Authentic Data Integration Assignment

For this assignment, I will discuss how I plan to bring data into the classroom for students to make data-driven decisions using earthquake data published by the United States Geologic Survey (USGS). Students will use real earthquake data, including magnitude and earthquake depth, to visualize the difference between two different boundaries between tectonic plates: convergent and divergent.

Data Source: USGS Earthquake Catalog: Search Earthquake Catalog (usgs.gov)

Lesson Enhancement:

In this lesson, students will download actual earthquake data from all Magnitude 4.5+ earthquakes that have occurred over the following year from two different regions: 1) the west Coast of South America (Fig. 1) and 2) a divergent boundary, probably the Mid-Atlantic Ridge. Students will use this data to collect depth (in km) and magnitude for each earthquake that has occurred in these regions. They will then create a table to compare the raw values and a graph using excel to visualize the tectonic plates as they meet at each boundary.
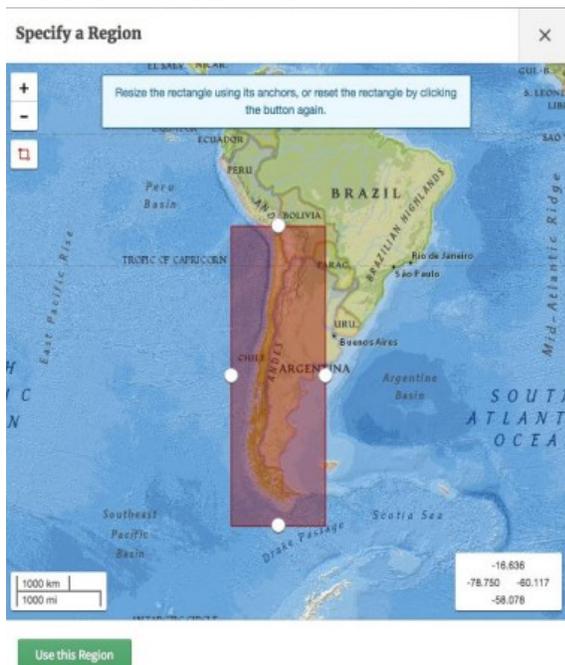

Figure 1: A picture of the rectangle used to specify an area from which to download Earthquake data.

The data collected for this activity enhances teaching plate tectonics because it allows students to visualize the geometry of tectonic plates themselves using Excel and Google Earth. This is much more engaging than what has been done in Geology classrooms for years, which is to show a picture of a convergent boundary and a picture of a divergent boundary and expect students to visualize what this looks like in their head. Additionally, it opens the door for more rigorous statistical comparisons that students can complete using a program like Microsoft Excel.

Personally, I find that anytime I can incorporate authentic, real-world data into a lesson, it instantly transforms the lesson from something that is purely hypothetical or theoretical into an activity where students are the agents of change in an investigation. The USGS and other earth-centric agencies have done a phenomenal job making their data available to researchers, students, and teachers around the world, and we should be so lucky as to be able to use it! Ideally, students are collecting the data

themselves; however, in a situation such as this where students cannot collect the data in groups, it is acceptable to collect it from a published source. Again, this transforms the lesson from one where students are passive witnesses to the science occurring, to active investigators.

Interdisciplinary Context:

This data allows me to teach across multiple content areas – earth science, mathematics, statistics, and computer science and technology, for example. By navigating to a website and downloading a .kmz file, students are learning how to navigate websites to gather data they desire. By importing the .kmz file into Google Earth, students must learn how to open and manipulate an educational app that can also be used in scientific research. By downloading data that has numeric values, students can practice statistical comparisons to see whether convergent boundary earthquakes occur at significantly lower depths (spoiler: they do!). Finally, students can then create a scatterplot in Microsoft Excel to help visualize the data, developing their scientific acumen and providing a means for them to visualize something as esoteric and complex as a boundary between tectonic plates.