MARS FOR EARTHLINGS: A HIGHER EDUCATION TERRESTRIAL ANALOG APPROACH FOR TEACHING INTEGRATED EARTH AND PLANETARY SCIENCE. M. A. Chan and J. K. Robinson, University of Utah, Department of Geology and Geophysics, 115 S. 1460 E. Rm. 383 FASB, Salt Lake City, UT 84112-0102, USA. marjorie.chan@utah.edu

Introduction: In a new age of high-resolution images from Mars, many features show surprising similarities to Earth. In the quest to "follow the water" and find extraterrestrial life, an understanding of Mars requires a solid understanding of Earth processes that can be applied to Martian landscapes. The high-resolution NASA data and imagery from Mars united with knowledge of Earth analogs now offers the rich opportunity for a paradigm shift in how university and college faculty teach lower-division Earth and planetary science. "Mars for Earthlings" content is a teaching-module approach using Earth analogs to teach about Mars, focused at an introductory college level. This is a multi-pronged education and outreach approach designed to bridge the gap between the middle school and high school programs (where Earth science and some planetary concepts are taught), and the upper division or graduate level where most Mars geology is taught in specialized higher education programs. This type of curriculum can invigorate introductory Earth science courses taught at every major university across the country.

Teaching Content and Pedagogy: A pilot higher education, undergraduate non-majors "Mars for Earthlings" course is being taught at the University of Utah to both develop planetary science curriculum and gain feedback on its applicability and hands-on approach to learning. A simple course description follows: *Explore the red planet Mars and interpret its history by comparing it to the Earth. Understand why Earth is a water planet and what evidence there is for water on Mars. Find out about recent international Mars missions and how scientists try to determine if there is Martian life.*

Students study Earth science concepts such as crater impacts, volcanoes, deformation, geomorphology, weathering, eolian and fluvial processes, diagenesis, extremophiles, and others. They apply these concepts to Mars through interactive exercises that utilize recent Mars data. The emphasis will be comparing and contrasting terrestrial analogs to Mars, with particular interest in the role of water and the potential for extraterrestrial life. In particular, the course calls upon many local examples and landscapes students can relate to. Students access and apply specific remote imagery and data directly from the web, generated from NASA and international Mars missions.

The structure of this course is designed to engage students directly in their learning, to promote critical thinking, and to address questions such as the potential of life on other planets or the societal impact of planetary exploration. The breadth of topics helps increase their science literacy. They hone their communication skills by participating in a team project and giving a formal presentation. Students taking the pilot class will provide feedback to help us formalize exercises and teaching modules to be accessed via our SERC-hosted (Science Education Resource Center) Mars for Earthlings website. The content is designed to meet pedagogical principles of inquiry, engagement, evaluation, and exploration. A module approach by topics is implemented so that teachers can easily incorporate a topical resource in their own classes.

Applications: This project builds content, engagement activities, and partnerships in the NASA SMD portfolio areas of higher education and informal education. Geologists who specialize in Earth processes now find their science is more exciting because they apply their terrestrial analog concepts to a totally "new world." It is the merging of these geology and planetary science content early in the college curriculum that can create synergy, make both sciences more accessible to the public, and better train physical scientists and engaged citizens for the future. This will have a critical effect of strengthening both Earth and planetary sciences nationwide by: 1) attracting and inspiring the introductory higher education audience where there is a strong likelihood of enticing students to major in STEM fields; 2) engaging and educating more students to feed into the pipeline to eventual science employment; 3) stimulating further research interactions and collaborations between the Earth and planetary science disciplines, and 4) heightening interest and connecting the public to recent and current NASA Mars missions by understanding our own Earth landscape.

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