

OIMB GK12 CURRICULUM

6th Grade

60 minutes

HOT SPOTS AND VOLCANIC ISLANDS

Oregon Science Content Standards:

6.1E.1 Describe and compare the properties and composition of the layers of Earth.

Ocean Literacy Principles:

2. The ocean and life in the ocean shape the features of the Earth

Goals: Students will

- learn about the composition of the Earth's crust and interior
- simulate the volcanic formation of archipelagos

Concepts:

- The earth is made up of a rocky crust overlying a hot, molten mantle which surrounds a dense metal core.
- Island chains, or "archipelagos" are formed as magma is ejected through a "hot spot" in the earth's crust. A single hot spot will create an entire archipelago.

Materials:

- A short video of a volcanic island formation (e.g. one of Surtsey erupting in Iceland <http://www.britannica.com/EBchecked/topic/575414/Surtsey>)
- Sheets of tinfoil, one for every 3 students
- Shaving cream, 1 can for every 3 students (or rotate) Note: squirt cans of frosting can be substituted, but we found shaving cream cut down on snacking and helped clean desks.

Lesson Plan:

- This lesson should follow a general introduction to islands.
- Ask the students, "How do you think islands form?" There are three basic answers to this.
 - a. Some island form from the buildup of coral over time (any image of a coral atoll would be a good representation of this).
 - b. Some islands form when the ocean isolates a landmass from the main continent. (For example, Greenland from North America, Madagascar from Africa.)
 - c. Some islands form by volcanic action (e.g. Hawaii).
- Students are quick to suggest volcanic action, so ask them some deeper questions about this method such as "where does the lava come from?" and "why does the eruption stop?"
- Watch the on-line video of the formation of Surtsey.

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- Inform the students that the solid ground they stand on is actually a relatively thin layer called the “crust” that covers the surface of the earth. Compare it to the thinnest outer layer of a gobstopper or jaw breaker. The crust is only 10-30 miles thick, which is trivial compared to the layer below it, the “mantle” which is 1,800 miles deep.
- While the surface of the mantle is also composed of rock, the rest of it is so hot that the rock has melted into molten rock known as magma. Students will realize that this is the source of the lava that is seen bursting to the surface during volcanic events. Inform them that the deepest part of the earth is the core, which is made of dense metal.
- Remind them that molten magma is usually trapped beneath the earth by the solid part of the mantle. It can only escape when it finds weak spots in the mantle. There are places on Earth known as “hot spots,” areas of permanent weakness in the Earth’s mantle. Would students expect to find more volcanoes there?
- Ask if the Earth’s crust is stationary. Discuss plate tectonics: how the crust is broken into separate plates that very slowly move.
- Introduce the students to archipelagos. Show them an image of Hawaii, informing them the entire chain of islands was and is being formed by a single hot spot in the mantle. How can this be? Allow students to form their own hypotheses before beginning the activity.
- Divide students into groups of three.
- Hand out a sheet of tinfoil to each group, explaining it represents a plate of the Earth’s crust. Tell them that the crust also has weak spots in it, so they must punch holes a few inches apart *in a line* across the surface of the tinfoil. Explain that the magma (shaving cream) will only be able to escape when the hotspot lines up with the weak spots in the Earth’s crust. Explain that the tinfoil plates will slowly move across the stationary hot spot.
- Hand out a can of shaving cream to each group of students, explaining that it represents the hot spot in the mantle and therefore does not move.
- Have two students hold the tinfoil so that it is a flat layer. Have the third student hold the can of shaving cream stationary *beneath* the tinfoil, facing upwards. The shaving can hot spot should be aligned with a hole in the tinfoil. Have the students begin the demonstration by sliding the tinfoil slowly past the opening of the shaving can while it ejects single burst of cream through the holes. Students should not be directly over the tinfoil.
- Note: if the class is too disruptive, the teacher can act as the hotspot and hold the shaving cream for each group.
- Remind the students that the movement of the tin foil represents the crust as it is sliding over the hot spot. Magma escapes where the weak spots in the crust align with the hotspot and create a string of islands (lumps of shaving cream) on the upper surface of the tinfoil.
- Clean up and review. Have the students report on how their islands formed.

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Assessment: Have the students explain how the hotspot was able to form the archipelago. They should write their explanations in their own words, and then share their explanations as a class. If you need to further reinforce the concept, you may repeat the demonstration yourself, narrating the events as they occur.

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