



Learning by doing: Use of research based methods and novel laboratory experiments in teaching Earthquake and Volcanic Processes

Karen Mair, Håvard Bertelsen, Frank Guldstrand, and Olivier Galland
Njord Centre, Department of Geosciences, University of Oslo, Oslo, Norway (karen.mair@geo.uio.no)

In this contribution we summarise our use of research based methods and novel experiments to teach Earthquake and Volcanic Processes with the goal of improving student learning experience.

Together with our PhD students, we have designed a series of simple experimental devices to demonstrate relevant geological and geophysical concepts that are used to collect data for classwork. The experimental setups (which include the Shearinator Shear Box; The Stick Slip Earthquake Machine; CalderaCollapse) are inexpensive and easy to operate, using simple components, measurement and control systems.

We take a hands-on approach, immediately immersing students in laboratory methods, protocols and analyses. In teams, students 'build' their experiment, physically generating the crust or fault zone they will deform, performing the experiments and recording data. Importantly, we blend human data collection (using stopwatches, duck tape and sharpies, manually recording slip events and handcranking our lab devices) alongside state-of-the-art photogrammetric and image analysis methods (used in our current research) to quantify and track evolving deformation processes. This ensures active participation in the experiments, student ownership of the data collected, and exposure to current research tools.

During the course we use novel forms of engagement, peer feedback and evaluation, essentially following each stage a real research path would take from running experiments, to discussing results in teams, to writing abstracts, to presenting posters at a 'fake' conference as final course assessment. In addition, each year, the experiments undergo upgrades, with students designing additional components such as arduino load cells, motor controllers and image analysis routines for which they receive credit points.

In our experience to date, students are extremely engaged, motivated and satisfied with this approach and they really do start to think like researchers.