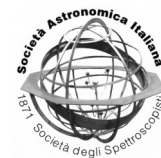




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EduINAF: new wor(I)ds to communicate

L. Giacomini¹

Istituto Nazionale di Astrofisica – Via del Fosso del Cavaliere, 100, 00133 Roma, Italy
e-mail: livia.giacomini@inaf.it

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Abstract. EduINAF is an Italian online magazine dedicated to education and outreach in astrophysics and science that aims to become a real incubator for new editorial proposals and experiences in the field. In this article, we will present some successful examples of contents that use new technologies for a greater understanding and involvement in science.

Key words. EduINAF – education and outreach in astrophysics and science – Augmented Reality – Virtual Reality – new technologies

1. Introduction: What is EduINAF

EduINAF is INAF's (National Institute of Astrophysics) online monthly magazine dedicated to education and outreach in astrophysics and science, aimed at teachers, students, researchers who carry out activities in schools or for the public and science enthusiasts in general. See Fig. 1 It was founded in 2014 as a portal financed by a project of the Italian Ministry of Education, University and Research (Law 6/2000), mainly as a repository of educational hands-on activities developed over the years.

In the following years it evolved and matured, until it was registered in June 2020 as an official publication. Since that date, EduINAF has undergone a profound restructuring partly linked to the COVID-19 health emergency, which has led to a clear increase in readers and a substantial change in their expectations, with a growing demand for valuable online content and proposals. Today, with an editorial board of more than 20 collaborators coming from all over Italy and an increasing number of visi-

tors, EduINAF has become an innovative space for public engagement, proposing itself as a real incubator for new ways of doing education and dissemination in the scientific field. (Giacomini, et al., (2022)) This choice has allowed a number of collaborations (internal and external to INAF), aimed at experimenting with digital educational products and editorial proposals and at using AR (Augmented Reality), VR (Virtual Reality) and new technologies for greater interaction, understanding and involvement of the young generations.

2. The background

Italy is one of the richest European countries: in 2020 it was the third-ranked country in the contribution to the gross domestic product of the EU, just after Germany and France¹.

¹ <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20211220-1>

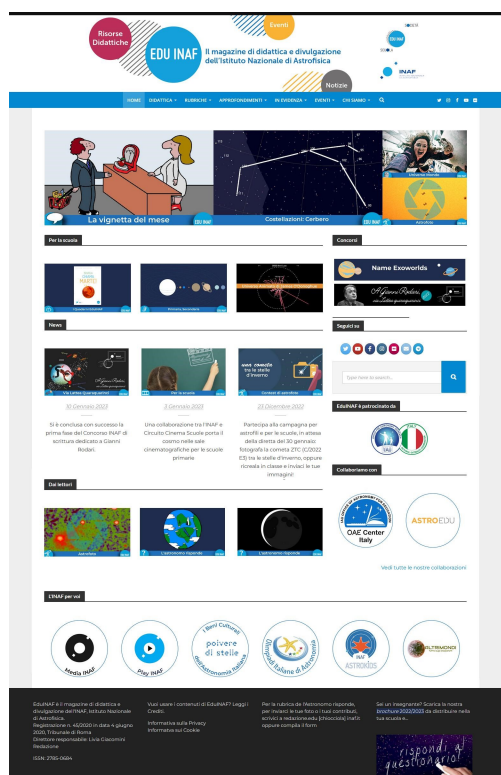


Fig. 1. EduINAF homepage on the 15th of January 2023

But, at the same time, Italy has one of the highest Early School Leavers rate in Europe: in 2021, it had 13 % of the population between 18 and 24 abandoning school and training, with only Romania and Spain doing worse². Basic scientific knowledge is also not as widespread as the Italian school curriculum might suggest: in 2022, only 60% of the Italian general public was able to correctly answer the question “Is the Sun a planet”. (Pellegrini & Saracino, (2021)) EduINAF is an online specialized media with the goal of spreading information, knowledge and passion for astronomy and science, providing a service to Italian schools and society. Like all media, it sees the satisfaction of its audience as a main objective and must take in account the specific reality of the Italian

² <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20220523-1>

society in which it operates, adopting the right editorial choices, proposing resources and contents that are interesting for its public and that use a very simple language. But of course, at the same time, it must be as engaging and entertaining as possible. To address this challenge, one of the choices made by EduINAF is to focus on new technologies and apply innovation in the field of communication, education and outreach (see Fig. 1). Of course, there are some limitations: EduINAF is an on-line media and, to avoid an entry bias, it must ensure a low-cost, easy approach to technology, making sure that the innovative contents proposed do not require specific purchases of hardware or software and do not need technical skills. The results of this approach are visible in the constant growth of EduINAF unique visitors and in the feedback of readers collected through focus groups during the years. (Giacomini, et al., (2022)) In the following sections we will present some of the EduINAF editorial proposals related to AR, VR and other innovative technologies, opening the horizon to new developments and possible future collaborations.

3. Il Cielo in Salotto

As a first example, EduINAF launched “Il Cielo in Salotto”, “The sky in your living room”, a series of online broadcasts streamed on Youtube and other social media, that aims at bringing science and astronomy closer to the public. (Mignone et al., (2022)) The series reached its third edition in 2022 and is organized around a calendar of 5 or 6 annual events dedicated to astronomical phenomena (like eclipses) or to media-friendly events related to astronomy and science (like SuperMoons or the celebration of the anniversary of a famous scientist, such as Margherita Hack). See Fig. 2

The format includes astronomical live observations with INAF telescopes from all over Italy and a talk show with guests who discuss a specific scientific topic. The public can participate by asking questions live, guiding the choice of observation targets, but also by taking part in the social media campaigns

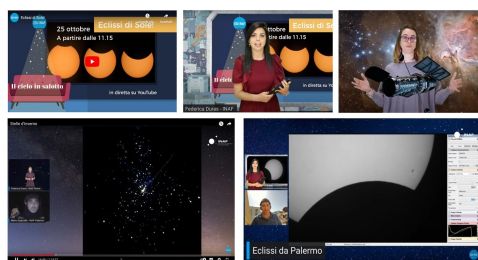


Fig. 2. Some frames from the broadcast series “Il Cielo in Salotto”

that “prepare” the live broadcast. In recent months, schools have also begun to participate by showing the video of the live broadcast in the classroom or using it as a recorded resource to introduce astronomical topics in the program. “Il Cielo in Salotto” makes an extensive use of 3D models and virtual reality to create ad hoc contents such as videos where the participants are projected into a 3D virtual environment and can interact with models of astronomical objects (like planets, black holes or satellites and telescopes). This choice makes the broadcast very engaging and funny to watch both for adults and young people and, at the same time, it helps make the scientific content easy to understand. In creating the contents of the broadcast, in-house knowhow and low-cost tools are being developed, using a previously built green studio of the INAF Institute in Padua and, more recently, a second studio built for the project at the IAPS Institute in Rome. These two infrastructures will soon be joined by other Institutes as the team is growing and “Il Cielo in Salotto” is becoming a useful tool to innovate communication in INAF and experiment with the uses of new technologies for education and outreach.

4. Educational Activities

EduINAF is also a platform providing educational activities related to astronomy and science to be used in the classroom by teachers, or by parents and students on their own. All of these contents are built to be engaging, easy to use and useful from an educational point of view and many of them are using new tech-



Fig. 3. The poster of the “MARS2020 Perseverance: the interactive experience” activity

nologies such as 3D and AR. One example is “MARS2020 Perseverance: the interactive experience” published in February 2021 for NASA’s Perseverance landing on Mars, after a seven-month flight from Earth³. Perseverance was the fifth rover to land on the Red Planet and represents a huge leap forward in our scientific and technological capabilities to explore Mars and find out if life ever existed on this planet. With “MARS2020 Perseverance”, the readers are able to play with the rover, discovering how it works, how its instruments were made and the mission’s scientific goals. It also offers an opportunity to take a selfie with the Perseverance rover and the Ingenuity drone and share it with friends via social media, thanks to 3D models and the use of AR. To make the experience as easy as possible, the reader needs to download and open the free Zappar app on a smartphone or tablet, then they simply need to frame a poster in the App and start the interactive experience. See Fig. 3 MARS 2020 is only a first example of educational activities proposed that will use extensively new technologies. In the wake of its success, EduINAF is distributing or publicizing a number of original, innovative contents related to science education that have been created by the editorial board or produced by Play INAF, the INAF platform dedicated to innovative education resources⁴.

³ <https://edu.inaf.it/astrodidattica/perseverance-realta-aumentata/>

⁴ <https://play.inaf.it/>

5. Virtual Tours

Another example of innovative contents proposed by EduINAF to its online audience are virtual tours that let readers visit virtually INAF sites, museums, laboratories and exhibits. These tours are collected and presented in EduINAF in a specific, updated section of the website⁵, and have been developed in recent years by a number of INAF local Institutes, as well as by specific projects and groups and by INAF Communication Office dedicated to cultural heritage⁶. This experience started before 2019, but the development of these tours had a boost during the COVID pandemic, as they provided an online alternative to classic guided tours for science festivals migrating to the web. These tours have been developed with different technologies, styles and approaches and this is due to the fact that INAF comprises a great variety of different sites distributed in 12 Italian cities, including astronomical observatories, museums in historical sites, but also technological institutes, laboratories and telescopes in remote places that are difficult to reach. In addition to this, INAF also organizes or contributes to the organization of a large number of exhibitions and temporary exhibits inside and outside its institutes that, in recent years, have started offering the possibility of being visited virtually. Some of these tours have a museum approach, following the steps of the physical visit through the physical rooms and exhibition, and can be used both as a completely online visit or as an AR tool to complement the visit in person. Others, developed for sites that are not easily accessible to visitors, are organized as real digital tours without a physical counterpart. In these cases, the user can visit extraordinary places such as laboratories, clean rooms or telescope mirrors, listening to the researchers' explanations or playing virtually with the 3D reproduction of scientific instruments or celestial objects.

⁵ <https://edu.inaf.it/tour-virtuali/>

⁶ <https://www.beniculturali.inaf.it/>

6. Conclusion

The examples examined in this article are among the most innovative proposals developed by EduINAF and were born in the COVID era as an alternative proposal to the in-person, classical approach. Today, all this material is available to the public to be navigated and used independently online. But this is just a starting point, and if the “WOW” effect is guaranteed, the challenge that EduINAF and that all science communicators are facing today, concerns the effectiveness and durability of these new technologies in education and outreach. For this reason, EduINAF is starting to collaborate directly with teachers and schools to provide hybrid live educational experiences and learn how to better evaluate them: students, guided by their teachers and without moving from their classrooms, can take online tours of INAF Institutes with a researcher to guide them, enter a physics laboratory and do experiments remotely or visit the Solar System, touching and playing with the planets. Today, VR, AR and innovative tools are therefore giving birth to innovative educational and outreach experiences that mix the benefits of an online approach with a more classical in-person one, to guarantee an additional, solid opportunity to engage the general public and to educate young generations in science.

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