

Authentic Data Integration

A. Data source:

Frequency of Damaging Earthquake Shaking Around the U.S.

https://www.usgs.gov/natural-hazards/earthquake-hazards/science/introduction-national-seismic-hazard-maps?qt-science_center_objects=0#qt-science_center_objects

B. Lesson Enhancement:

This upcoming school year I am newly teaching seventh grade Earth Science/Earth History. One natural phenomenon I will explore is earthquakes. This National Seismic Hazard Map allows me to show my students how often a damaging earthquake shaking is predicted to occur in the United States within ten thousand years and specifically in their own state. It lets them compare earthquake shaking hazards throughout different parts of the United States. It helps students generate questions like, “If places on the map have the same color, will they have the same level of damage if an earthquake occurs”? This map is based off of

the Modified Mercalli (MM) Intensity Scale. It was developed in 1931 by the American seismologists Harry Wood and Frank Neumann. This scale, composed of increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It does not have a mathematical basis; instead it is an arbitrary ranking based on observed effects”.

https://www.usgs.gov/natural-hazards/earthquake-hazards/science/modified-mercalli-intensity-scale?qt-science_center_objects=0#qt-science_center_objects

Some new objectives that I can address will be students being able to tell the difference between an earthquake hazard and earthquake risk. I can have students explore how engineers use these types of maps and data for construction of houses and buildings in specific areas. I can also raise awareness of earthquake safety and preparedness. By having this data source it makes the possibility of an earthquake happening in your location realistic, not just something that happens in the movies. By showing my students that the USGS is taking the time to create these maps and track earthquake shaking, it is a possibility in the near future. I feel seventh

graders need shock value and a reality check to keep them engaged, and this data and map will do just that for my investigation on earthquakes.

I feel that using data in the classroom that is collected by student-observation or from another source is a necessary tool of academics. Just like teachers use multimedia, data is an essential part of the process of learning. In my personal experience, student-observation data is very meaningful to the students. The fact that they are part of the process of planning out the investigation, controlling all necessary variables, performing the action, taking the measurements, recording the measurements, taking an average for accuracy, and then interpreting the results really makes the students invested in the whole process of obtaining the data. I have students willingly come on their lunch break to make up the work and obtain their data if they were absent. That shows how meaningful the process is to my students. Then the follow-up when students are challenged to take the data they discovered and create a two-coordinate graph and make predictions by interpreting the graph is magical. Students can look for patterns, they can interpret mistakes, and think about what variables weren't controlled or if measurements were taken incorrectly. They can even go back and retest. It sets up collaborative learning and conversation between peers. There is great responsibility for the students and excellent classroom management skills put forth by the teacher in obtaining the data.

C. Interdisciplinary context:

The US Geological Survey's homepage states that

“We provide science about the natural hazards that threaten lives and livelihoods; the water, energy, minerals, and other natural resources we rely on; the health of our ecosystems and environment; and the impacts of climate and land-use change. Our scientists develop new methods and tools to supply timely, relevant, and useful information about the Earth and its processes”. (<https://www.usgs.gov/>)

This is a resource I will be visiting on a daily basis since I am newly teaching about the processes that shape our planet. Within this resource I found the National Seismic Hazard Map and its contents to have the potential to create interdisciplinary lessons in multiple content areas. My

first thought was geography and social studies. I wonder how many of my students know where all fifty states are located on this map? Can my students interpret a map key and understand what the colors symbolize? What is the potential in my student's state for an earthquake shaking occurrence in the near future? In LAL students could write persuasive essays or have a debate about where the safest areas in the United States are to live based off of the map analysis. For music and art class we could find images or genres of music that specifically are symbolic of earthquakes or the aftermath and devastation of earthquakes. It could all be compiled into a Google Slide presentation for the class to watch together. For physical education, students could measure the force with which they can jump and shake the ground using some sort of Richter Scale. It could be a competition to shake the ground as well as an earthquake. Who can shake like a quake? It's amazing that one map of damaging earthquake shaking could spread awareness and create a multitude of lessons across multiple content areas.

This data can also be used to integrate across STEM content areas as well. In science, do the colors of the map correlate to fault lines or tectonic plates? Does the location, latitude or longitude, of each state affect the colors shown? Could the seasons and temperature also affect the colors shown? From the engineering aspect, how do engineers use this information in terms of infrastructure and earthquake safety? Could we compare building types in high predicted earthquake shaking areas versus low predicted earthquake shaking areas? Does this information affect a specific state and the resale value of a home? Students could brainstorm and come up with a conceptual model and then a physical model to build a structure to withstand the "shaking" given a limited number of supplies. Students could also create some sort of Richter Scale physical model to use in gym class and measure the strength of a student's jump. In mathematics, we could compare the predicted number of damaging earthquake shaking to the actual occurrences and work on ratios and probability. We could also use the data to construct bar graphs or two-coordinate graphs comparing different regions of the United States. The technology could be as simple as using Google slides to report their findings on each state's earthquake plans or researching videos that show an earthquake in progress, like at the baseball game in Candlestick Park in San Francisco. This National Seismic Hazard Map is a prime example of how each individual part of STEM is connected, and when planned out properly, creates an environment that stimulates engagement and a desire for knowledge.