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Delivering authentic online practical science teaching – geoscience perspectives from the OpenScience Laboratory

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Teaching practical science at a distance is challenging – how do you give students studying online a meaningful practical experience? In July 2013, the Open University (OU) launched the Wolfson OpenScience Laboratory (OSL) [1] to deliver a wide a range of authentic practical science activities for their distance learning undergraduates. Prompted by the recognition that modern science is increasingly conducted via a computer screen (e.g. remote sensing, Martian fieldwork), the OSL presents a variety of opportunities for students to observe, investigate, gather and analyse data. The rationale is to foster problem-based, active learning, which has been proven effective by numerous studies [e.g. 2]. Simulation is kept to a minimum; most activities either generate or use real data, with authentic anomalies and 'noise' included – an aspect valued by the students.

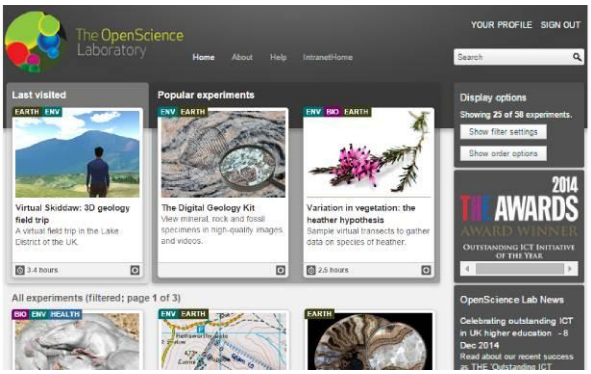

Figure 1: The home page of the OpenScience Laboratory. Clicking each of the captioned images accesses one of the practical science assets, which include virtual laboratories, virtual field trips, virtual instruments, scripted experiments, remote experiments, citizen science investigations, structured enquiries, practical tools/techniques, or live labcasts. The laboratory uses real data wherever possible.

Geoscience is rooted in raw data collected during practical investigations, notably fieldwork. A key skill is observation, so the OSL includes digital collections of minerals, rocks and fossils, as zoomable, high-resolution images and 360° videos for the 3D perspective. The Virtual Microscope enables petrographic examination of thin sections using high-quality zoomable images, in both plane- and cross polarised light, with rotation of the sample for certain points of interest. There is a virtual field trip based in a multi-user virtual environment (MUVE), as well as an exercise on maps and landforms.

Developed primarily for OU undergraduates, many of the assets in the OSL are being made more openly accessible, with free registration. We are developing partnerships with other universities and schools, both as users and contributors to further assets (e.g. thin section collections). We have also gathered feedback from several surveys of OU undergraduates, as well as external users. Feedback on the pedagogical aspects of the OSL is broadly positive, with some assets (e.g. the virtual microscope) garnering particular praise; respondents value the potential for interaction with experts but also desire an explicit connection to the materials' original field context. However, technological issues at times present a barrier to learning – perhaps reflecting the high diversity of OU cohorts, especially in terms of their individual hardware, software and IT skills. Some students resent the time investment required to

master specialised scientific software, though it could be argued that acquiring such IT skills is an essential part of practising modern science!

References:

[1] OpenScience Laboratory (2013) https://learn5.open.ac.uk/course/view.php?id=2 [Accessed 29 Jan 2016]

[2] Freeman et al. (2014) PNAS 111(23):8410-8415