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STEAM-Med: a co-design for Med Children

CO-Design a significant learning in the Mediterranean Area

OAE Center Italy coordinates a global effort for children in primary and junior secondary schools (under 12 year old, U12) and a regional effort in the Mediterranean Area (primary and secondary schools, under 19 year old, U19).
For this first large project, we choose to work at the intersection of those two areas.

Lesson learned @3rd Shaw-IAU workshop 21and previous experiences

We learned people have different approaches and points of view. We learned that something meaningful for children in Argentina can be less interesting for children in Tokyo, as well as for someone living in a city or in a village.
Our idea is to create an educational path that could be interesting for children/school in the Mediterranean area. Something that can engage them, inspire them, make them feel a community. We propose an Educational path because we would like to engage the children with a project, with a learning experience and we found out that to have a real and deep impact we need time and multiple experiences (months). This is a bit different with respect to preparing a set of resources that teachers can use.

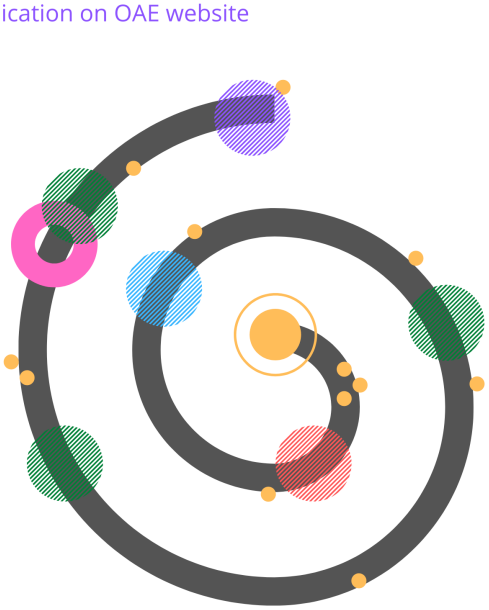
We want to produce an educational path for children in the approximate age-range 6-12, which will be hopefully remixed by other teachers in the world; not a single resource or a single workshop but a set of activities which will explore a concept, or an idea in Astronomy/Astrophysics/Physics. We can mix and match different methods/practices/instruments.
We are planning to continue this exercise in the future, by involving different groups selected by their geographical regions or for a common interest.

Process/timeline

- **Kick Off** 1/12/21 We begin our process and we will carry on meetings in order to get to know one other and better define our project. We ask to provide info on NAEC past experience
- **Idea Selection** Beginning of February we will select a general idea or theme for the co-design (two slot 2 February and if needed 3 February 2022) The

idea is to select an idea that can be meaningful for children in the Mediterranean

- **Production and iteration** By (early) May each team will prepare their own materials and resources that will compose the educational activity
- **Regional school** During the summer, we will have a regional school where we will share, test and enrich our resources. (TBD JULY: First iteration with larger participation)
- **Sharing with a global community** At the end of the process (september) this educational path/project will be published on the OAE website as a common effort of the Med-Area and as a common effort of all the NAECS and NAECS team that contributed.



Product-oriented or process-oriented?

We believe the most important part of this project is the process itself because what we really want is to stimulate the Med community, nurture it and generate space where people from the Med Area can work together in AE. The challenges of this project are obvious, because the geography of the Med does not correspond to a uniformity of language, nor religion; different countries may also have political disagreements, people may come from different educational backgrounds with diverse values and positions. And jet, we do believe this project is feasible and OAE Italy can lead this process.

Goals in terms of Product

- Regional school (July)
- educational path published on OAE Website (at least 4 units by Fall 2022)
- at least 2 resources on AstroEDU (after September 2022)

Goals in terms of Process

- Report about communication (mail sent, people engaged, participation to calls)
- paper or document about the Med “community of learning”
- interview with NAECS (qualitative analysis)
- documentation (zoom recording, interviews, possibly something a bit more articulate

Kick Starter: Officina degli Errori / Officina della luce

As OAE we decided to invest in an ongoing Italian educational project “Officina degli Errori” (Workshop of Mistakes) as a kick starter for future communities of practices, co-design experience with teachers and STEAM learning at school.
The OAE financial support will allow us to run the project in other schools, approaching different contexts, such us underprivileged outskirt of Palermo (Sicily), semi-rural areas in Sardinia. It can potentially engage about 100 teachers from different environments.

Officina degli Errori began in 2017 as a partnership between INAF and Museo del Patrimonio Industriale in Bologna. The basic idea was to bring constructionist practices- such as tinkering to primary school teachers in Bologna. In theory, teachers from the whole metropolitan area of Bologna could attend, but because of the position and the typical audience of the museum (located in quartiere Navile, an underprivileged neighborhood with classes for 90% immigrant children) we worked - as expected- with a mixed community of teachers from small schools in the suburbs and outside Bologna, and larger schools in the city from underprivileged areas.
In the year 2017/2018 we tested our audience and we tuned our activity with the museum hosting tinkering workshops for children at the museum floor (4 workshops).
In the 2018/2019 we carried on a co-design project with 20 teachers one year long articulated as the following:

- professional development for teachers and for museum educators, 12h half workshop and half training and discussion (September)

- Each teacher visited the museum with his/her class for a tinkering workshop facilitated by at least one INAF researcher, one educator from the museum and another teacher participating in the project. In this way, the teacher could observe what this practice can do for their pupils without worrying about facilitation. On this occasion, teachers visiting with their classes and teacher facilitating discussed several aspects of the facilitation and the groups' dynamic together with INAF researchers and museum educators (October to January).
- The teachers received a kit (scribbling machine) to try tinkering in the school environment. INAF researchers provided feedback and advice if needed. In this period of time (February to June) teachers experimented at school
- Mid June full day of reporting of the various local activities, feedback and lessons learned.

In the same year we carried out other professional development courses following other teachers in a less structured way (Istituto comprensivo 12 Bologna).

In 2019 we applied as a partner of Istituto comprensivo 12 Bologna to a Ministry of Education Grant in order to carry on those activities in a more structured and mature way and we won a grant of about 60 Keuro to cover basically materials and teachers extra time. We develop a co-design educational project with a small group of dedicated teachers, thematically connected with astrophysics but also truly relevant for children. We believe documentation is a relevant part of this practice and we chose to work with a project zero/Reggio children approach so we involved INDIRE (the National Institute for Documentation, Innovation and Educational Research) researchers with this particular experience.
We focus on tinkering as constructionist practices so the aim of the documentation is to reveal the tinkering-approach learning process. Tinkering a priori does not state a curricular learning goal; we found out that for teachers it is very important to have other resources instead, clearly connected with the curricula. Together with teachers, we produced a series of thematic educational resources that can be used as a moment of "rilancio" (re-launch), to dig deep in an aspect the children found interesting or - for example- to bring in new perspectives.

We prepared resources on tinkering, on documentation, and on hands-on activity here https://play.inaf.it/officinadellaluce/. We had a kick Off in Bologna with 30 teachers at the beginning of September with 2 full days of activities.

This project is being carried out on 5 schools right now (4 in the Emilia romagna Region and one school in Naple). In this first round teachers will have the chance to have 5 workshops facilitated by experts, setting up a tinkering environment in their own classes, they will also observe the facilitation and get acquainted with materials. They will have extra time to actually do those workshops but also to document the learning process. We set up a possible documentation protocol to facilitate this task. Teachers can also use other methods/protocols. We will closely follow this project and we will have a full day of exchange within the schools and with the researchers involved at the end of this school year (June 2022).

Those kits will represent part of the Italian contribution to STEAM-Med.

astroEDU ITA

The Italian version of the website was launched in 2017 by the Italian National Institute for Astrophysics (Istituto Nazionale di Astrofisica — INAF) and the Italian Astronomical Society (Società Astronomica Italiana — SAIt) with the support of the

International Astronomical Union (IAU) and Leiden Observatory (see https://www.iau.org/news/announcements/detail/ann17035/ for details).
The establishment of I-OAE and the entrance of Stefano Sandrelli in the astroEDU International Steering Committee brought to a redefinition of the Italian Editorial Board, with the nomination of Livia Giacomini as Editor-in-Chief of the Italian edition.

Constitution of the astroEDU ITA editorial board

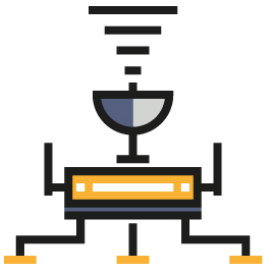
The activities of the astroEDU ITA editorial board started in September 2021: in the first 2 monthly meetings (september-october) we appointed a new editorial board and reviewed its strategy and tasks, defining targets, workflows and tools (see minutes of the meetings for more detail). In the following 2 months (november-december) we focused on the production of new activities and on the analysis of the existing platform, so as to identify and address technical issues and possible improvements.

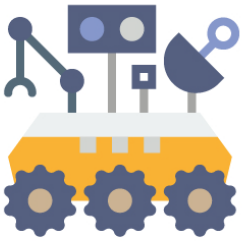
The newly-formed editorial board is constituted by: Livia Giacomini (INAF), Sandro Bardelli (INAF), Caterina Boccato (INAF), Ilaria De Angelis (Università degli Studi Roma tre), Gianluigi Filippelli (INAF), Giuliana Giobbi (INAF), Laura Passeri (Liceo Scientifico J.F. Kennedy, Roma), Ezio Pignatelli (Liceo Scientifico I. Nievo, Padova), Anna Wolter (INAF).
Stefano Sandrelli (INAF), member of the astroEDU International Steering Committee is also taking part in the activities.
We also started identifying a Board of educational reviewers among teachers who have already collaborated, or who are willing to collaborate with us, making a list of names to be confirmed in the next few months.

Activities for astroEDU ITA

Publication of educational activities in astroEDU ITA

Among the targets for the first year of activity (September 2021-September 2022) we decided the publication of 1 activity per month, which can either be a brand-new activity in Italian or the translation of an existing activity (translated from Italian into English or from English into Italian).





The activities published since September are:

- SEPTEMBER https://astroedu.iau.org/en/activities/2001/ (*Driving on Mars*, english version translated from Italian)
- OCTOBER http://astroedu.iau.org/it/activities/measure-the-solar-diameter/ *(Misura il diametro del Sole*, Italian version, translated from English)
- NOVEMBER: https://astroedu.iau.org/it/activities/2103/ (*Il Sole si sta muovendo? Segui le macchie solari*, Italian version translated from english)
- DECEMBER: https://astroedu.iau.org/it/activities/1605/ - in course of publication (*La notte e il giorno nel mondo*, Italian version translated from English)

For the following months, we are working on a number of new educational activities to develop.

Communication and distribution of astroEDU activities to the Italian community

We are collaborating with the EduINAF staff (the INAF online magazine for education) in order to include a number of astroEDU activities in articles and other EduINAF contents and initiatives.
Just to cite the last example of astroEDU activities that have been included or cited by EduINAF: https://edu.inaf.it/astrodidattica/clima-continentale-oceanico/

For the creation of OAE, we also published a press release in collaboration with the INAF Press office: https://www.media.inaf.it/2021/03/15/oae-iau-inaf/

OFFICE OF ASTRONOMY FOR EDUCATION

Astronomia e didattica, nasce un centro italiano

L'Office of Astronomy for Education è stato istituito dall'International Astronomical Union per promuovere l'educazione superiore in tutto il mondo tramite l'astronomia. Grazie all'Istituto nazionale di astrofisica, in Italia sorgerà un centro di eccellenza con un ruolo importante a livello globale e nell'area del Mediterraneo. I partner della rete italiana sono la Società astronomica italiana e l'Università di Tor Vergata

Ufficio stampa Inaf 15/03/2021 Tweet Condividi 1551

In order to improve the visibility of astroEDU and OAE Italy within the Italian community, we also published the following articles/pages:

- https://edu.inaf.it/oae_italia/home/ Informative page about OAE Italy and Astroedu in EduINAF
- https://edu.inaf.it/news/eventi/astronomy-for-education-workshop/ News about the Shaw workshop (28th of September)
- https://edu.inaf.it/news/eventi/cielo-itinerante-viaggio-camper/ News (8th of July)
- https://edu.inaf.it/news/per-la-scuola/oae-iau-didattica/ News about the establishment of OAE Italy (March 2021)

In order to improve the visibility of astroEDU and OAE Italy among the Italian community of teachers, we also took part in an online workshop for teachers "Sperimentiamo insieme: la misura e il laboratorio in fisica" ("let's experiment together: the measure and the physics lab"). The workshop organized by Roma Tre University, is aimed at promoting the teaching of physics by experimental activities and AstroEDU has been presented as a powerful tool which teachers can use.

As an additional initiative to distribute astroEDU (and Oae Italy) to the Italian community, we also produced this brochure in Italian which can be translated into English and proposed to a larger audience:
https://www.flipsnack.com/eduinaf/astroedu.html

Activities for astroEDU International

Analysis and upgrade of the astroEDU website

In the first months of activity, we analysed the website and identified a list of technical problems that we started to address. In the table below you can see the problems we identified, the actions that were implemented and the status at this date. Legenda: green: solved; yellow: in action; red: not yet to be addressed.

Problem description	**action: what we have done**	**status and action to do**
Broken Links and Form no longer working	We corrected the mistakes	Solved
In educational activities, titles of paragraphs cannot be translated	Edward Gomez has been contacted	Not solved - we are looking for a solution
In educational activities, we cannot choose to make visible only some uploaded files, so we cannot publish an educational activity with only the attached files in the right language visible	Edward Gomez contacted - in the meanwhile we publish ALL the documents (english and Italian) in the activity	Not solved - we are looking for a solution
It is impossible to manage separately the different languages of a single activity. For example, English version of the activity published and the Italian version “in revision”	Edward Gomez contacted - in the meantime we work on an offline version of the file and upload it at the end	Not solved - we are looking for a solution
Collections/themed activities are missing in the Italian version	We tried to translate them but an error occurred and the collections are not visible in the Italian version	Need to speak with Edward
in the “see all the activities” section, a visitor should be able to make searches through simple filters (date of publication, author, school level)	Not yet communicated	Need to speak with Edward

Analysis of Visitors and their behaviour from Google Analytics

At the beginning of December 2021, we had access to AstroEDU Google Analytics and started to analyse the data. We include in this report a first chart, in which we reported some of this data, referring to the global AstroEDU website in the last 3 years.

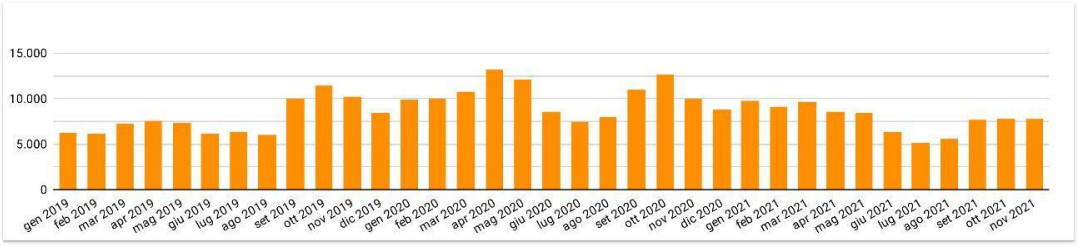
We will analyse these data in the next months, but some considerations can already be made, which we will share with the astroEDU International editorial board:

- in the first 11 months of 2021 (January-November), astroEDU has a mean number of monthly visitors of 7700, with great opportunities of growth (as a reference, in the same period, the Italian Eduinaf monthly visitors are about 20.400);
- The sum of visitors coming from USA, India and Italy represents 60% of the total: there is a great chance of distributing astroEDU to other countries;
- among the 25 most visited pages of the website there is only 1 Italian resource, the one we used and distributed through EduINAF, so we recommend to continue this kind of communication activity;
- The most visited activities seem to be the ones about very easy and direct topics, related to school CV topics (day and night, Solar system model). We decided to focus our translation efforts on these activities and to select this kind of topics for future activities;
- 81% of visitors come from google search: there is a great opportunity of growth in other channels of distribution (social media, links);
- The typical reader does not stay long in astroEDU and visits less than 2 pages (the mean time is 45 seconds and less than 2 pages): we aim at improving these numbers.

AstroEDU Report with Google Analytics

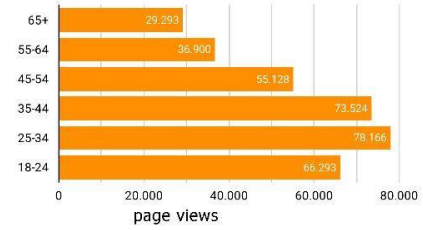
01/01/2019 - 30/11/2021

Monthly Users

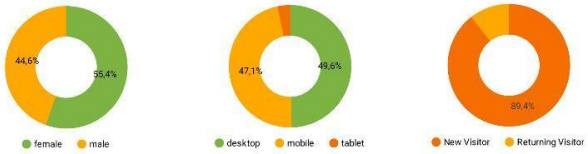


Users	Sessions/user	Sessions	Page views	Pages/session	Mean duration	Bounce rate
294.707	1,13	333.091	432.226	1,3	00:00:45	87,54%

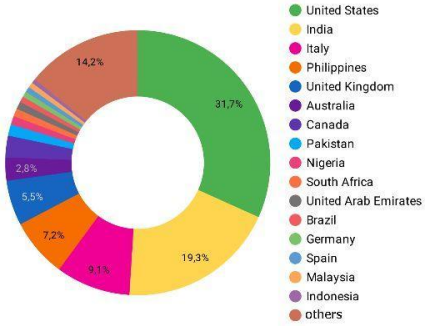
Users Age



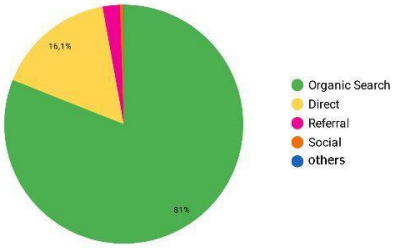
Other characteristcs



Where do visitors come from?



How did they arrive to astroEDU?



Mostly read pages

	Pages	Views
1.	Day and Night in the World | astroEDU	40.362
2.	astroEDU	36.060
3.	Meteoroids, Meteors and Meteorites | astroEDU	35.978
4.	Why Do We Have Day and Night? | astroEDU	29.677
5.	Solar System Model | astroEDU	19.614
6.	Sun's Shadow | astroEDU	19.095
7.	Sun, Earth and Moon Model | astroEDU	16.076
8.	Build Your Own Artificial Satellite | astroEDU	15.758
9.	Search results | astroEDU	12.467
10.	Star in a Box: High School | astroEDU	12.459
11.	Design Your Alien | astroEDU	8.974
12.	Solar System Model on a City Map | astroEDU	6.279
13.	Star in a Box: Advanced | astroEDU	5.882
14.	Making a Sundial | astroEDU	5.798
15.	Build a Safe Sun Viewer | astroEDU	5.638
16.	Transforming water into acid... and back | astroEDU	4.982
17.	Activity Collections | astroEDU	4.577
18.	How High is the Sky? | astroEDU	4.382
19.	Creating Asteroids | astroEDU	4.294
20.	Navigation in the Ancient Mediterranean and Beyond | astroEDU	4.281
21.	Birth of a black hole | astroEDU	4.244
22.	Know Your Planets | astroEDU	4.101
23.	Continental Climate and Oceanic Climate | astroEDU	3.875
24.	Clima continentale e clima oceanico | astroEDU	3.810
25.	Measure the Sun's Rotation Period | astroEDU	3.419

Design and test of game-based learning activities. Presentation in the national games convention *Lucca Comics and Games* 2021

For more than a century, many pedagogical studies have pointed out how playing improves disciplinary and socio-emotional competences. Moreover, it enforces our awareness of which strategies and dynamics are the most effective, both in playing and in other contexts of life.

Game-based learning (GBL) is the discipline that studies how games can be used in learning environments and, in general, as tools for improving our knowledge of disciplines, but also of methods and other soft and life skills. In particular, the deep engagement achieved when playing is a perfect ground for the good mood that brings to effective learning. Besides, games can also engage the player in the practices and not only the disciplinary contents, make GBL very effective in science.

We have been experimenting with GBL as an innovative means of accessing STEM knowledge and developing transversal competences, spanning across both disciplines and daily life. Aiming at cross-fertilizing different professionalities involved in this research field and in order to design valid and meaningful educational resources, we have started a co-design project with game scientists. The process led to the creation of a board game, named PIXEL, which we recently presented in a National games convention, Lucca Comics and Games 2021.

The importance of such a collaboration is twofold: on the one hand, we, as astrophysicists working in public engagement, acquire new professional skills in tangent and innovative fields of research. On the other hand, the introduction of astronomy and astrophysics in mainstream games has the advantage of presenting these subjects in a very effective way, in terms of engagement and meaningful educational processes, very well connected to real life and lifelong learning through STEM.

The main purpose of the game PIXEL consists in obtaining a hi-res image of an astronomical object, in order to understand its nature and discover its main morphological and physical features.

The game mechanics of PIXEL reflect the features of scientific research, thus allowing the experimentation of such mechanics while playing. On the other side, facing the challenges proposed in the game, players indirectly face some STEM-related issues, like the role of resolution in astrophysics.
Our participation in the game convention *Lucca Comics and Games 2021* allowed OAE to appear as the main character in a very engaging, multidisciplinary and challenging context, focusing the spotlight on astronomy education, as one of the most innovative and unconventional learning and teaching methods.

Supports with use of the I-OAE logo

Supported the Tour 2021 of *Il cielo itinerante* (the Travelling Sky), a non-profit association inspired by the Project *The Travelling Telescope* by Susan Murabana and Daniel Chu Owen.

The 2021 Tour is an initiative supported also by IAU, INAF, SAIt and Unicef Italia, which involved about 450 kids. In July and August, a Van equipped with several telescopes travelled from Sicily to Emilia Romagna. It stopped in 11 different places with specific educational poverty, allowing kids to watch the Moon and the planets, attending hands-on laboratories, informal activities, and talking to experts.

Link: https://ilcieloitinerante.org/tour-2021

Attachment 1. Budget actions list

Detailed lists of purchases, transfers or others

7/7/2021
Transfer from Roma to Arcetri: € 400
from 1.03.02.02.004.01 - Communication, Outreach & Education
Project Manager: Alessandra Zanazzi

Transfer from Roma to Bologna IRA: € 400
from 1.03.02.02.004.01 - Communication, Outreach & Education
Project Manager: Stefania Varano

Transfer from Roma to Bologna OAS: € 1500
from 2.02.01.07.999 (hardware)
Project Manager: Sara Ricciardi

Transfer from Roma to Milano Brera: € 2500
from 2.02.01.07.999 (hardware)
Project Manager: Stefano Sandrelli

Transfer from Roma to Milano Brera: € 15000
from 1.01.01.01.009 (Grant)
Project Manager: Stefano Sandrelli

21/07/2021
from 2.02.01.07.999 (hardware)
hardware purchase: € 6.280,56 - RUP Giuliana Giobbi (purchasing manager)

30/09/2021
Transfer from Roma to Bologna OAS: € 20000 euro
from 1.03.02.02.004.01 - Communication, Outreach & Education
Project Manager: Sara Ricciardi

14/10/2021

Variation from Roma to Roma: € 2000

from 1.03.02.02.004.01 - Communication, Outreach & Education

to 1.03.02.02.004.01 - Software licenses

27/10/2021

from 1.03.02.02.004.01 - Software Licenses

Software purchase: € 13.872,62 - RUP Francesco D'Alessio (purchasing manager)