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Experiences on teaching astrobiology in Baja California: from classical lectures to MOOCs

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Abstract. We present our experiences teaching the course Astrobiology 101 to BSc students from different majors in Baja California, Mexico (Northwestern). Motivation, description and evolution of the course, from a "classical" approximation to the project of a Spanish MOOC are presented. Relationship with some research areas as well as experimental exercises have lead to improvement of the student's performance. We expect to use the MOOC in the course, but to also share it freely with all the spanish speakers through the web.

Key words. Astrobiology – Teaching – Laboratory

1. Introduction

Teaching astrobiology at the undergraduate level in Mexico has represented a very interesting challenge for our workgroup during 15 years. Our course, taught at the University of Baja California (UABC), has been a pioneer in the teaching of astrobiology at that level in Mexico (Vázquez & Núñez 2019). We present a review of initial motivation, contents of the course, statistics of students, as well as the evolution of the course in time. We started to teach Astrobiology 101 in 2004 motivated by our own interest. One of the lecturers is a Biologist and the other is an Astronomer, both of us interested in multidisciplinary studies and concerned by the search for life in the Universe. We designed our course based on our own experiences and following the general approximation by Goldsmith & Owen (2001), as well as other books and NASA and ESA websites. In the meantime, other excellent textbooks have appeared, allowed us to enrich the content of the course, e.g. Rothery et al. (2011), and more recently Cockell (2015), among many others.

Our course was evolving leading to a multidisciplinary composition of classmates, including students with majors in Science, Engineering, and other disciplines. We have taken advantage of this to integrate multidisciplinary and multi-level teams (whose members are selected by the lecturers), and try new ways to teach like practical works, lab experiments and video discussions. The "classical" lecture is taught by both lecturers using pptx presentations and small in-class demonstrations with a two-hours basis.

2. Activities and Lab Experiments

During the development of the courses, we detected that the practical teaching of the subjects through activities and laboratory experiments, qualitatively improved the school performance. Therefore, we work on a project to collect and/or design a set of activities, practices, and exercises, and compile them in a student manual.

Such project received a grant from UNAM and we bought some equipment, material, and produce an exercises notebook in Spanish (manual) for teachers and students (PDF is available under request). The notebook contains a series of laboratory exercises, at different levels of complexity, to be applied in formal courses (graduate and undergraduate students in science and engineering), summer schools (undergraduate and high-school students), as well as the general public in outreach events (Open House, Star Parties, etc.).

Finally, we have installed a new astrobiology lab, in which we involve students on professional research. The initial fields of investigation include (a) lithopanspermia, (b) fungi viability in other planets, and (c) discovery and characterization of water bears (see Núñez et al. 2019). We receive undergraduate and graduate students, some of them former Astrobiology 101 students, to work on thesis, small projects, etc.

3. The (spanish) Astrobiology MOOC

Finally, motivated by the work done by colleagues from overseas (Lineweaver 2019), as well as Mexican colleagues and students who ask for courses at their locations, we decided to give a try to the "flipped" modality for our course, making an Astrobiology MOOC (Massive Open Online Course) in Spanish. We have conceived this new project as a consequence of our previous work. The general structure of the MOOC will follow the structure of the Astrobiology 101 course. We plan to make between 20 to 30 videoclips, following the recommendations of Lineweaver (2019) with respect to the duration (around 10 minutes). We will try to cover the most important or relevant information of each chapter. The idea is that this MOOC could serve as both, support to our "classical" course, as well as a glance for those who only want to know the basics about a specific theme. We will put special care in not be boring, trying to use images and videos to enrich the experience. Finally, we will select a platform to make available the course to all the spanish speakers interested in astrobiology. This project is just starting.

4. Final comments

Experiences teaching astrobiology during almost 15 years allow us to learn that a popular theme like this, is very useful to teach students about science, multidisciplinary teamwork, and even can define professional vocations. Up to now, almost 500 students have taken Astrobiology 101 with us. We hope that we can test the utility of MOOC itself, especially when it is used as support material of the full course. We thank any feedback and suggestions about teaching techniques, exercises, experimental practices, or any other procedure that can be adapted to this project.

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References

Cockell, C. S. 2015, Astrobiology: Understanding Life in the Universe (John Wiley & Sons, Chichester)

Goldsmith, D., Owen, T. 2001, The search for life in the Universe (University Science Books, Sausalito)

Lineweaver, C. H. 2019, EPJ Web Conf., 200, 01019

Núñez, P. G., Quevedo, N., Vázquez, R. 2019, EPJ Web Conf., 200, 02011

Rothery, D. A., Gilmour, I., Sephton, M. A. 2011, An introduction to astrobiology (Cambridge University Press, Cambridge)

Vázquez, R., Núñez, P. G. 2019, EPJ Web Conf., 200, 01015