

## COMMISSION C1

## ASTRONOMY EDUCATION AND DEVELOPMENT

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## COMMISSION C1 WORKING GROUPS

<b>Div. C / Commission C1 WG1</b>	<b>Competitions for Secondary School Students</b>
<b>Div. C / Commission C1 WG2</b>	<b>Astronomy Education Research and Methods</b>
<b>Div. C / Commission C1 WG3</b>	<b>Astronomy Education Resources (AstroEDU)</b>
<b>Div. C / Commission C1 WG4</b>	<b>Network for Astronomy School Education (NASE)</b>

Commission C1 is also involved in the following inter-commission WGs:  
**Inter-Commission B7-C1 WG Achieving Sustainable Development within a Quality Lighting Framework**  
**Inter-Commission C1-C3-C4 WG Archaeoastronomy and Astronomy in Culture**  
**Inter-Commission B2-C1-C2 WG Data Driven Astronomy Education and Public Outreach (DAEPO)**  
**Inter-Commission C1-F2-F3-H2 WG Education and Training in Astrobiology**  
**Inter-Commission C1-C3-C4 WG Ethnoastronomy and Intangible Astronomical Heritage**

## TRIENNIAL REPORT 2018-2021

### 1. Introduction

Since the XXX GA in Vienna, the main goals of the Commission C1 for this term was announced to be the journal and a meeting like CAP. During the event, in the 349th IAU Symposium, in an oral presentation about the history of Com. C1, based on the Newsletters (Bretones, 2019), many contributions such as teaching materials, courses and meetings were mentioned. Based on the recommendation of Division C, to have only one website and one newsletter, the Com. C1 newsletter has ceased. After this, we have sent a call for Proposals for C1 Working Groups (WG) and the decisions of the Div. C SC, all the approved WGs were informed in September 2019. Beginning with 286 members in Oct. 2018, we now have 345 members.

So, even with the efforts of the WGs and their achievements shown in the Reports, we have worked to promote Astronomy Education Research and Studies by many ways.

Since 2012 as the chair of the WG on Theory and Methods in Astronomy Education, we did our best to contact colleagues and promote surveys about published material in many countries and regions. It is a hard work, but as result and shown in the WG AERM Report, some surveys were updated as: Colombia (Néstor Camino) and others with studies published in a meeting as: Japan (Akihiko Tomita), Portugal (Paulo Mauricio) and France (Frederic Pitout).

Despite the diverse and large number of astronomy education events and conferences, there has been no regular international conference place for astronomy education researchers and practitioners worldwide to convene and discuss their work in the field. After many discussions with Pedro Russo and Urban Eriksson, we enthusiastically promoted the Astronomy Education Conference: Bridging Research & Practice, in Munich, Germany, September 16-18, 2019. We especially thanks to Tania Johnston and Wolfgang Vieser to be held in ESO Supernova and also Michael Fitzgerald and Saeed Salimpour for all their efforts to make everything about registrations, abstract reviews, schedule, website, grants and communication with the participants run so smoothly as it did. But, unfortunately because of the pandemic, we are waiting for the next to be in-person in May 2023 at the Dunlap Institute, Toronto, Canada and, after, and not in the same year as CAP or the IAU General Assembly in other continents.

More specifically, as a model and example to promote meetings in many regions we had also promoted the Workshop on Space Sciences Education, in Sharjah, United Arab Emirates, and was planning to have more 4 meetings as Workshop to Promote Astronomy Education Research (AER) and Studies in some different regions to be held during 2020. But, unfortunately because of the pandemic were cancelled an, we hope, postponed to be held in the future. Recently, the Proceedings were released and announced.

Also during the GA, the Office of Astronomy for Education (OAE) was announced to have submissions to candidates. The OAE was announced and presented in Paris in December 2019 where we have presented a talk to represent the Com C1. The idea to introduce the project Astronomy Day in the Schools was submitted to the IAU, approved and, fortunately, happened very successfully. Even with the pandemic, to continue the project taking advantage of the Solar Eclipse of December 14, we have prepared a website with multiple resources. And we hope to continue this and next years during the weeks and dates of the equinoxes, solstices, and hope for it to be a continuous project.

After discussions with the colleagues to start the submission system, the editors, editorial board and webpage, in December, 2020, was announced the new Astronomy Education Journal (AEJ) and the first call for papers. The AEJ aims to be a key publication site for both researchers and practitioners, globally, in the field of Astronomy Education. There will be a peer-reviewed section and a non-peer-reviewed but edited and curated section. So, the AEJ aims to meet the needs of the astronomy education community by providing a location for all manner of practical, newsworthy and scholarly publications involving developments in the field.

About the project “Big Ideas in Astronomy: A Proposed Definition of Astronomy Literacy” booklet was released in May 2019. It is a culmination of years of debate and discussion over the essential things that an astronomically literate person should know. As a collaboration with the OAE with the aim of creating a collection of the fundamental concepts of astronomy.

Even during these difficult times, considering the commitments of our Commission, its goals and its tasks, in August 2020 we have sent some questions about the activities of the Com. C1 members. With the objective of stimulating our projects, to foster collaborations and to be in contact with colleagues, we asked them to answer about their activities during 2019, 2020 and suggestions for Com. C1 projects or activities going forward.

After they have been collected, the answers would be sent for the entire group and published in future reports and works. So, we would like to consider their opinions, suggestions and feedback and to keep in touch as much as possible with the broader astronomy education community. However, unfortunately we have received only 21 answers of a total of 343 members. About this we are planning to ask again even for the next term to get more answers and to foster collaborations.

Another project was an IAU Resolution Proposal on preservation, digitization and access of publications of astronomy education. As an example, relevant materials should be digitized as: Theses and Dissertations, Proceedings, Journals, Newsletters and other files. Such material could be in different forms and relevance (for their cities, regions, countries and internationally) and it all needs to be digitised and categorised properly. After receiving some comments and suggestions and having discussions, with the help of colleagues, there were more suggestions from Div. C but we have no time to prepare the final edition considering the deadline for submission. So, this is a project that could be continued for the next term with more discussions and collaborations for the edition. These contributions are very important to the history and future of the field, and a lot will be missed or hidden if no action is taken.

More specifically about the projects mentioned above and efforts related to this term and triennium, below we mention in more detail some pertinent projects.

## 2. Developments within the past triennium

### 2.1. Meetings

The first **AstroEDU Meeting: Astronomy Education Conference: Bridging Research & Practice** was held at ESO Supernova, Garching, Munich, Germany from September 16th -18th, 2019. The field of astronomy education has grown significantly over the last few decades, with an increasing number of research articles having been published by a growing number of academic and practitioner groups. Despite this, there has been no regular international conference place for astronomy education researchers and practitioners around the world to convene and discuss their work in the field. Hence, this meeting is intended to be the first of a regular, biannual, IAU Commission C1 Astronomy Education Conference with an aim to increase the quality, quantity, community and impact of astronomy education research and practice. This conference brought together astronomers, astronomy education researchers and education practitioners to communicate, discuss and tackle common issues. The three key topics spanned traditional and practical research exploring the purely theoretical to issues encountered attempting to embed research results into practical situations, usually mediated by standards, curriculum and instruction. The conference also provided an opportunity for the community to discuss the results in astronomy education stemming from the IAU Strategic Plan 2010-2020 and discuss the requirements for meeting the next IAU Strategic Plan goals regarding astronomy education. The Key Topics were: 1. Astronomy Education Research; 2. Astronomy Education Standards, Curriculum and Instruction and 3. Bridging research and practice in Astronomy Education. There were 114 Participants from 25 countries: 25, 44 talks, 10 workshops and 50 posters. More information are available in Vieser et al. (2019). The programme can be seen at: <http://iau-dc-c1.org/astroedu-conference>. Recently, the Proceedings were released and announced at: <https://www.iau.org/news/announcements/detail/ann21022/> and available at: [https://iau-dc-c1.org/iauastruedu2019/wp-content/uploads/AstroEDU\\_Proceedings\\_2019.pdf](https://iau-dc-c1.org/iauastruedu2019/wp-content/uploads/AstroEDU_Proceedings_2019.pdf)

Another successful regional astronomy education meeting, the **Workshop on Space**

**Sciences Education Research in the Middle East (2019)**, was held at the Sharjah Academy for Astronomy, Space Sciences and Technology, United Arab Emirates on October the 28th and 29th, 2019. Based on the idea of Paulo Bretones and the organizers, Professor Hamid Al-Naimiy (Chancellor – University of Sharjah) and Dr. Ilias Fernini (UoS/SAASST), there were 35 participants from UAE, Turkey, Jordan, Brazil and Australia. More information are available at: <https://scass.sharjah.ac.ae/en/news/Pages/scassnd.aspx?mcid=289>. A report on Sharjah TV is available at: <https://www.youtube.com/watch?v=ENFCODEd0eA&feature=youtu.be>

**The 1st Shaw-IAU Workshop** held from 17 to 19 December, 2019 at the headquarters of the IAU, at the Paris Astrophysics Institute (IAP) when the OAE, which will be at the Haus der Astronomie (HdA), in Heidelberg, Germany, was announced and presented. On the occasion, it was presented a talk by Paulo Bretones about the “Interactions of the Commission C1 with the OAE”, also considering the suggestions sent by the Com. members. Also, Com. C1 Secretary Michael Fitzgerald presented: “Publications & data bases: What infrastructure is needed for Astronomy Education?” There were about 50 IAU colleagues at the meeting. We hope that everything goes well for the new office and that it facilitates the development of Astronomy Education around the world. More information at: <https://www.iau.org/news/announcements/detail/ann19071/>

**The 2nd Shaw-IAU Workshop** on Astronomy for Education from 6 to 9 October 2020 was fully online. Representing the Com. C1, and invited by the organizers, was presented a talk by Paulo Bretones: “IAU Commission C1: History and Current Activities”, in Session 2: Astronomy Education within the IAU, recorded and presented at 7 and 8 October with the Panel discussions. The video is available at: <https://www.youtube.com/watch?v=FIceZD8SB10&t=25s> More information at: <https://astro4edu.org/shaw-iau/>

About the **IAU Symposia** related on Astronomy Education were held: IAU Symposium 358: Astronomy for Equity, Diversity and Inclusion: a roadmap to action within the framework of the IAU 100th Anniversary, held in Japan, Nov. 12-15, 2019. More information at: <https://iau-oao.nao.ac.jp/iaus358/> IAU Symposium 367/VIRTUAL Education and Heritage in the Era of Big Data in Astronomy - The first steps on the IAU 2020-2030 Strategic Plan. 8-12 December 2020. More information at: <http://sion.frm.utn.edu.ar/iaus367>

## 2.2. *Projects*

The **IAU100 Global Project, Astronomy Day in the Schools** initiative was an IAU100 Global Project as a part of the activities of the IAU 100 years (<https://www.iau-100.org/>), with the vision of mobilising the astronomical community to organize activities in schools. Based on the idea of Paulo Bretones, a Steering Committee has been set up to discuss the initiative, name of the event and suggestions. After this, the IAU100 Secretariat coordinated the Astronomy Day in Schools project to help the participants about event registration and reports. This was a special opportunity for students to directly interact and engage with astronomers in their communities, and to learn about the important role of astronomy in our lives. Any amateur or professional astronomer, scientist or teacher was invited to participate. IAU100 encouraged school visits taking place during or around the week of 10-17 November 2019. During this week, the 10th of November marked the World Science Day for Peace and Development and a Mercury transit also took place on the 11th of November, which offered an exciting outreach opportunity for the visiting astronomers. There were over 500 events and activities in 70 countries worldwide. This was the inaugural event in 2019. In future years, the date is still to be decided, but it may be the date of an

equinox. It is an important date, even historically as many cultures use this date to begin the year and the equinox makes catering to both hemispheres easier to synchronize activities. More information at: [www.iau-100.org/astro-day-schools](http://www.iau-100.org/astro-day-schools) and <https://www.flickr.com/photos/161571186@N03/albums/72157711979885508/with/49>

To continue the project for 2020, taking advantage of the Solar Eclipse of December 14, with Akihiko Tomita as co-chair and with the help of Saeed Salimpour we have prepared a website to provide resources to engage communities: <https://iau-dc-c1.org/eclipse-2020/> The event presented a special opportunity for students to learn more about the science of eclipses, and for teachers to develop units of work and incorporate the concepts into their science classes. That will be a big legacy for teaching material to share with all of those who would be interested in teaching about these astronomical phenomena. So, we hope that this website could help teachers and students even in these times with remote teaching and learning in many schools in the world. We have encouraged teachers, educators, students and also amateur or professional astronomers and scientists to share their activity reports and officially register the activities. There were 79 registrations from 13 countries and 1930 web site visitors from 86 countries. In future years, the date is still to be decided, but it may be the dates of the equinoxes, solstices and/or would be a continuous project.

Throughout 2019, extensive feedback from the community has been obtained for the “**Big Ideas in Astronomy: A Proposed Definition of Astronomy Literacy**” booklet. After over a year of contributions from the worldwide community of scientists, educators and communicators, all this feedback was carefully studied and discussed during 2020, and a new version that incorporates that feedback was created. The group started to work on producing faithful translations of this second version of the Big Ideas booklet - 10 translations were created. A new dedicated website was also developed for the project. At the end of 2020, a MoU was signed between the Big Ideas in Astronomy WG, represented by the WG for Astronomy Education Research and Methods and the OAE. Under its mission, OAE will continue and support the implementation and secure the next steps of Big Ideas in Astronomy, which are to conduct empirical studies on the Big Ideas, to foster curriculum development aligned with them, to promote the production of educational resources and the production of materials for teacher training, and to prepare policy-reports for curriculum development. For more information: <https://iau.org/news/announcements/detail/ann19029/>

### 2.3. *Astronomy Education Journal (AEJ)*

On December 2, 2020, was announced the new *Astronomy Education Journal* (AEJ) and the first call for papers. At the inaugural IAU Astronomy Education Conference (AstroEdu), we announced the intention to launch the journal. Today, we are happy to inform you that the journal is officially open and is accepting submissions of manuscripts. This online journal aims to be a key global publication platform for both researchers and practitioners, in the field of Astronomy Education, Research, and Methods. As of today, we have some 15 manuscripts submitted and the first issue is planned for summer 2021. AEJ aims to meet the needs of the astronomy education community by providing a location for all manner of practical, newsworthy and scholarly publications involving developments in the field. In a sense, the journal tries to capture the original spirit whilst taking on board the important lessons from the, now out-of-print, *Astronomy Education Review*. By focusing on building community collaboration, disseminating important news and opinions, while also maintaining a section on more formal, technical, Astronomy Education Research (AER). This research section intends to compliment the current scholarly discipline-based work undertaken by *Latin-American Journal of As-*

tronomy Education (RELEA), the Journal of Astronomy & Earth Sciences Education (JAESE) and, recently, the acceptance of AER articles into Physical Review Physics Education Research (PRPER). AEJ will draw on journals such as the *CAP Journal*, *Nature*, and *Science*, to incorporate both peer-reviewed and non-peer reviewed articles. There will be a peer-reviewed section of research articles that will be incorporated into AEJ's scholarly indices. These research articles will be formally peer-reviewed as traditional scientific journal manuscripts and, as such, need to be of a sufficient scholarly standard as recommended by, for example, Scopus. In addition, there is also scope for published invited reviews written by specialists of the area of AER. There will also be a less formal, non-peer-reviewed, but edited and curated section that contains other relevant material, such as, news, announcements, interviews, opinions, resources, correspondences, best-practices, classroom and astronomical activities, to help circulate information among the community. We welcome everyone to submit manuscripts to AEJ by visiting: [www.astroedjournal.org](http://www.astroedjournal.org).

#### 2.4. Working Groups

The Com. C1 WGs, since the approval, has been working very well and have connected with their members. For example: NASE WG has organized many courses in many countries; the WG Competitions collected data about olympiads and competitions in many countries and the WG AstroEDU has reviewed and published more activities and will become part of the OAE's remit and the AERM WG activities were mentioned above. The reports of each WG can be seen at: [https://www.iau.org/science/scientific\\_bodies/commissions/C1/](https://www.iau.org/science/scientific_bodies/commissions/C1/)

### 3. Conclusion and future plans

Considering the mentioned achievements of the Com. C1 for the next triennium would be important to continue and promote some projects, such as: - surveys of publications about Astronomy Education Research as thesis, papers and proceedings in many countries. - the AstroEDU Meetings and promotion of AER workshops and AE studies in different regions, including underserved communities. - Astronomy Day in the Schools. - Big Ideas in Astronomy. - Astronomy Education Journal (AEJ).

So, in a general way, it is important to preserve the published material, advertise teaching materials and promote courses and not only for STEM or STEAM, but all the subjects for which astronomy can encourage and inspire studies and knowledge. More than competitions, it is important to promote studies, collaborations with teachers, students and researchers to work together for a better world!

### 4. References

Bretones, P. S. (2019). A history of IAU Commission C1: a look from the Newsletters. In: 349th Symposium of the International Astronomical Union, Under one sky: the IAU Centenary Symposium, 2019, Vienna. Under one sky: the IAU Centenary Symposium. Cambridge: Cambridge University Press, 2018. v. 1. p. 419-430. Vieser W. et al. (2019). Report on the IAU Conference "Astronomy Education — Bridging Research & Practice", The Messenger, No. 178 – Quarter 4, p. 63-66, at: <https://www.eso.org/sci/publications/messenger/archive/no.178-dec19/messenger-no178.pdf>

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