

MOONS: A MOOC AND OPEN EDUCATIONAL RESOURCE WITH GAMES AND A MICROSCOPE.S. P. Kelley¹ D. A. Rothery¹, and S. P. Schwenzer¹,¹The Open University, Walton Hall, Milton Keynes, UK. (simon.kelley@open.ac.uk).

Introduction: We have created a Massive Open On-line Course (MOOC) based on a theme of moons of the solar system. Unlike many current MOOCs our approach is not based on videos of an individual lecturer and on-line handouts. Instead, we have opted for an interactive and media-rich model that mixes short videos, animations (e.g. Fig. 1), HTML5 activities, games, and conventional text and images.

The Moons MOOC is delivered in the new Future-Learn MOOC platform [1]. The content is divided into short steps, accessible on mobile devices, and is hopefully attractive to unconventional and non-academic audiences. Crucially, following the first presentation in early 2014, we intend to offer all the content as an Open Educational Resource allowing the content to be used and re-used in full or in part for teaching purposes for years to come.

Thanks to a collaboration with the Lunar and Planetary Institute, we had a roving camera crew at the 44th Lunar and Planetary Science meeting in 2013, and they recorded a series of interviews with researchers covering current science of moons (Figs. 2, 3). These interviews have been edited into short videos and appear throughout the MOOC.

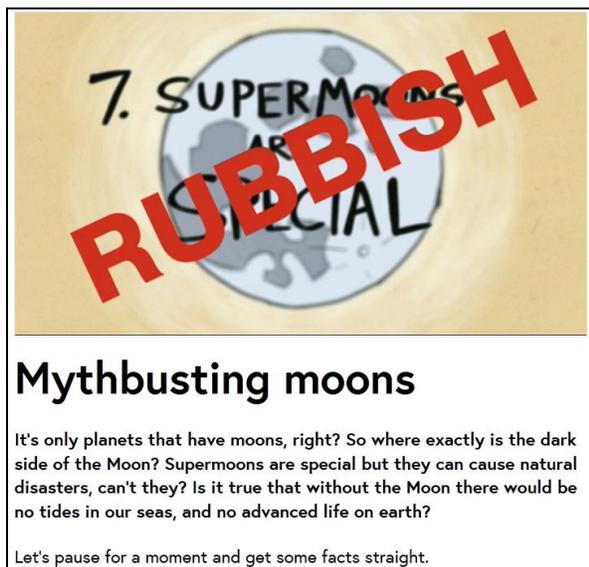


Fig 1. One of ten moon-myths ‘busted’ in a fun animation.

MOOC content: In eight weeks of study at a rate of around three hours a week, learners are exposed to science pitched at a level that is somewhere between a TV documentary and a university short course. Stu-

dents are led through the content by guide videos every week, and some of the material is designed for individual study, but some material encourages social interactions with other learners. Forums where students can comment and ask questions are built into the learning, with support coming from staff with experience of supporting distance teaching, and importantly from other learners, some of whom have a great deal of knowledge.

Built-in assessment in the MOOC is simple multiple-choice intended to support learning, and the content and guide videos in each week enthuse students with the new content of the coming week.

Course outline:

Week 1. An introduction to moons, the Solar System, orbits and tidal heating.

Week 2. The composition of moons and the importance of impacts and cratering in forming the surface of moons.

Week 3. Volcanism and cryovolcanism, some small moons, and the Moons Trumps game (Fig. 4).

Week 4. The Earth’s own Moon. The race to the Moon and bringing samples back to Earth.

Week 5. The formation of the Moon, its surface, and the study of Moon rocks.

Week 6. The story of water on the Moon. The dry Moon-wet Moon debate and implications of the different forms of water.

Week 7. Exploring moons, in particular missions to the outer Solar System.

Week 8. The future of exploration., and the debate over habitable places in our Solar System including the potential for life beneath the surface of icy moons.



Fig 2. Bill Bottke talking about the Moon explains models for the Late Heavy Bombardment.



Fig 3. Paul Schenk talks about the causes of volcanism on Io

MOOC Highlights:

The key features of the MOOC are the short videos, many of which were made specifically for the MOOC, several high production value videos weaving existing content together with interviews, and various animations (Figs. 2,3) including a rotating Moon demonstration already freely available on the OpenLearn website [2]. We have created several HTML5 based activities including a cratering game also freely available on the OpenLearn website [3], and Moon Trumps (Fig. 4) a newly created on-line card game where the player is dealt a moon card and chooses one from given values of radius, density, orbital period, orbital radius and 'potential for life' as the value most likely to beat the same property on the card for another moon held by the computer. This allows students to check their learning both by formal testing and informal 'gaming' as they improve their own score.



Fig 4 Moons trumps in play, on-screen

A virtual microscope allows students to study Moon rocks on their computer or tablet screen, as if they had access to a high quality petrological microscope [4].

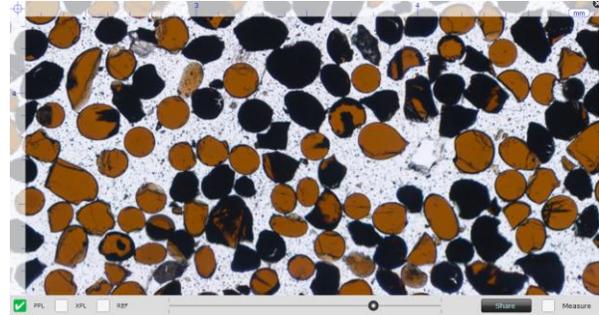


Fig 4. An image from the virtual microscope showing the orange soil sample

MOOC Legacy: Many MOOCs are internal looking, and are aimed at garnering new students to a particular institution. In contrast, the Moons MOOC will be offered as a fully shareable Open Educational Resource via the OpenLearn website (<http://www.open.edu/openlearn/>) and a free course on Apple's iTunes U portal. In this way we hope that the high quality content can provide a lasting legacy of teaching material that can be used and reused as a whole or in short sections or steps to support the transition from informal and formal learning, and as enrichment for K-12.

References:

- [1] (<https://www.futurelearn.com/courses/moons/>)
- [2] <http://www.open.edu/openlearn/science-maths-technology/science/physics-and-astronomy/astronomy/60-second-adventures-astronomy-the-rotating-moon>
- [3] <http://www.open.edu/openlearn/science-maths-technology/science/physics-and-astronomy/meteoroid>
- [4] <http://www.virtualmicroscope.org/content/moon-rocks>