

## COMMISSION C1

## Astronomy Education and Development

*Education and Development*

### COMMISSION C1 WORKING GROUPS

#### Astronomy Competitions for Secondary School

Chair

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#### 1. Introduction

During 2020 the work of the WG was severely impacted by the ongoing global pandemic (for more details see below). The lockdowns and restrictions meant that, alongside secondary-school teaching, competitions were restricted, postponed, or moved on-line, and meetings and discussions with teachers and students were more difficult than usual. Nonetheless the situation also created new opportunities for developing ideas about astronomy competitions and outreach. Members of the WG attended the 2nd Shaw Workshop organised by the OAE and had fruitful discussions with the OAE, NAECs and other participants. Regarding online competitions, the WG especially noted that the wide-scale switch to on-line methods allowed some competitions to reach students who would previously not have been able to participate due to the cost and time requirements of long-distance travel.

#### 2. Impact of COVID-19

From January 2020 onwards, successive waves of the global COVID-19 pandemic significantly impacted astronomical competitions globally, due to the restrictions placed on travel and gatherings. Typically, the period from February—June includes multiple rounds of competitions in many countries. In particular this is the time-frame of the semi-finals and finals of National Astronomical Olympiads and selection rounds for the International Olympiad on Astronomy and Astrophysics (IOAA) and International Astronomy Olympiad (IAO) teams. However, many countries were forced to cancel competitions, conclude them early or move competition or training events on-line. While it was initially expected that the International Olympiad on Astronomy and Astrophysics (IOAA) would go ahead as planned in September in Colombia, this was ultimately postponed to 2021 (it remains to be seen if it will take place as planned). A knock-on effect caused the postponement of the 2021 event to 2022 etc. Some examples of the impact of COVID-19 on astronomy competitions in different countries include:

1. In Estonia the Astronomy Olympiad was cancelled due to the COVID-19 pandemic and was replaced by an online competition for both junior and senior secondary school students (two events) held on 23 April 2020. As an

experiment and to provide a more interesting competition the organisers put out an invitation through the WG and IOAA members to participants from other countries with the competition to be held along the lines of IOAA/IAO (i.e. with translation by team leaders into national languages). This provided very useful information which allowed for an online replacement for the IOAA to take place in 2021 (see below).

2. In Poland the semi-final of the National Olympiad took place in mid-February, with the final initially scheduled for 15 March as usual. Due to restrictions imposed by the government, the final was cancelled, and the prizes awarded based on the ranking from the semi-final. Since Poland also uses the final to select the team for the IOAA, this was also done based on the semi-final results. The Polish team participated in the Estonian competition described above as a training exercise.

3. In Lithuania the first round of the National Olympiad was held but the second, due in April, was cancelled. The Lithuanian students also participated in the Estonian online competition.

4. In the UK the selection camp for the IOAA was run remotely.

5. In Indonesia the provincial level of the national science Olympiad (which includes astronomy) due in mid-April was postponed, with the finals taking place in November. Team selection and training for the international astronomy Olympiads was performed online.

6. In Armenia training for the selected team for the IOAA was held on-line

7. In Greece the 3rd round of the annual competition on astronomy was postponed to June—July.

8. In Portugal the National Astronomy Olympiad was cancelled.

9. In Brazil the Astronomy Olympiad took place in an online format.

10. In Thailand, with a strict measure on COVID-19 pandemic, the Thai National Olympiad (TAO) took place at Chulalongkorn University in Bangkok in December 2020.

### 3. The Global e-Competition on Astronomy and Astrophysics (GeCAA)

With the postponement of the IOAA event which was to have been held in Colombia, and the promising results of the Estonian on-line National Olympiad with guest participation from other countries, the International Board of the IOAA decided to hold a replacement event for the IOAA on-line. This was supported by feedback from National Olympiads and organisers which showed a strong desire from students who had passed their national selection process to be allowed to test themselves and their abilities in some way. The name “Global e-Competition on Astronomy and Astrophysics” (GeCAA) was chosen to differentiate the event from the existing in-person IOAA and IAO.

The Estonian Astronomy Olympiad committee backed by the Estonian Ministry of Education and Research offered to virtually ‘host’ the event based on the positive outcome of their National Olympiad (see above) and this proposal was accepted. In order to accommodate time-zone differences and school schedules the event was spread out over approximately a month with ‘windows’ for the examinations. In the style of the IOAA the event included individual and team competitions. As during the IOAA, the team

competition was constructed so that members of each team were from different countries, and one of the tasks used this to have the students make observations of the Moon from different locations around the world, which would have been impossible in an in-person competition.

Guest lectures were also given by astrophysicists Professor Erin Kara and Dr Elena Maria Rossi and astronaut Catherine Coleman, which as well as being of topical interest also had the aim of presenting the students with role models of women scientists in line with the IAU goals of improving gender equality in STEM.

The WG and GeCAA organisers surveyed the participating students following the event. The response was overwhelmingly positive, though some expressed a preference for the in-person IOAA over an on-line event (especially due to the social interaction). The global nature of the team competition was also expressly mentioned as a positive aspect.

Some highlights:

1. 70% of respondents rated their experience as good or excellent,
2. 75% of respondents felt either strongly or very strongly that the competition made “a positive impact on your view of astronomy and astrophysics”,
3. 65% had not participated in an online competition before,
4. 83% had not participated in an in-person IOAA or IAO before,
5. the on-line lectures received “very positive” ratings from 70-75% of respondents.
6. 63% rated the Moon observation team problem (requiring observation from around the world) as positive or very positive.

Comments included:

*“This was probably the biggest, most stressful and most fun project I’ve ever had to work with in my entire life. Coordinating the different time zones, finding ways to communicate, discussing theories and then putting them to the test, writing the final paper detailing everything — all of this created a unique experience which I’m not sure if I’ll ever get again, but I know I won’t forget”*

A more detailed description of the event and survey results is being prepared for publication in the Astronomy Education Journal. Depending on the developing situation a 2nd GeCAA may take place in 2021 alongside or as a replacement for the IOAA.

#### 4. Conclusion

During 2020 the rapid development of online teaching and competitions has been the primary interest of the WG. The online competitions have been largely successful and well-received among students, despite some issues as is usual with any new development. It is clear that this has had a significant impact and will have benefits for the future even post-pandemic when travel restrictions are lifted. On-line competitions have significant positive benefits in terms of inclusivity for students unable to travel for financial, political or perhaps even cultural reasons, allow more students to participate because of the lower cost for the host, and allow for tasks which are not possible in-person such as simultaneous observations from different locations. This can bring a new level of collaborative astronomical experience to students, one which is more similar to the way research science is conducted. Of course the

negative aspect of reduced personal interaction exists and cannot be ignored, there must be a place for both in-person and on-line competitions in the future.

As mentioned in the report for 2019, the WG will be sending out a new version of the survey regarding astronomy competitions. In light of the experiences in 2020 this will now include questions on on-line events and participation which can then inform future decisions.

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