Nepal Node**, hosted by the Nepal Astronomical Society. They will concentrate on coordinating teacher training in the South Asian Association of Regional Cooperation, where they already have collaborators (Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and SriLanka).

OAE Reviews

OAE Reviews are meant to be a key tool for the professionalisation of astronomy education. They are meant to provide professional astronomers with information about pertinent topics, in a compact form.

The establishment of additional OAE Review panels is planned for 2021. Once we are joined by OAE Centres and OAE Nodes, the supporting roles (“OAE support scientist” for an OAE Review) will be filed by OAE Centre and OAE Nodes personnel. The OAE Astronomy Education

Seminar Series (see below) is also meant to aid us in finding prospective OAE Panel members, as well as resources useful for inclusion in OAE Reviews

Astronomy Education around the world

In order to create an overview of the role of astronomy in education around the world, we requested NAECs to provide an [overview of the educational system in their respective countries](#). So far, we have collected reviews from 64 countries. This is the first step in a more extensive research project aimed at providing a comparative study of astronomy in primary and secondary school curricula across the world, taking into consideration the diversity of education systems, and curriculum approaches. This review will build on the lessons learned and methodological framework from [a recent review of astronomy in the curricula](#) of all the OECD countries including South Africa and China, of which OAE Astronomy Education Research Coordinator Saeed Salimpour is a co-author.

This will be achieved by exploring the astronomy topics covered in the school curricula, the age group at which the topics are taught, and in what context the topics are situated. In addition, the review aims to connect this picture with the ideas and concepts that are fundamental to astronomy, using the Big Ideas in Astronomy document as a mapping framework. This will allow stakeholders in curriculum and curriculum development around the world to get a global snapshot of astronomy education.

The two main outcomes or deliverables from this project will be:

- An online searchable resource that will be accessible via the OAE website. This will in the long-term be linked to the glossary, Big Ideas and astroEDU activities.
- A research report that will be made accessible to policy makers, educators, researchers and curriculum developers.

OAE Review on Equity, Diversity and Inclusion

This review will produce a concise practical guide on how to make astronomy education activities equitable, diverse and inclusive. The panel for this review was chosen by the members of Commission C1. The panel has had several remote meetings and is currently discussing how to divide the work of the review between them.

OAE Review on Digital Teaching and Learning

This review will summarize best practices on how to efficiently use digital technology for educational purposes, including (but not limited to) interactive simulations, e-assessment tools, online teaching, etc. The panel is in the process of being set up.

Astronomy Education Infrastructure

astroEDU

[astroEDU](#) is an open-access online resource of peer-reviewed astronomy education activities which has since its inception been a collaborative effort between various institutions. It is a project of the International Astronomical Union under the framework of the IAU Office of Astronomy for Development. The project is supported by the IAU OAD, Universe Awareness, Leiden University, LCO, Space Awareness, Europlanet and European Union. IAU astroEDU is part of Europlanet 2020 RI and EU Space Awareness projects and it has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreements No 654208

This resource has now been transferred to the stewardship of IAU OAE as part of the core astronomy education resources. The OAE has begun a collaboration with Heidelberg University, who will manage the Open Journal Systems (OJS), and the Digital Object Identifiers (DOIs). This will ensure that the current model where each activity undergoes an efficient peer-review process and can be cited in research, is maintained. astroEDU editor-in-chief Michael Fitzgerald is working with Gwen Sanderson (OAE) in the process of transferring. This is to ensure the activities that were in the pipeline during the transfer will undergo the review process once the infrastructure is set up and to familiarise Gwen with the mechanics of the OJS peer-review system. The aim is to have astroEDU up and running in the first quarter of 2021, so that new activities can be submitted, clear the backlog of activities and to have in place a system for processing in order to avoid future backlogs. Although this timeline is dependent on Heidelberg University updating their OJS installer (taking place in February) and once this is completed they will contact us.

Astronomy Education Resources in ADS

Throughout the year, OAE has been in negotiations with the NASA Astrophysics Data Service, which is the main resource used by research astronomers to find specific literature. We now have a draft agreement of how to include astronomy education resources in ADS, with OAE acting as curator for an ADS collection with bibcode oae..educ, and will move forward with this endeavour in Q1 2021.

Big Ideas in Astronomy

With a memorandum of understanding signed in October 2020, OAE has taken over responsibility for the Big Ideas in Astronomy project with the previous IAU Commission C1 working group becoming Big Ideas Advisory Panel. The rollout of version 2 is currently underway. The website is already [online](#) although not yet ready for public distribution. Work is ongoing to put the existing translations into the Big Ideas booklet design. The full rollout of version 2 is envisioned by the end of Q1 2021.

Astronomy Education Resources

Part of our mission is to provide astronomy educators worldwide with a basic collection of open, high-quality educational resources, either curated or newly created, translated wherever possible into the learners' native languages, and available under licenses that allow for free use (namely suitable Creative Commons licenses).

Multilingual Glossary

This is a joint project with OAO (Lina Canas, Hidehiko Agata), which aims to produce a glossary of a few hundred astronomical terms that will commonly come up in primary or secondary school lessons, with translations both of the terms itself and brief definitions (providing context) into as many languages as we can manage. To ensure the quality of the translations, we will institute a review process where, ideally, each translation will have been checked by a professional astronomer who is also a native speaker.

In particular, the glossary is meant to serve as the basis for future faithful translations of educational materials. In order to make sure that our selection is representative and suited to primary and secondary school settings, in a first round of community involvement, we asked the NAEC teams to provide terms that were still missing from the glossary; in a second round, two panels (one for primary education, one for secondary education) will indicate which of the terms are particularly pertinent for primary and secondary school use, in particular, allowing us to create the initial English list of terms. Afterwards, we will begin the translation process, in coordination with the IAU Astronomy Translation Network (ATN).

At a later stage, the glossary terms are also meant to serve as a structure for the browsable educational resources on the OAE website.

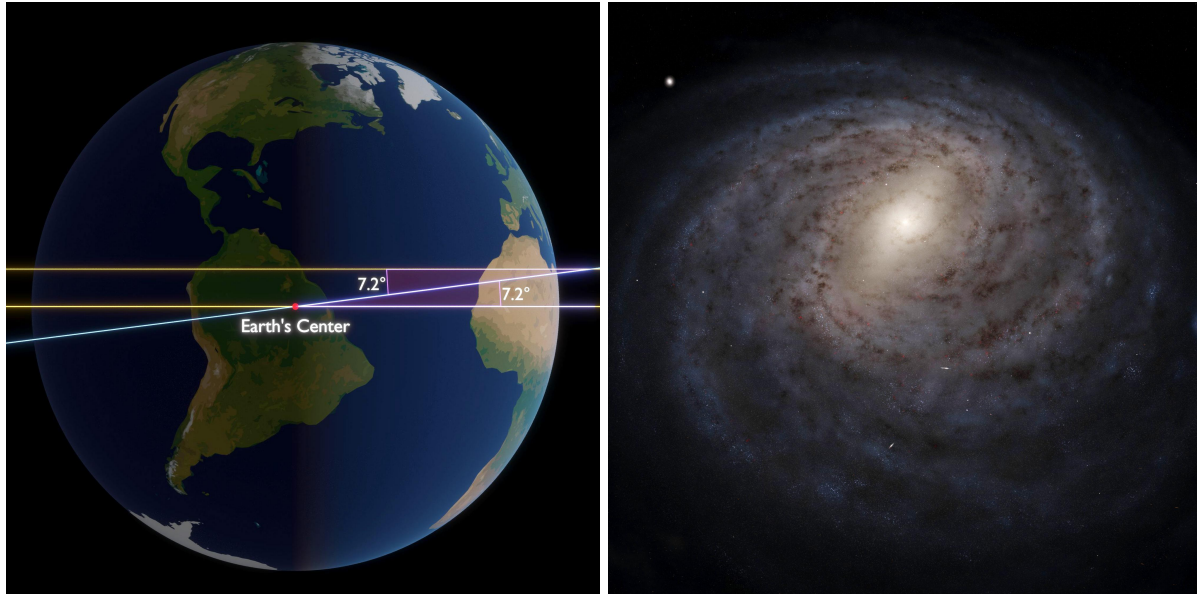
Astrophotography Contest

Suitable images are an important teaching tool. In a number of areas of astronomy, numerous excellent images are available, thanks to the image publications notably from the NASA/ESA Hubble Space Telescope and the ESO telescopes. In other areas, notably in situations where high-end and/or space telescopes are unsuitable, there are some gaps when it comes to images accessible freely under open licenses.

The aim of our Educational Astrophotography Contest, our [astrophotography competition](#) launched in early 2021, is to fill some of the gaps. Winning images will receive cash prizes, and will be released as Open Educational Resources under a suitable Creative Commons license. Participants can submit images in 10 categories, such as aurorae, light pollution, star trails, etc. The entries will be evaluated by a panel comprising astronomy educators and astrophotographers, who will judge not only the aesthetics and technical merits of each entry, but also their value as educational tools in primary and secondary teaching.

Visualisation resources

As another addition to the pool of freely available images and diagrams for astronomy education, we commissioned numerous diagrams/animations/visualisations specifically related to the topics of the “Big Ideas in Astronomy,” from visualization specialist Stefan Payne-Wardenaar.



Stefan first came to our notice through the impressively realistic renderings of our home galaxy, the Milky Way, that he had created (above right), and has already been working for HdA in the context of the Sonderforschungsbereich 881.

Events

Shaw-IAU Workshop 2020

The Second Shaw-IAU Workshop on Astronomy for Education was a fully online event held on Oct 6-9 2020, using the Hopin platform. It brought together the NAECs and other key actors in the field of astronomy education. The Opening Session also served as the official launch event of the OAE. Subsequent sessions featured talks on the following topics:

- Making astronomy education equitable, diverse and inclusive
- Astronomy education within the IAU
- Astronomy education in low-tech environments
- Astronomy education resources
- Astronomy education around the world.

- Paulo Bretones, Universidade Federal de São Carlos, São Paulo
- Lina Canas, IAU Office for Astronomy Outreach
- Tawanda Chingozha, IAU Office of Astronomy for Development
- Olayinka Fagbemi, National Space Research and Development Agency, Nigeria
- Michael Fitzgerald, Edith Cowan University Perth
- Amelia Ortiz Gil, University of Valencia
- Kevin Govender, IAU Office of Astronomy for Development
- Teresa Lago, General Secretary of the IAU
- Markus Pössel, IAU Office of Astronomy for Education
- João Retre, Institute of Astrophysics and Space Sciences, Porto
- Pedro Russo, Leiden University
- Cecilia Scorza, Ludwig-Maximilians-Universität München

Additional speakers were recruited from the NAEC Teams. Proposers who could not be given a talk slot had the opportunity to present a “poster talk” (short pre-recorded video or slides at designated exhibition booth) instead.

From feedback received during the event, and in a special feedback session on the last day, and after the event, we conclude that the workshop was generally seen as a big success, and that the interactive format we had planned worked well for most participants; the NAECs in particular were very motivated. Accessibility (time zones, captioning) was mentioned as a particularly positive feature by a number of participants.

Planned: OAE Astronomy Education Seminar Series

We also laid the groundwork for a regular OAE Seminar Series, slated to begin in 2021, with a list of possible speakers. In the series, we want to provide information about the same topics that are also covered in the OAE Reviews – with the series effectively acting as a “trial run” for the different reviews. We also want to introduce astronomers and astronomy education practitioners to the basics of astronomy education research. The overall aim is to bring together experts and members of the astronomy, astronomy education and general education research communities to instigate fruitful discussions about how to engage in astronomy education. Our target group consists of anyone interested in understanding the fundamentals of astronomy education and astronomy education research, whether a beginner or a seasoned expert.

We intend our seminar series to play an important role in fostering the professionalisation of the astronomy education community, with an eye towards establishing community-consensus standards for both training workshops and resources. Individuals and organisations engaged in the teaching and learning of astronomy, whether formally or informally, are interested in determining whether their resources, pedagogies, and programs are in fact bringing about the change(s) or having the intended impact/outcome(s). If the individuals and organisations have evaluated a program, they are interested in knowing whether the approaches used in their evaluation are founded in robust theoretical and methodological frameworks. Equally important are individuals who are new to astronomy education from different fields, and would like to know

where to begin. These scenarios are just an example of the opportunity that exists for the OAE to engage and support those interested in astronomy education.

An additional goal of the series is to bridge the gap between astronomy education practitioners and astronomy education researchers. Astronomy education research, after all, is discipline-based education research, in that it draws on the underlying theories from education research, and applies them to a specific context. As such, its methods are markedly different from those of the natural sciences. In order to bridge the gap, and give astronomers and astronomy education practitioners an insight into the basics of astronomy education research, a number of seminars will focus on those fundamentals, and cover topics such as methodology, theories, data collection, ethics and much more in an elementary, accessible manner.

Participation in external events

Over the year, OAE gave several invited talks aimed at presenting the newly-founded OAE to the wider astronomy education community.

Carolin Liefke gave a short online presentation about the OAE at the 13th NASO Day on 25 August 2020 to members and guests of the Nepal Astronomical Society.

Markus Nielbock presented the OAE with a talk during the IAU Office of Astronomy for Development (OAD) Regions meeting in Cape Town, South Africa in January 2020.

Markus Pössel gave talks about the OAE at the 2020 Global Hands-On Universe (GHO�) Conference on August 22, and at the IAU Symposium 367 “Education and Heritage in the Era of Big Data in Astronomy” on December 9.

Closing remarks

It’s been a busy year for the OAE, and naturally, most of our effort was spent on getting the office up and running – in particular, creating the network of National Astronomy Education Coordinator teams predictably took a lot of individual work. For 2021, our initial focus will be on getting the OAE Centres and OAE Nodes established and, once that is done, to use the resulting increase in personnel to begin work on most of the OAE Reviews topics. We will also take the first steps towards a community consensus about common standards for astronomy education resources and for training workshops, by asking practitioners and external experts for their current practices.

OAE work has been and continues to be a team effort. We are grateful to our supporters, from funding by the Klaus Tschira Foundation, the Carl Zeiss Foundation and the Shaw Prize Foundation to the numerous individuals within and outside the IAU who have contributed to getting the OAE off to a running start, helping us to leverage astronomy for education.