

## Bringing field- and laboratory work into the classroom by using online modules in the edX platform

\*Alejandra Quintanilla-Terminel<sup>1</sup>, Matej Pec<sup>1</sup>, Oliver Jagoutz<sup>1</sup>

1. Massachusetts Institute of Technology

We present two projects that aim at enhancing geoscience education in the classroom through the use of online modules in the edX platform. “Deform the earth” and “Virtual field trip” are two online modules that the department of Earth, Planetary, and Atmospheric sciences is developing in collaboration with MITx . These two modules will be used residually at MIT, and by being freely accessible through the edX platform, also aim at expanding access to geoscience education worldwide. Each module addresses different challenges in geoscience education. How to teach laboratory skills in the classroom, particularly in a field that is both dangerous and difficult to access? How to teach field skills in a dynamic and effective way and how to make sure the students make the most out of their field experience?

Experimental rock deformation studies allow us to acquire data by measuring mechanical properties of rocks and minerals under a broad range of conditions. This data is essential for geodynamical models and tectonic interpretations. However, because the experimental protocols are difficult to explain in a classroom, and only few rock deformation laboratories exist world-wide, students overlook this component of Earth Sciences and often lack the knowledge to critically evaluate experimental results. Through “Deform the Earth” we want to introduce students to experimental rock deformation. An online module will allow us to both build and assess an experimentalist skill-set without ever needing to enter a real laboratory. The module is built on how-to videos explaining each step in the experimental procedure and analytical explanations of the data analysis. This module will allow us to experiment on ideal methods on how to teach a skill-set by scaffolding the experience for students. In addition, we plan to use pre- and post-testing to find out the most common misconceptions and worked and faded examples to teach how to interpret experimental data. The module will be freely accessible online and could be used by teaching institutions that do not have access to experimental rock deformation facilities.

An essential part of the geology training is learning how to make reliable field observations. This skill, however, is extremely difficult to teach in a traditional classroom setting. It is usually taught through field trips and it is a fundamental part of the curriculum that motivates and excites students into pursuing further studies in geology and earth sciences in general. In introductory classes, students are still learning to distinguish important characteristics in outcrops and may not be able to make important connections during the field trip. “Virtual field trip” aims at recreating the learning experience of the Introduction to geology class in the edX platform. It will be used residually to provide the students access to the information learned in the field at different stages of the semester-long class, and allow them to consolidate their learning by strengthening connections between concepts they learned in the field and in the classroom. We plan to use pre- and post-testing and compare them with previous runs of the class that did not have access to the online module in order to evaluate its effectivity. The broader audience will benefit from a curated field experience that can be replicated by going to the sites.

Keywords: online learning, field trip, laboratory skills, blended learning