

PROMOTING ACCESSIBILITY IN GEOSCIENCE EDUCATION: WHAT PRACTICES FROM PLANETARY SCIENCE CAN WE APPLY? J. L. Piatek¹ and G. Gosselin², ¹Department of Geological Sciences, Central Connecticut State University, New Britain, CT (piatekjel@ccsu.edu), ²Department of Earth, Atmospheric, and Planetary Science, Purdue University.

Introduction: Although nearly 13% of the population of the United States polled by the 2010 census is considered to have a disability, the percentage of professional physical scientists with a disability is only 9%, and this rate is even lower in physics and astronomy (only 6%) [1]. This discrepancy represents an opportunity for educators and mentors to increase interest and opportunity in the physical sciences by developing instructional materials that are accessible to students both with and without disabilities.

Without necessarily intending to do so, planetary scientists have developed methodologies that are ideal for use in accessible instruction. Nearly all planetary scientists face the issue of an inaccessible field site or limited access to samples: the technologies that allow for studies of bodies outside the Earth should be adaptable to making science classrooms and labs accessible. Efforts to increase accessibility in geoscience education benefit from the experience of planetary scientists.

What is the IAGD? The International Association for Geoscience Diversity (IAGD) was created in 2008 to improve accessible instruction in geoscience education and promote accessibility for geoscience students and professionals dealing with disabilities. The organization is entirely volunteer-based and donation-supported. Ongoing efforts include development and promotion of accessible field trips associated with national geoscience meetings (e.g. the Geological Society of America), an expanding library of resources for faculty looking to broaden access to their courses, creation of the Inclusive Geoscience Education and Research award, and an expanding network of members connected via the organization website [<http://www.theiagd.org>] and social media (@AccessibleGeo on Twitter, Facebook, and Instagram).

Example Projects. Increasing access can include using technology to bring remote sites to the interested viewer and using multiple modes to present data (e.g. different visualizations, tactile representations).

Field Experiences: Field trips focused on accessible stops can be expanded by using remote technologies to bring inaccessible locations to the user (rather than the user to the location). The educational experience provided by this type of accessible field experience was examined by an NSF funded project in 2016-17. The first field season explored sites of geological interest in northern Arizona (including stops that are part of the “Holey Tour” [2] familiar to some planetary

scientists). At these field sites, mobile WiFi hotspots were tested to determine if video links could be used to connect students who were unable to access field sites to those who had hiked to points of interest (see Fig 1).

Lessons learned from this trip were used to develop more rigorous exercises implemented during the next field season in western Ireland. During this second season, students were grouped in pairs and tasked with performing typical geologic mapping skills (e.g. measuring foliation/bedding planes, identifying unit lithologies and contacts) to generate a cooperative map. Students with limited mobility worked at accessible outcrops, while connected via wifi and video to mobile partners in less accessible locations. A final exercise in glacial geology used the portable video links to connect less mobile students to their partners at an inaccessible beach-side outcrop (see Fig 2). Initial outcomes from this project demonstrate that these field experiences provided all students with educational field experiences, regardless of disability status [3].

Use of 3-D tactile models: Many students, regardless of disability, struggle with interpretation of topographic maps and digital elevation images. This is often due to inexperience and lack of “real-world” applicability. Three-dimensional models of the terrain shapes represented by the maps/images can be used to assist students in interpretations: these also provide tactile representations of these data that may be more accessible to those who have difficulty reading the maps/seeing the different colors on the images. Examples of concepts where 3d models may be useful include helping students associate the shapes of volcanic constructs with the types of rock erupted by those features (e.g. relating shape to magma viscosity), or to help students identify “rough” vs. “smooth” terrains (such as the difference between the northern and southern hemispheres of Mars) [4]. These models can also be used to illustrate the weird and wacky shapes taken by small bodies in the Solar System, many of which are available as shape files from NASA’s 3-D resource page [<https://nasa3d.arc.nasa.gov>].

Summary. Planetary scientists have been solving problems of accessibility for decades: this expertise provides an opportunity to share these methods and technologies to help promote access to the physical sciences. Interested scientists and educators can find and share resources and join a community of interested individuals at the IAGD website <http://www.theiagd.org>.

References: [1] NSF, 2017.. Special Report 17-310. <http://www.nsf.gov/statistics/2015/nsf15311/>[2] Greeley, R., 2011, GSA Special Paper 483, p. 377–391, doi:10.1130/2011.2483(23). [3] Marshall, A.M. et al., 2018, AGU Fall Mtg., ED41C-1120. [4] Piatek, J.L., 2018, GSA National Mtg., 2018AM-324541.

Figure 1. Screenshot of remote video link between field partners: the student visible in the screenshot is in the field van, while their partner has hiked to the remote site of interest ('sam jones' is a generic username). In this case, the location is Montezuma Well National Monument (Arizona), a limestone sinkhole. At the time of the field exercise (2016), the path to the site required navigating stairs and was not accessible to all involved in the project.

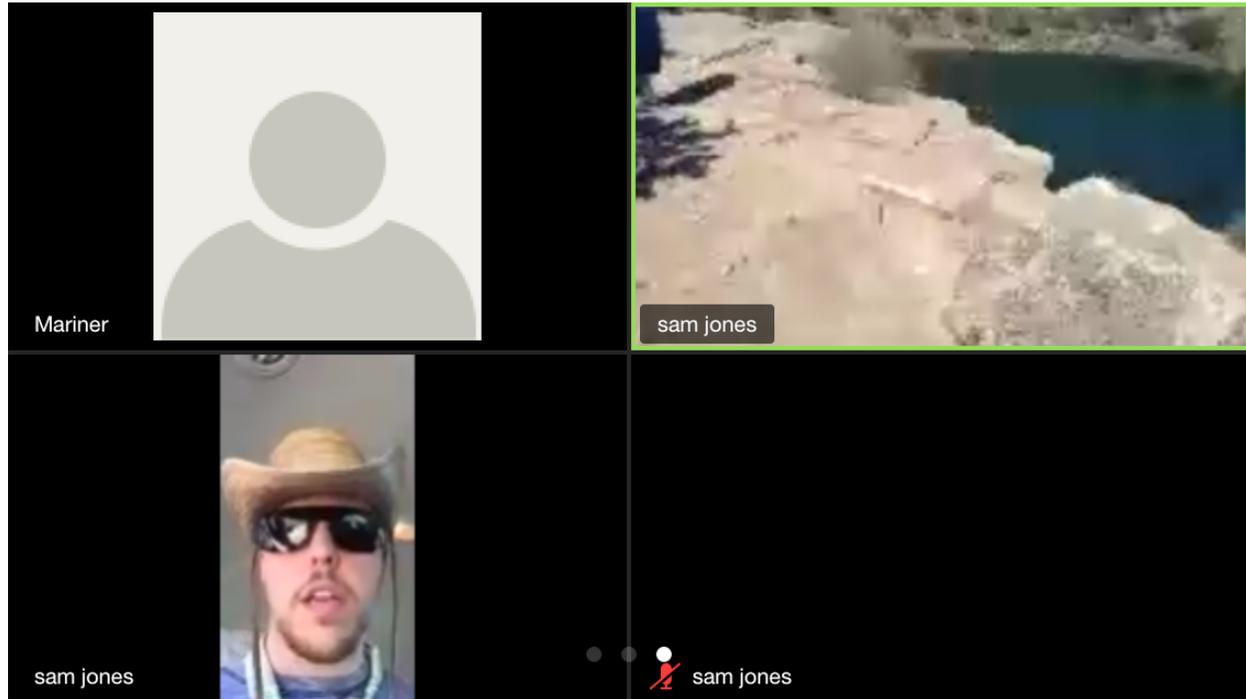


Figure 2. Expanded use of remote connections: Renvyle Point (w. Ireland): The top row of photos were taken at the remote outcrop, which was accessible only via the rocky beach. Students at the outcrop are collecting video and still images and discussing via walkie-talkie. The remote students (bottom row) were connected to the field in real-time via a local area network (antenna in the middle bottom photo) as well as walkie-talkie

