Lesson Title	Volcanoes in a GIS World
Length of Lesson	100 minutes
Created By	Claire Babineaux
Subject	General Science
Grade Level	8th
State Standards	4.a-b
DOK Level	1,2,3,4
DOK Application	1:Recognize, Recall, Report, Define, Identify 2:Classify, Estimate, Make Observations 3:Explain Phenomena in terms of Concepts 4: Analyze, Apply Concepts
National Standards	D (Structure of the Earth System, Earth's History);
Graduate Research Element	The knowledge of crustal movements is an important aspect of geology. Also, the structure and history of the earth allows for open knowledge of how things work on earth today. In addition, the connection of the climate and atmosphere to the rate of sea level rise is an important aspect of this lesson.

Student Learning Goal:
The goal of this lesson is to present information about volcanoes to an 8th grade science class at the minimum DOK level of 1, but will apply all levels.

State Standards:

4. Describe the Earth's System in terms of its position to objects in the universe, structure and composition, climate, and renewable and nonrenewable resources. *The students will develop an understanding of the earth as a system and how that system works as a whole, and on a relatively smaller scale. This lesson will focus on volcanoes and how they relate to plate tectonics.*

a. Compare and contrast the lithosphere and the asthenosphere. (DOK 1)
- Composition, density, and location of continental crust and oceanic crust
- Physical nature of the lithosphere (brittle and rigid) with the asthenosphere (plastic and flowing)
- How the lithosphere responds to tectonic forces (faulting and folding)

b. Describe the cause and effect relationship between the composition of And movement within the Earth's lithosphere. (DOK 1)
- Seismic wave velocities of earthquakes and volcanoes to lithospheric plate boundaries using seismic data
- Volcanoes formed at mid-ocean ridges, within intra-plate regions, at island arcs, and along some continental edges
- Modern distribution of continents to the movement of lithospheric plates since the formation of Pangaea

National Standards:
D:

1. Structure of the Earth System
    a. The solid earth is layered with a lithosphere; hot convecting mantle; and dense metallic core.
    b. Lithospheric plates on the scales of continents and oceans constantly move at rates of centimeters per year in response to movements in the mantle. Major geological events, such as earthquakes, volcanic eruptions, and mountain building, result from these plate motions.
    c. Land forms are the result of a combination of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruption, and deposition of sediments, while destructive forces include weathering and erosion.
    d. Some changes in the solid earth can be described as the rock cycle. Old rocks at the surface weather forming sediments that are buried, then compacted, heated, and often re-crystallized into new rock. Eventually those new rocks may be brought to the surface by forces that drive plate motions, and the rock cycle continues.

2. Earth's History
    a. The earth processes we see today, including erosion, movement of lithospheric plates, and changes in the atmospheric composition, are similar to those that occurred in the past. Earth history is also influenced by occasional catastrophes, such as the impact of an asteroid or comet.

Materials Needed (supplies, hand-outs, resources):
List of active volcanoes in Alaska (website provided in teacher's notes), PowerPoint lecture, information/notes worksheet, Google Earth, Worksheet for Google Earth activity, Maps, one laptop per student (classroom set provided by the school)

Lesson Performance Task/Assessment:
The students will demonstrate their understanding for this lesson by answering questions provided on the worksheet by using critical thinking and recalling from what they have learned.

Lesson Relevance to Performance Task and Students:
Students will be able to understand the rock cycle, earth as a system, and volcanoes. For the topic of volcanoes, the students will develop an understanding of what they are, where they are located, how they form, and will use Google Earth to locate volcanoes using coordinates provided.

Anticipatory Set/Capture Interest:

Intro or recap of plate tectonics. The teacher may also show some videos of erupting volcanoes, and statistics of volcanic eruptions. A few interesting questions to ask are:

1. What is a volcano?
2. Where can you find them?
3. Have you ever seen one erupt? (show videos)
4. Where is the closest volcano to Mississippi?
5. If this volcano erupts, would Mississippi be affected?

The teacher may opt to show videos of volcanoes erupting. (See teacher's notes)

Guided Practice:
The teacher will present a PowerPoint lecture on volcanoes and the relationship to plate tectonics, structures, and the earth system (see resources). After the lecture, the teacher will introduce Google Earth and provide each student with either the name or coordinates of an active volcano in Alaska (See Teacher's Notes).

Independent Practice:
The students will search for the name or coordinates of the active volcano the teacher provided for them. They will then use this information to fill in the Volcano information worksheet. They will use this information to write a short essay about the logistics of their volcano. The students will use a classroom set of laptops.

Remediation and/or Enrichment:
Remediation: Individual IEP-The teacher may separate the students into groups and have them work together.
Enrichment: Lesson extension: The teacher may lengthen the lesson and cover more about volcanoes using specific examples.

Check(s) for Understanding:
The students will demonstrate their understanding for this lesson by completing an information worksheet and short essay. The teacher may opt to give an assessment on the information presented.

Closure:
A teacher led discussion of volcanoes, plate tectonics, and the location of volcanoes will lead to closure of this lesson.

Possible Alternate Subject Integrations:
Although the subject of volcanoes is an obvious Geology topic, the pieces and parts that compose of how they work, move, and their history can be integrated.
History: The concept of Deep Time can be expressed through the geologic time scale. Also, the Theory of Uniformitarianism, "The present is the key to the past" can be used to explain certain phenomena that occur in geologic time.

Math: The rates of plate movement and of volcanoes can be calculated.

Teacher Notes:
Website for the Alaska Volcano Observatory. This resource can be used to locate active volcanoes within the State of Alaska. It also provides links to other observatories, such as Yellowstone.
http://avo.alaska.edu/