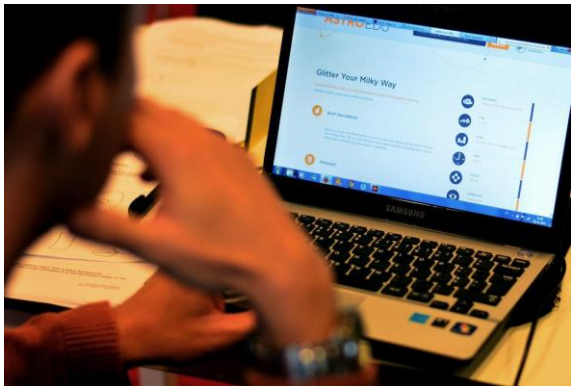
ASTRO EDU

Peer-reviewed Astronomy Education Activities



AstroEDU Report 2022/2023

Authors: Livia Giacomini (INAF, astroEDU), Edward Gomez (Las Cumbres Observatory, astroEDU), Giulio Mazzolo (astroEDU), Gwen Sanderson (IAU OAE, astroEDU)

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Abstract

AstroEDU (https://astroedu.iau.org) is the free, open-access platform for educational activities supported by the Office of Astronomy for Education (OAE) of the International Astronomical Union (IAU). Starting from the 1st of April 2022, astroEDU went through a deep reorganization: in this Report, we describe the first year of activities of the Editorial Board (1st of April 2022-1st of April 2023), its achievements and the plans for the near future.

1. What is astroEDU?

With astroEDU, educators can find a selection of education activities on astronomy, Earth, and space science that have been reviewed both by a professional educator and a professional scientist to ensure accuracy from both the educational and scientific perspectives.

AstroEDU was founded in 2013 by Pedro Russo and Edward Gomez and initially endorsed by IAU Office of Astronomy for Development.
Since May 2021 astroEDU has been operating under the auspices of the IAU OAE in Heidelberg, (Germany). Since April 2022 astroEDU has a new Editorial Board and is undergoing some major updates, implementing many changes in its editorial process and adopting new technologies in order to publish in the future more versions of the site in different languages.

To date, astroEDU has 2 language editions (English and Italian), each with its own editorial board, with a total of 87 published activities in English and 39 in Italian.

AstroEDU has today a lively community of users and collaborators, including researchers, teachers, students, and experts in science education. **An average of about 4300 users coming from different countries of the world visited the website each month in the period 1st of April 2022-1st of April 2023** (see attachment 1).

Exchanges with the community offer a clear view about what astroEDU is today and the role it should play in the future. In a nutshell, astroEDU wants to be:

1. the IAU's international reference for high quality astronomy and Earth science education activities;
2. a free online platform where new, fun and engaging educational activities are published regularly;
3. a multilanguage home for readers and users from around the world, enhancing collaboration and integration across different educational approaches and standards;
4. a community to collaborate with by publishing, reviewing or translating new activities.

2. Accomplishments of the 1st year

On the 1st of April 2022, the new Editorial Board of astroEDU was appointed.
Board members are Livia Giacomini, Giulio Mazzolo, Edward Gomez and Gwen Sanderson. The board meets on a weekly basis to organise and coordinate astroEDU tasks.

2.1. Identification of main problems

The Editorial Board started analysing the existing website and the publication/review process, identifying a number of problems to be addressed in the first year of activities:

- the board of authors/reviewers was not motivated and often not collaborating;
- the revision process was tracked with an OJS system, typically used for scientific journals. The system requires authors and reviewers to signup and carry out the review online, slowing the revision in this first phase;
- the publication process of an activity was too long and confusing. Some activities were lost in the process;
- the website was difficult to navigate and to use (e.g. the search tool was not working, the website was not optimised for access from mobiles);
- it was difficult to manage translations;
- many activities needed to be reviewed to meet the standards (e.g. they missed images and an abstract, had major problems of layout, wrong age ranges, metatags were not correct);
- an evaluation of who was using the website and how was needed.

To solve the identified problems, we then defined some practical tasks that we addressed and solved in the first year of activities.

2.2. Redefinition of the Editorial Board and of the workflow

In this first year of activity we discussed and approved a structure for the astroEDU Editorial Board and the roles of the members of the structure. This new structure includes a Management Board of the International version and Local Editorial Boards of other versions of astroEDU (to be created in the future). The editor in chief of each Local Editorial Board will participate in the activities of the International Editorial Board, working as a link between the different editions of the platform.

In the Editorial Board, there is also a Board of Reviewers who are involved in the revision process when needed.
In the reorganisation, a Steering Committee and a Board of Ambassadors were also established. Tasks and activities of the single boards are indicated in Image 1.

Image 1: astroEDU Editorial Board

2.3. Definition of the editorial process of publication and review

To solve one of the main problems identified and make the review/publication process as fast and effective as possible, keeping the high standard of a double review process, we adapted the publication process as shown in image in Attachment 2.

Once the process has been shown to work efficiently, we will optimize it by implementing the Open Journal System tools for managing the peer review process.

2.4. Implementation of a new technical structure for the website

The existing website presented a number of technical issues so the decision was made to pass to a new CMS called Wagtail. The switch to the new website has been done just after the 1st of April

and in the first year we identified and solved a number of technical problems, improving the website on the following topics:

- simplification of editing interface;
- update of informative pages of website;
- implementation of a new search tool;
- optimization of tags and possibility to make searches using them;
- simplified management of different language versions;
- google analytics installed;
- mobile version of website installed.

2.5. Review and uniformation of existing activities

The first astroEDU activities were published in 2013. Since then, many changes have occurred, involving an uneven review and publication process. As a result, a number of activities were written with different styles, had broken links, had missing images and documents, and were not correctly visualized.
For this reason, the Editorial Board reviewed the existing activities. The review process included: standardization of all metatags, addition of images, pdf and other missing material, check of broken links, addition of an abstract field, review of content (when needed). The scientific and educational content was not reviewed systematically, as the activities had already undergone such a check when first published.

The review process was introduced and followed by a communication to all authors and a regeneration of all PDFs associated with activities (27-04-2023).

2.6. Appointment of a board of reviewers

Since the list of authors and volunteers collected during the years was outdated, the Editorial Board decided to identify at least 20 active reviewers (teachers and researchers) from at least 4 countries willing to review at least 1 activity per year. To find volunteers, an online form was published and distributed at public events. The form is available in Attachment 3 and online at https://astroedu.iau.org/it/volunteer/. At the time of writing, 40 answers have been collected. Starting from the 2nd year of activity, activity reviewers will be amongst these subscribers.

2.7. Publication of new activities

In the last years there were a number of activities that were submitted to astroEDU and did not complete the whole revision. In its first year, the Editorial Board has finalised the revision of some of them. Moreover, five activities in English submitted during the first year of work were reviewed and published. These are:

Hunting for spectra (in English and Italian)
https://astroedu.iau.org/en/activities/2201/hunting-for-spectra/;

Make your own Sun (in English)
https://astroedu.iau.org/en/activities/2202/make-your-own-sun/;

Let's play with powers of 10 (in English)
https://astroedu.iau.org/en/activities/2204/lets-play-with-powers-of-10/;

Measuring the average speed of a comet (in English, Italian version was already online)
https://astroedu.iau.org/en/activities/2002/misurare-la-velocita-media-di-una-cometa

Age that crater (in English)
https://astroedu.iau.org/en/activities/2205/age-that-crater/

2.8. Communication

Communication was mainly focused on selected international congresses and events, where posters or talks were presented (see attachment 4).
On occasion of the 4th Shaw workshop (November 2022), the editorial staff also designed and offered a workshop (available both in person and online) aimed at explaining how to submit an activity to astroEDU. The workshop was quite successful, **with almost 150 participants, many of which filled in the form to become astroEDU volunteers.**

News and articles have been published to start communicating about astroEDU, and a brochure was also created for online sharing.

3. Analysis of existing activities

On the 1st of April 2023, at the end of the complete revision of existing activities**, 87 activities in English and 39 in Italian were publicly available on the website.**

3.1. Number of activities per scientific category

All published activities are classified according to their Scientific Categories, considering that each activity can be classified with a maximum of 3 different categories.
The distribution of the activities across the scientific categories is shown in Image 2. The chart indicates that not only Astronomy is represented, and that many activities cover Planet Earth (1st position), Scientific Instrumentation (5th), Ecology (7th), Physics (8th) and Space Exploration (9th).

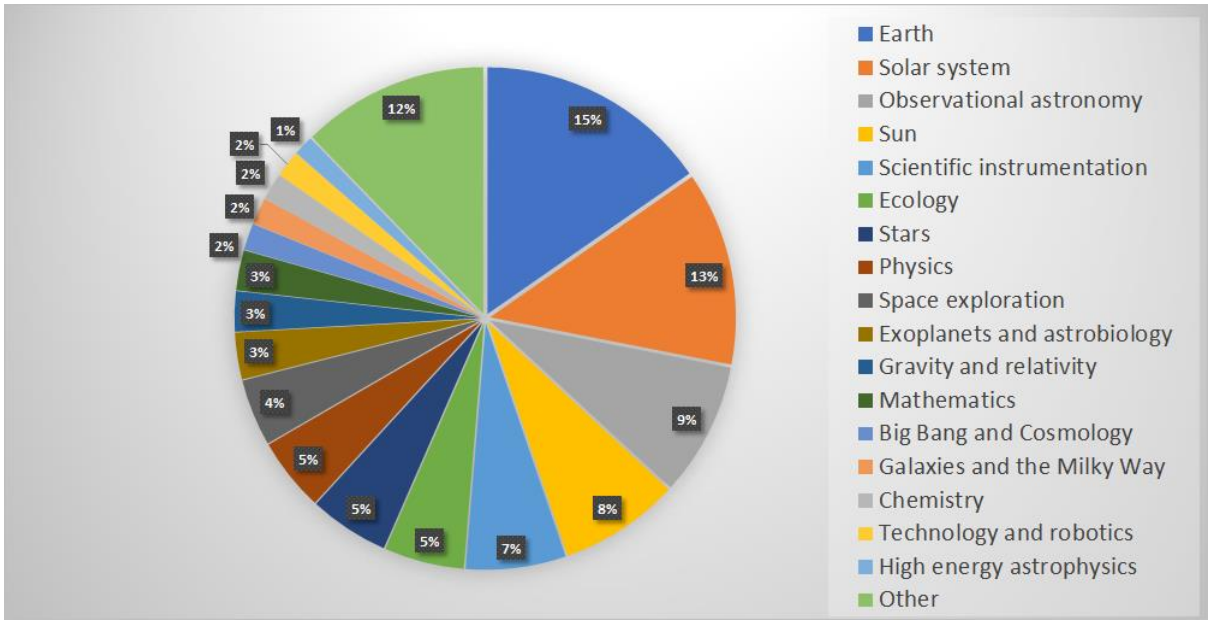


Image 2: Percentage of published activities per scientific category

3.2. Activities per age range

The distribution of published activities per age range is also very interesting. Image 3 shows that activities are well distributed across age range and school ranges.

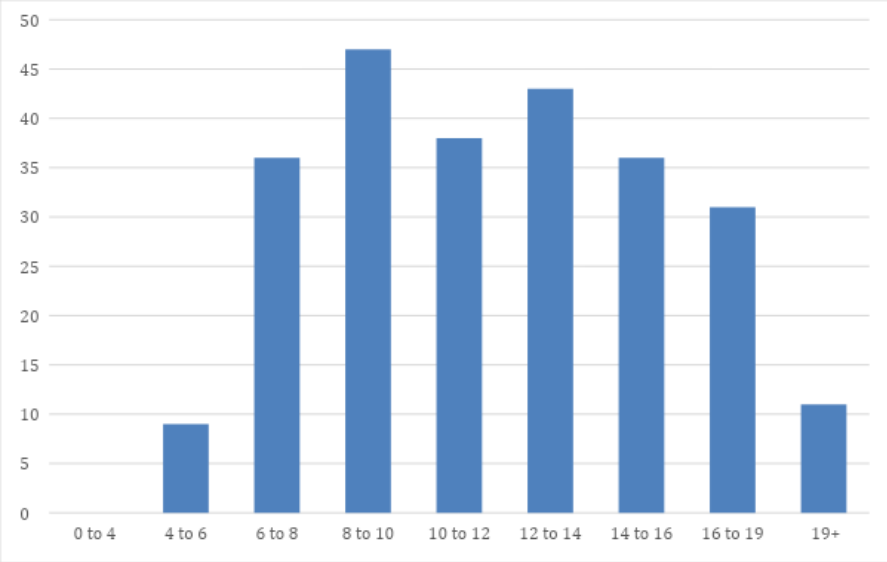


Image 3: Number of published activities per age range

3.3. Tags associated with activities

It is also very interesting to analyze the tags assigned by authors to their activity. It should be noted that the choice of these tags depends strongly on the author's approach, but there are many recurring words. The most chosen tags are shown in the Word cloud of Image 4 in which words like “fun and creativity” and “hands-on” stand out.

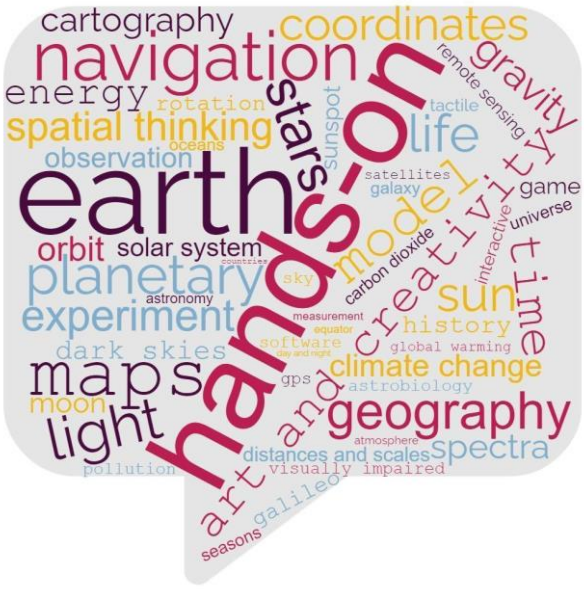


Image 4: Word Cloud of most chosen tags

3.4. The most read activities

To evaluate the topics that best suit our audience, we identified the 15 most read activities of astroEDU in the period 1st of April 2022- 31st of March 2023 (see Image 5). The list shows very clearly that the most read activities are the ones related to everyday/simple topics (the alternance of day and night like in activities that ranged position 1 and 3), or to simple hands-on activities very near curriculum topics (building a model of the Solar System, like in activities ranged in position 2, 7).

1 apr 2022 - 31 mar 2023

AstroEDU most viewed activities

	Title	Page views
1.	Why Do We Have Day and Night? | astroEDU	8.264
2.	Solar System Model | astroEDU	4.080
3.	Day and Night in the World | astroEDU	2.720
4.	Meteoroids, Meteors and Meteorites | astroEDU	2.681
5.	Build Your Own Artificial Satellite | astroEDU	2.503
6.	Creating Asteroids | astroEDU	1.782
7.	Solar System Model on a City Map | astroEDU	1.685
8.	The Intertropical Convergence Zone | astroEDU	1.351
9.	How High is the Sky? | astroEDU	1.290
10.	Transforming water into acid… and back | astroEDU	1.284
11.	Star in a Box: High School | astroEDU	1.283
12.	Design Your Alien | astroEDU	1.269
13.	Sun's Shadow | astroEDU	1.205
14.	Costruisci un Visore Solare sicuro | astroEDU	996
15.	Navigation in the Ancient Mediterranean and Beyond | astroEDU	879

Image 5: The most read Activities in astroEDU

4. Planning for the future

We want astroEDU to become a fundamental tool for the worldwide community of astronomy and more in general science teachers and educators. To reach this goal we identified some tasks and targets that will be addressed during next year, and more precisely:

4.1. Study of the astroEDU community and its needs

Next year will be dedicated to studying our worldwide community, its needs and expectations and how astroEDU can meet them.
To this aim, **a MSc thesis will be dedicated to this topic (see attachment 5)**. Data will be collected during the V Shaw Workshop (November 2023) and the results will be published by the end of the second year of activity.
The user experience will also be investigated, through a focus group of community members and, for the online aspects, Google Analytics.

4.2. Publication of new activities

With the first revision of astroEDU completed, the Editorial Board plans to publish new activities with a target rate of **at least one English activity per month.**

In the first 6 months of activity the Editorial Board will also optimise the publication process, deciding if the OJS system will be used in the future.

4.3. Enlarge the use of astroEDU worldwide

One of the main tasks of the second year of activities will be to monitor and increase the number of monthly visitors, making sure that visitors are distributed as homogeneously as possible across the world and increasing their average time on astroEDU.
The target is to **improve by 30% the current number of visitors.**

This should of course include non English native speakers communities. To this aim, the board will encourage and support the establishment of local editorial boards.

The first 6 months of the second year will be devoted **to the revamp of the existing Italian Editorial Board through the appointment of a new editor in chief and the translation of all the activities in Italian.** B**y the end of the second year of activities, a third version of astroEDU with a local editorial board should also be in place.**

4.4. Improve internal and external communication

Effective communication is crucial to boosting the visibility and impact of astroEDU worldwide. Hence, in the next year, significant effort will be dedicated to this task. This will include the **development of a communication plan and application to funds for the creation of communication materials (a brochure, a video trailer but also stickers and other material).**

We also want to improve internal and external communication making the participation of other IAU projects, organizations and entities to astroEDU more visible through a dedicated page. The board will present astroEDU at conferences and write scientific articles about the platform and its possible uses. It will also organize workshops aimed at increasing the participation of authors and reviewers, establishing collaborations with national organizations of teachers, editors or other possible users.

Conclusions

Over its first year of work, the Editorial Board has successfully laid the foundations for the future growth of astroEDU. Key focus areas have been:

- the identification and solution of numerous challenges and pitfalls;
- the definition and implementation of a new workflow, including the editorial activity and the review of new activities;
- the review of all published activities to meet astroEDU standard;
- the engagement of new potential reviewers and other astroEDU enthusiasts;
- the promotion and awareness raising of astroEDU across the international community of astronomers and educators.

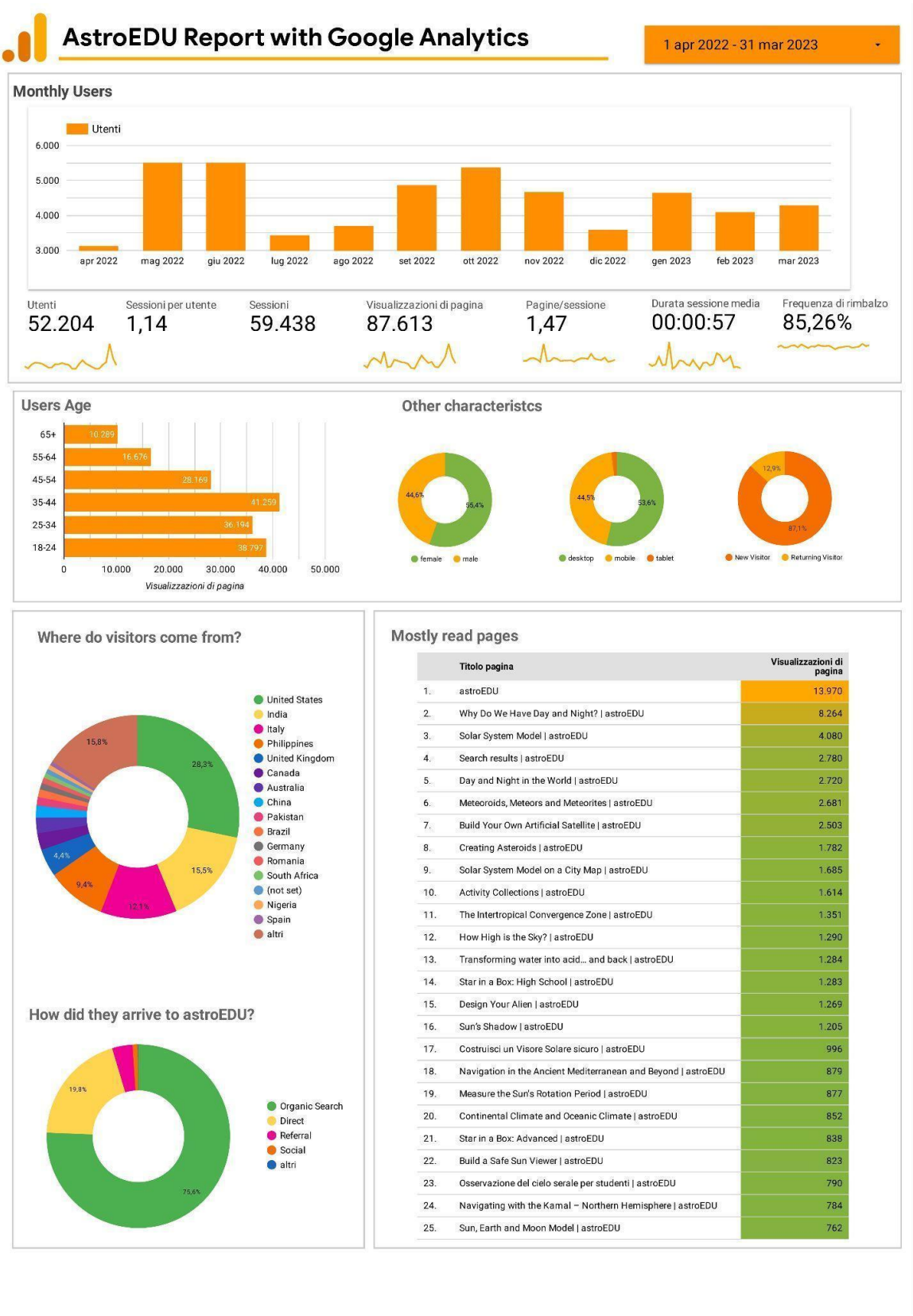
In particular, the work carried out during the past year has highlighted the importance of the following key aspects:

- AstroEDU has a strong impact potential on the educational community worldwide. This is indicated not only by the steady flow of new submissions, but also by the high number of active participants at the workshops organized and of volunteers. To enlarge the astroEDU community it is crucial to pay some efforts in presenting the platform to Congresses, Conferences and schools.
- The review process is what makes astroEDU unique in the worldwide panorama and to meet the standard, it should be kept as simple as possible. The voluntary basis of the professionals involved (from the members of the Editorial Board to reviewers) calls for a wise management of the limited time and resources available. For this reason, the effectiveness of the review procedure will be evaluated with care, as well as the opportunity to involve additional staff.
- Communication is key and would strongly benefit from the development of a communication plan and the availability of professionally designed communication materials such as leaflets, brochures, videos that need to be produced externally.

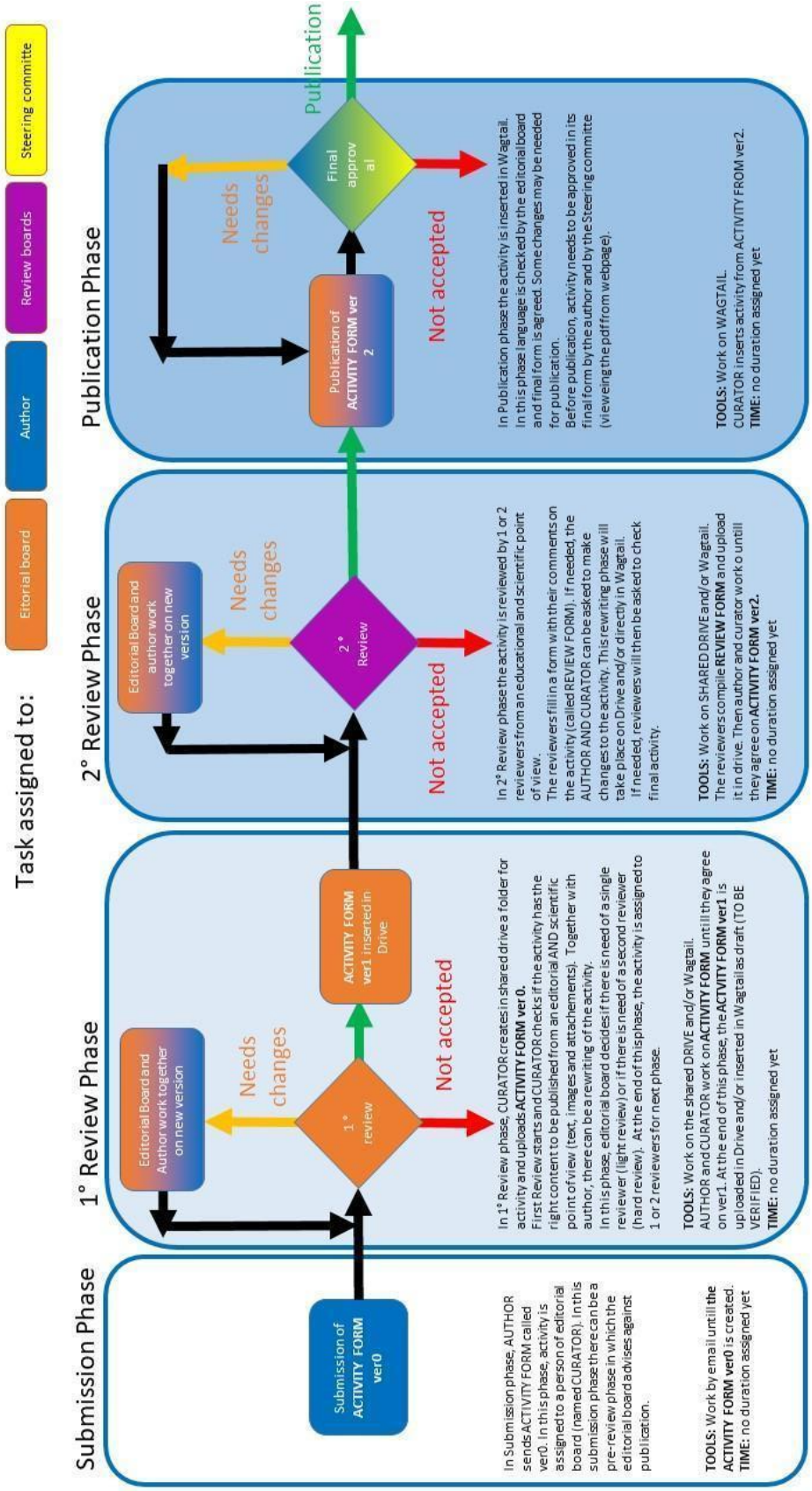
To successfully achieve the goals highlighted above, and fully accomplish the astroEDU mission, it is of the utmost importance that funding is made available. In particular, funds would allow to: i) enlarging the network of collaborators across the globe, by establishing synergies with organisations such as research institutions and universities; ii) involving in the review process additional staff (e.g. students or interns) and collaborators; iii) supporting the development of engaging and effective communication materials by outsourcing their production to professional graphic designers; iv) assisting in the development of activities, particularly for enhancements that arise during the peer-review process. Over the next year of activity, the Editorial Board will work towards the identification of possible source of funds, thus informing the direction that the astroEDU project will take.

Attachments

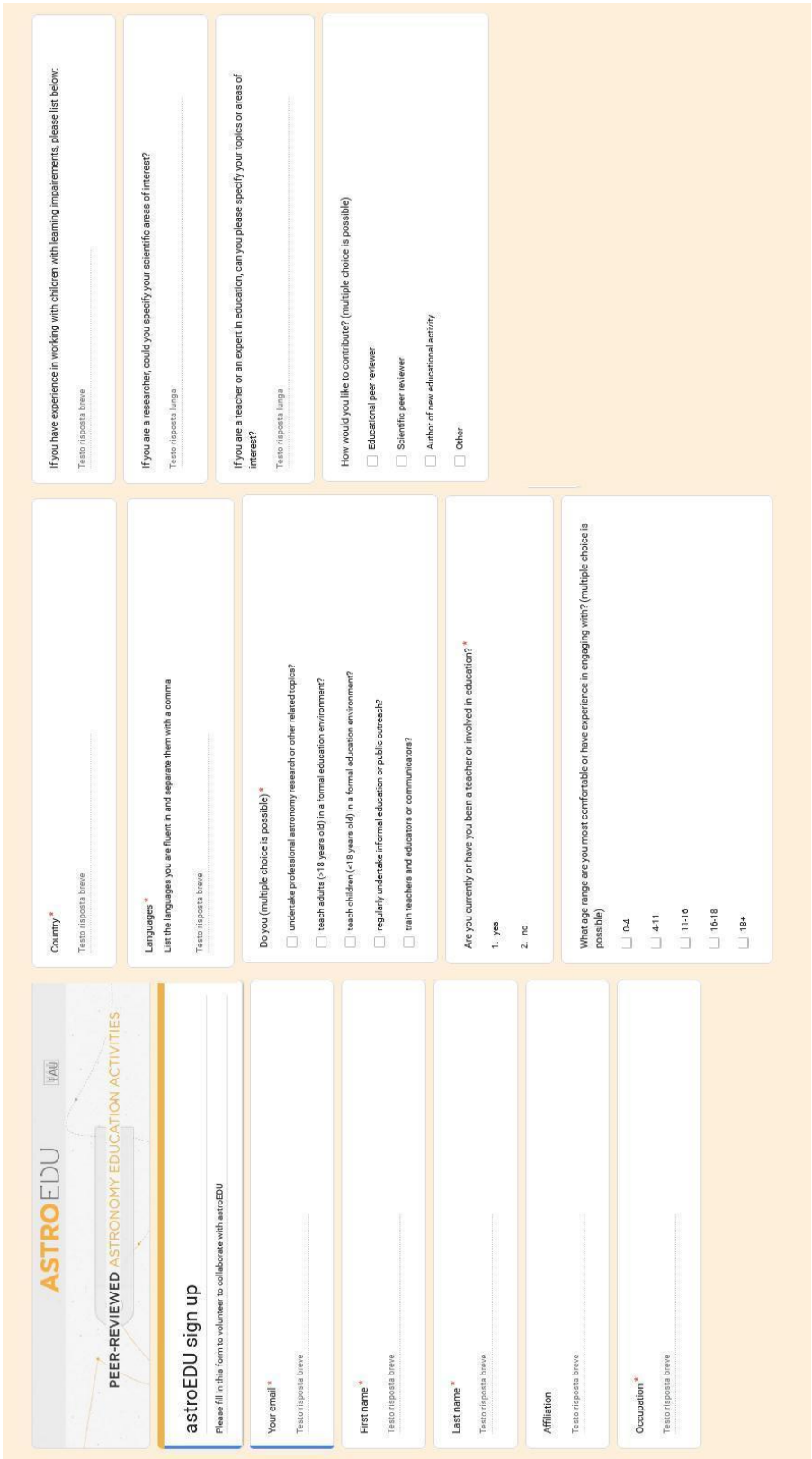
Attachment 1 – AstroEDU on Google analytics



Attachment **2 – Publication Process**



Attachment 3 – Form for subscribers



Attachment 4- List of Publications and Scientific Congresses

Participation to congresses and scientific publications

- **poster at the Congress EAS2021, Valencia**
  "AstroEDU, IAU open-access platform for peer-reviewed Educational Activities", Authors: Livia Giacomini; Edward Gomez; Giulio Mazzolo.

- **poster at the Europlanet Science Congress 2022**, Granada, Spain, 18–23 Sep 2022
  "astroEDU, IAU open-access platform for peer-reviewed Educational Activities" EPSC2022-1028, https://doi.org/10.5194/epsc2022-1028, Giacomini, L., Gomez, E., Mazzolo, G., and Sanderson, G.

AstroEDU Workshops

- **AstroEDU Workshop: Let's learn with AstroEDU** 4th of August 2022, IAUGA 2022, Busan, Republic of Korea & online
  https://www.iauga2022.org/program/program_06_4.asp?sMenu=abo6

- **AstroEDU Workshop: Let's learn with AstroEDU** 16th November 2022, 4th Shaw-IAU Workshop on Astronomy for Education, 15th of November 2022 to the 17th of November 2022, online https://astro4edu.org/shaw-iau/4th-shaw-iau-workshop/

Articles and news

IAU announcement about AstroEDU - 5th of April 2022
https://www.iau.org/news/announcements/detail/ann22016/

News in EduINAF (in Italian) - 28th of October 2022
https://edu.inaf.it/news/eventi/shaw-iau-workshop/

News in EduINAF (in Italian) - 24th of October 2022
https://edu.inaf.it/approfondimenti/insegnare-astronomia/visore-solare-didattica-sole/

News in EduINAF (in italian) – 28th of September 2021
https://edu.inaf.it/news/eventi/astronomy-for-education-workshop/

Atachment 5 - Proposal for a thesis

Title: Assessing the impact of astroEDU in the worldwide panorama of science education
Student: Antonella Corleone
University: Università degli Studi Roma Tre, Master's degree in Mathematics (Educational & Outreach)
Year: 2022/2023 (starting February 2023- duration 9/12 months)
Proposing Professor: Andrea Bruno, Livia Giacomini

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AstroEDU was founded in 2013 and since May 2021, it has been operating under the auspices of OAE (Office of Astronomy for Education) and undergoing some major updates, implementing many changes in its' editorial process and adopting new technologies in order to publish in the future more versions of the site in different languages. To date, astroEDU has 2 language editions (English and Italian), each with its own editorial board, with a total of more than 100 activities that have been selected and published.

The thesis should focus on assessing the impact of astroEDU in the worldwide panorama of science education, giving clear indication on how to improve this impact worldwide, both on a quantitative and qualitative point of view.

The thesis should also define a standardization for impact assessment, identifying or building a set of tools to be used in time to evaluate the effectiveness of activities and the engagement level of different communities.For this analysis, it will be fundamental to collaborate both with the editorial board of AstroEDU and with the different OAEs, that will help the candidate to identify and contact NAEC (National Astronomy Education Coordinators) of some selected countries and to collect their input.
In this thesis, the candidate should collect and analyze information about the educational contents of AstroEDU and the community around it. Part of his/her work will be to analyze online data from the statistics of the website; reach out and interview a Focus group of teachers and researchers from all over the world; build specific tools to collect and analyze detailed information on the educational effectiveness.

Important questions to be addressed in the thesis will be both quantitative and qualitative: how many teachers have made use of AstroEDU activities and how many students have been reached? Which topics are the most appreciated in classrooms by teachers and why? Is there a geographical-related bias connected to the linguistic and curriculum aspects that affects the production and use of activities and, if so, how can it be overcome? What could be done to make it easier for less developed countries to make use of astroEDU activities?