

A MASSIVE OPEN ONLINE CLASS ON ASTROBIOLOGY. C. D. Impey and M. Wenger¹. ¹Department of Astronomy, University of Arizona, Tucson, Arizona 85721, cimpey@as.arizona.edu, mwenger@email.arizona.edu.

Introduction: Massive open online classes, or MOOCs, are transforming the landscape of informal science learning. The number of learners has increased very rapidly over the past five years, and over half of those enrolled live outside the United States. A MOOC usually has no cost unless a completion certificate is desired. Most MOOCs do not lead to any transferrable college credit. The completion rates are typically low, around or below 10%, but that level is not unusual in a free-choice learning situation. MOOCs span a wide range of disciplines; in science they offer a way to enhance the basic literacy and appreciation of technical subjects for a wide public audience.

We have three years of experience in designing and running astronomy MOOCs. The Udemy course called “Astronomy: State of the Art” and the Coursera course called “Astronomy: Exploring Time and Space” have had over 110,000 registered users from 140 countries. The core content is video lectures, augmented by quizzes, activities, and peer writing assignments. We have accumulated a large amount of research data on learner demographics and motivations, and on the types of engagement and activity that correlate with completing the courses.

Astrobiology MOOC: Explosive recent growth in research on exoplanets and high public interest in the search for life in the universe has led us to develop an astrobiology MOOC for Coursera. Some material was taken from the two existing MOOCs, but new topics were added and several existing videos were refilmed to reflect current research. Although the first author is a cosmologist, he has written several books and many popular articles on astrobiology, and he has taught the subject to non-science undergraduates at the University of Arizona for over fifteen years.

“Exploring Life in the Universe” centers on a series of 55 video lectures totaling just over six hours. Each video or topic lasts 8-10 minutes, well matched to the attention span of most informal learners. There are six modules: Matter and Radiation, Telescopes and Space, The Solar System, Life on Earth, and SETI. The videos were shot using a green screen so backgrounds could be added and talking head lectures are annotated with images and graphics, and punctuated with animations. The video lectures are available on YouTube as well as on the Coursera web site. Coursera uses a cohort model so users can join at any time, but in online discussions and in terms of user experience, they are grouped with people who joined the course in the same month.

Pedagogy: Textbooks are not usually required for MOOCs. In this course, the video lectures are linked to reference material written by the first author. There are 90 articles from among 540 on the Teach Astronomy web site, totaling 80,000 words of reference material. There are also links to 30 articles from the trade book “The Living Cosmos,” published by Cambridge University Press and used with permission. Last, there are links to 40 interviews with prominent astrobiologists, mostly taken from the book “Talking About Life,” also published by Cambridge University Press and used with permission.

The course has two video quizzes for each module, aimed at encouraging the learners to watch the videos. There are two activities and three peer writing assignments. The writing assignments are based on recent research results in exoplanets and the search for life in the universe. A rubric and model answer are provided, and each person is asked to grade the writing of three other learners with a slight penalty for non-compliance. Our research has shown that learners who complete the first activity or the first peer writing assignment complete the course at a rate ten times higher than average. Students can interact with the instructor via discussion boards hosted by Coursera, a Facebook page, and live Q&A sessions held every two weeks.

The unique aspects of this online astrobiology class are the extensive reference materials, the use of citizen science for activities, and the use of peer evaluation of writing about recent research results that scales to large numbers of students. We plan to report on the lessons learned from the first year of operation of this MOOC at a later date.

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