Earthquakes, Google Earth and Haiti
Matt Nabity
Independent Lesson
Middle School, Grade 8
Duration: One 50-minute class, repeated 3 times
Implementation: February 2010, Falcon Bluffs Middle School, Littleton, CO
Lesson Prepared: February 1, 2010

Overview
In this lesson, students will discuss the recent earthquake in Port-au-Prince, Haiti. Students will review topics from earth science, be exposed to newer technology, and gain more perspective on the recent tragedy.

Purpose
Emphasis is on reviewing topics from earth science (currently covered in sixth grade) and understanding basic physical principles related to plate tectonics. This lesson addresses questions about the recent earthquake which is the subject of a current aid project within the school. Students will explore what causes earthquakes and the effects of seismic activity.

Objectives
At the end of this lesson, students will be able to explain what causes earthquakes, discuss the possible effects of an earthquake, and be familiar with Google Earth. Students will know the North American plate, the Caribbean plate and how tectonic plates interact. Students will be able to discuss the interaction of plates with physical science terms (eighth grade), such as force, while reviewing earth science terms (sixth grade). Additionally, students will discuss the Richter scale, a logarithmic scale that quantifies the energy released during an earthquake. This complements another base 10 system used in science, the metric system.

Standards Met
CO State Science:
Standard 1, Benchmark 4: demonstrate that scientific ideas are used to explain previous observations and to predict future events (for example: plate tectonics and future earthquake activity).
Standard 4, Benchmark 4: Major geological events such as earthquakes, volcanic eruptions and mountain building are associated with plate boundaries and attributed to plate motions.

National Science:
Standard B Physical Science - Motions and Force, Standard D Earth and space science - structure of the Earth system, Standard F Science in Personal and Social Perspectives - Natural Hazards

Background: Students should be familiar with basic ideas from earth science and aware of the recent seismic activity.


Lesson Vocabulary: plate tectonics, crust, earthquake, force, pressure, fault, oscillation

Materials required
Computer with Google Earth and display capabilities, a web browser, internet access, piece of paper per student.

Preparation: None.
Safety: Nothing needed for this activity.
Method: 5 E’s Model

Engage: Begin with web browser at http://www.google.com and ask students when they think the most recent earthquake occurred. Most will say something like January 12 in Haiti. Entering “seismic activity” into the search field will result in information on the latest earthquakes, world wide. Earthquakes occur quite often, but most do not occur in locations to cause damage on the scale seen in Haiti. More information about a specific earthquake can be found at the USGS website:

Explore: To further explore the underlying causes of earthquakes, we review the structure of the earth with a discussion with the following images. Students participate in a discussion with resident about the Earth’s crust, reviewing concepts from sixth grade. Students will draw a picture of the North America plate and the Caribbean plate, the two plates involved in the recent earthquake. The discussion will continue with how tectonic plates can move and cause earthquakes. See the following figures:
After the discussion, students will be asked to draw a picture of two plates interacting, see the following figure for an example.

Once students have an idea how earthquakes form, a brief group discussion will follow on how to measure the “size” of an earthquake. Students will discuss the Richter scale and relate it to the metric system, as both are
base ten logarithmic scales. Students will discuss what it means to increase 1 increment in magnitude and look at descriptions of the energy released (or effective damage) by various magnitudes. Once some feeling for measuring an earthquake has been gained, students can discuss the recent earthquake in Haiti.

Elaborate: To expand on the earthquake in Haiti, we explore the region using Google Earth and the time slider tool. After launching Google Earth, the resident or a student can enter Haiti into the “fly to” field and the class will travel to Haiti.

Once there, with Google Earth, students will follow the actual fault lines that delineate the North American plate. After traveling around the North American plate and returning to Haiti, the epicenter of the Haiti earthquake will be examined. The time slider tool makes it possible to look at satellite imagery of Haiti from months before the earthquake. Students will see crisp edges of buildings and infrastructure on the historical imagery (from December 2009 or thereabouts). Then students can compare the images to the most recent images in which buildings have collapsed and the infrastructure has been damaged. Students will participate in a large group discussion about what they see.

Evaluate: To assess understanding of the material, students will be asked to add to their sketch of the tectonic plates a written description or picture of how plates can interact to form earthquakes.

Adaptations or differentiated learning
[Include all potential adaptations that may be useful for the classroom.]
Extensions & connections
Mathematical Modeling, prediction based on data.

Peer review comments
[List any peer comments that aided in the preparation of this lesson]

Reflections (completed after lesson is implemented)
[How does this lesson integrate your research into the classroom?]
This lesson did not directly integrate my research into the classroom, but many of the tools used in this activity rely on aspects of my research. Specifically, the search engine Google uses numerical methods to compute eigenvalues when determining page rank of search results. The notion of assigning a “size” to an earthquake for purposes of comparison also relates to my work.

[How could the lesson be improved?]
This lesson could be improved by giving the students a meaningful calculation to accompany their sketches. While many were engaged by the technology, some students were left craving a more analytical approach than sketching tectonic plates and their interactions.

[What worked well?]
The technology was obviously the star here. Most had heard of Google Earth, but very few understood some of the capabilities and built-in tools. Students were highly engaged as the subject was topical, and it helped that the school was organizing relief efforts at the time.

[What did you learn?]
I learned that things work really well when students can have an immediate connection to the subject of an activity.

[How does this impact your future profession?]
This activity reinforced something I have long held in my educational opinions, the best learning situations occur when students are engaged and the material being presented is related to them in a way that is meaningful to them.

[Further thoughts...]

student work examples (completed after lesson is implemented)
[Sample submitted separately.]