

Online courses of astrophysics

A. Zabot¹

¹ Universidade Federal de Santa Catarina
e-mail: alexandre.zabot@ufsc.br

Abstract. Online teaching has become more and more popular with the advancement and improvement of the internet. Today, online courses are sought after by a very varied audience, from students to the curious. There is a great demand for formations in the field of Astrophysics and few options available in Portuguese. In this work I will share the experience of preparing and offering online courses in Astrophysics.

Resumo. Ensino online tem se popularizado cada vez mais com a avanço e melhoria da internet. Hoje os cursos online são procurados por um público bastante variado, desde estudantes a curiosos. Há uma procura muito grande por formações na área de Astrofísica e poucas opções disponíveis em português. Neste trabalho irei compartilhar a experiência de preparar e oferecer cursos online de Astrofísica.

Keywords. Teaching of Astronomy

1. Introduction

“Astrofísica para Todos!”(1) (Astrophysics for All) is an Outreach Program of the Universidade Federal de Santa Catarina (UFSC), which promotes the knowledge and practice of Astrophysics. Its main activities are fully online courses, offered free and open, always with support for doubts and the possibility of certification by UFSC.

The courses are offered in the continuous admission modality, without closed classes. Students enroll in the course whenever they wish. They also attend classes and take the tests whenever they wish. After completing all the tasks, and being approved, the student receives the Certificate.

Offering online courses allows you to reach a large and diverse audience, which for various reasons is unable to formally study astrophysics at a trusted institution with a trained professional. The project is close to completing four years with more than 27 thousand enrolled students, being followed by almost 50 thousand people on social networks(6). There are students from more than 1300 Brazilian cities, with a very varied profile.

It is hoped that the socialization of the project’s methods and results will encourage more astronomers to devote part of their time to online teaching activities.

2. Courses

At the moment, the Project offers three courses, and is getting ready to launch another two soon. The table 1 lists some course numbers.

The General Astrophysics Course(2) offers an overview of Astrophysics, covering all the main areas: Astronomy, Instrumentation, Solar System, Stars, Exoplanets, Galaxies, Cosmology and Astrobiology. Altogether there are 30 classes where mathematics is not used. A teaching approach based on experimental graphics is used. The target audience is quite diverse, from completely lay people to graduated physics students. It is considered an intermediate level course. It assumes some basic knowledge of Physics and Science in general.

The Astronomy & Astronautics Course(3) is an introduction to Astronomy, Astrophysics and Astronautics. These three ar-

TABLE 1. Statistics of the Project *Astrofísica para Todos*

	Start	Enrolled	Certified
General Astrophysics	03/2018	19486	2470
Astronomy & Astronautics	09/2019	6345	1472
Cosmology I	12/2020	1216	31
	Total	27047	3973

... eas make up three distinct modules of the course, which covers all the contents of the Brazilian Astronomy and Astronautics Olympiad, levels I and II, and a good part of the contents of levels III and IV. It is a course aimed at elementary and high school students and teachers. However, as it is a shorter course than General Astrophysics, it has been useful for an audience looking for a faster introduction to the three areas presented. It also does not use mathematics, and relies less on experimental graphics, focusing the discussion on the analysis of the main concepts of each theme.

The Cosmology I Course(4) is an Introduction to Cosmology, prepared for people with undergraduate level knowledge. The entire course is divided into two parts. This course is the first of these and focuses on the cinematic and dynamic aspects of the universe’s expansion. The Big Bang Theory is presented from an observational and theoretical perspective. Theoretical treatment is carried out through the deduction of the Friedmann-Lemaître equation, its analytical solution for asymptotic cases and numerical solution for the general case. The analyzes of the experiments that characterize the Λ CDM model and the accelerated expansion of the universe are remade, in a didactic way.

A fundamental aspect of the project is providing support for students’ questions. Students usually send questions to the course contact email. They also leave questions in the comments box of the class videos, published on YouTube.

In general, about twenty messages are answered a day. This number is much lower than what could be expected considering the total number of students enrolled. It is important to remember, however, that the courses are offered in the continuous admission modality, without closed classes. Today there are about a thousand people taking the courses at any given time. In addi-

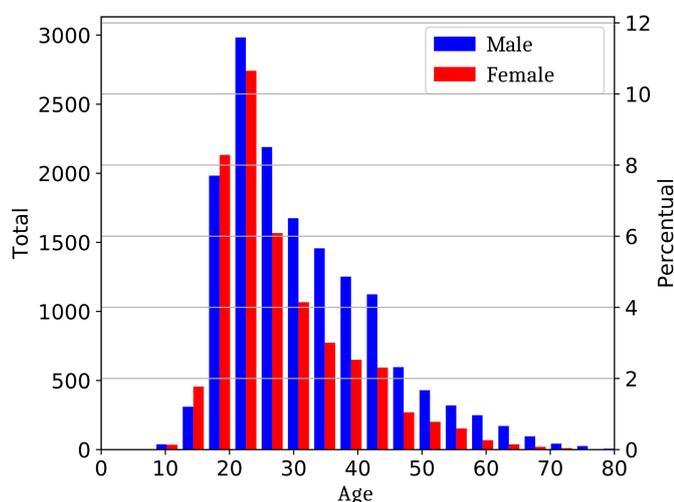


FIGURE 1. Age distribution of students enrolled in courses. The typical profile is young adults.

tion, the comment boxes on YouTube already have many questions answered, students take advantage of this information as a learning resource.

3. Student profile

Teaching via the Internet also requires attention to the great heterogeneity of student education. Some time the doubt of a doctoral student is being clarified, then of an elementary school student or even a curious person who wanted to study something different in his spare time.

Serving the most diverse audiences is also a constant concern of the project. For this, courses were created and offered at different levels of knowledge, from elementary school to graduation.

In the figures 1 and 2 it is possible to quantitatively assess the profile of the students. The typical age is young adults, therefore a strong presence of a university audience. But there are also many people who have already graduated, or have not, and are looking for a qualification. The experience of contact with students shows that there are many people who study Astrophysics for leisure.

On the other hand, bearing in mind that there is a difference in depth between the courses, it is clear that the majority of those enrolled are looking for training without the use of mathematics, and which is broader. Again, our experience with students shows that there are people from the most diverse areas of training, and that few have mastered mathematics. Even so, they are very fond of Astrophysics and highly value accurate information, but without mathematical resources.

4. Conclusion

People are fascinated by astronomy and highly value contact with professionals in the field(5). There are already many scientific dissemination actions, but teaching is different because it requires much more professionalism, attention and dedication. In other words, it requires constant presence and personalized attention. Maybe that's why it's still so difficult to find free online courses in the area and above all that offer support for questions by a professional.

Teaching via the Internet is an indispensable tool to bring science to all regions of Brazil. In a country with continental

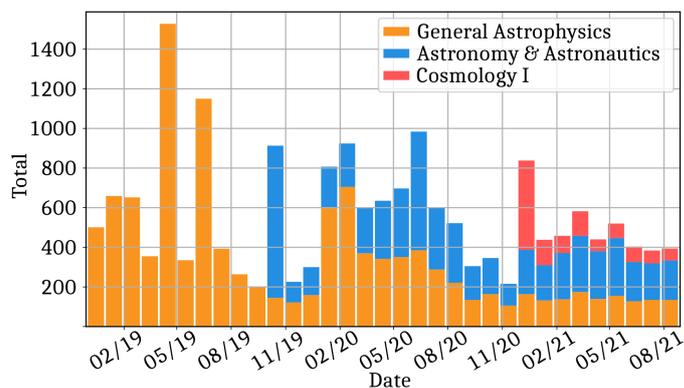


FIGURE 2. Number of new registrations, per month, in each course. The average is 550 new registrations per month.

dimensions like ours, undermined by social inequality, it is necessary to exploit all digital resources in order to reach as many people as possible.

Furthermore, we are all concerned about the proliferation of inaccurate scientific information. It is necessary that everyone unite to “drown” the digital channels with good and qualified information. In addition, it is necessary to be present, clarifying doubts with patience and determination.

References

- Astrofísica para Todos!, <https://astrofisica.ufsc.br>, 05/11/2021.
- General Astrophysics Course, <https://astrofisica.ufsc.br/astrofisica-geral>, 05/11/2021.
- Astronomy & Astronautics Course, <https://astrofisica.ufsc.br/aa/g>, 05/11/2021.
- Cosmology I Course, <https://astrofisica.ufsc.br/curso-de-cosmologia/cosmologia1>, 05/11/2021.
- Testimony of studes, <https://astrofisica.ufsc.br/depoimentos/>, 05/11/2021.
- YouTube's Channel, <https://www.youtube.com/c/Astrof%C3%ADsicaparaTodos>, 05/11/2021.