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EarthChem: a valuable tool for fostering quantitative skills in introductory petrology courses

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According to AGI, many geoscience graduates wish that they had learned data-related skills during their formal educational careers [1]. Surveys also report that data-related skills are valued by graduate advisors and employers. Undergraduate petrology courses are a platform where such skills can be nurtured. Exercises involving the data repository, EarthChem provide opportunities for students to 1) use data to inform their learning, 2) find relevant data for analysis, and 3) learn data-presentation skills and tools.

EarthChem has been incorporated into the petrology course at SUNY Geneseo for 10+ years. In one exercise, students find basalt data from three tectonic settings. Students learn how to search EarthChem and learn/review knowledge regarding basalts and tectonic settings. Once students have found data, they can compare the chemistry of these settings. Although EarthChem can create Harker and TAS diagrams, students benefit from creating their own graph that overlays multiple datasets.

In a second exercise, students re-visit EarthChem to obtain data for generating a REE spider plot. Such graphs are found in petrology textbooks but students can gain a deeper sense of "ownership" of the information if they create the graph themselves. A third exercise asks students to look at a tectonic setting to assess what types of rocks are present. This has been especially successful when studying basaltic volcanism at spreading centers. Instructors can tell students that tholeiites dominate, but students will remember this more if they have data-mined and gathered their own convincing evidence.

At times, students have struggled with Excel and the large datasets that EarthChem can supply. Multiple exercises help build skills and confidence and by the end of the semester, students have reported that they feel more agile working with data. Some students even report that their experiences with EarthChem helped them in other classes such as statistics. Students have also revisited EarthChem for senior projects and some students use it as an additional tool when searching for research papers.

[1] Gonzales & Keane (eds.) (2023), ISBN 13: 979-8-859054-92-3.