**Lesson 4: Volcanoes**

**Objective**

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| Students will:   * Describe several parts of a volcano. * List the three main types of volcanoes. * Be able to name at least one famous volcano. |

**Time needed**

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| **Prep time:**  **Class time:** |

**Materials**

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| * Empty water bottles (enough for one per pair of students) * Aluminum baking tins (enough for one per pair of students) * Baking soda * Vinegar * Red food coloring * Volcanoes video: <http://www.youtube.com/watch?v=l0Pbna2zWuM> |

**Standards**

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| **Practices** | **Crosscutting Concepts** |
| **Disciplinary Core Ideas and Concepts** | |

**Background Information**

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| A volcano is a place on the Earth's surface at which material from the center of the Earth escapes to the surface. Volcanoes usually occur along the *fault* lines that separate the tectonic plates that make up the Earth's crust. The typical image of a volcano is a large cone with glowing red lava flowing out of the top. Different types of volcanoes — cinder cones, shield volcanoes and stratovolcanoes — have different types of eruptions and other unique characteristics.  The three main types of volcanoes are cinder cone, shield volcano and stratovolcano. A cinder cone is the most common. Also known as scoria cones, they are usually small and made of volcanic fragments from previous eruptions, called cinders or scoria. They have steep sides and typically a bowl-shaped crater. Another type of volcano is a shield volcano, which is formed almost entirely of liquid lava. The lava flows out of a vent and slowly slides down the side of the volcano. As the lava cools, it forms a broad cone of basalt. The slopes of a shield volcano are usually very gentle. And last, stratovolcanoes have the tall conical shape most often associated with volcanoes. They have very steep sides and often form during violent eruptions. They are made of tephra and solidified lava.  A volcano has many parts. Under a volcano, from a pocket of molten rock known as the magma chamber, hot magma travels up through a fissure, called a vent. While a volcano can have more than one vent to the surface, it usually has one central vent. Magma exits the volcano at the crater, becoming lava. The crater is typically a bowl-shaped opening located at the top of the cone. If the eruption is violent, ash and rock are launched into the air. This material is collectively known as tephra. Much of the material ejected from the volcano collects on its sides. After many eruptions, enough layers, known as strata, build up to form a volcano's recognizable cone shape. |

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| **Engage** |
| * Ask students: * Who has seen or been to a volcano in person? Seen a volcano on TV? * Show students a video to get them thinking: <http://www.youtube.com/watch?v=l0Pbna2zWuM> * Have students get in pairs and discuss: * How would you describe a volcano? * What makes a volcano different from a mountain? * What is a volcano? * What causes an eruption? |

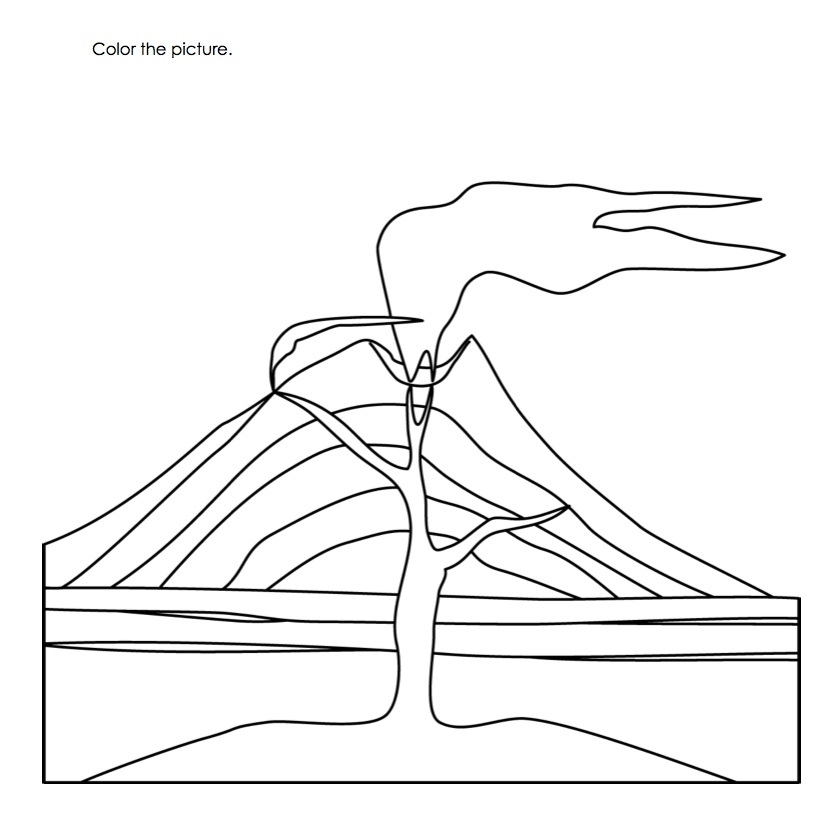
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| **Explore** |
| Tell students that they will be making their own volcanoes today. Have students get into pairs.   1. Have students place their bottles in their baking dish. 2. Have them build a mountain around their bottles using the paper. Let them know they can crumple and tape, or they can make a cone, or they can get creative with their design. 3. Have students pour water, soap, vinegar, and the food coloring into the bottle. Ask students what they think will happen when they add the baking soda. 4. Have students add the baking soda to their bottles. If students want, they can keep adding more baking soda and vinegar to make more eruptions. |

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| **Explain** |
| 1. Tell students that this is just one example of how volcanoes can erupt. 2. Ask students if they have an idea of other ways volcanoes erupt. 3. Tell students that there are two main ways that volcanoes can erupt: explosively, and non-explosively. Explosive eruptions are those that add large amounts of ash, lava, and gases into the air. Non-explosive eruptions just spill over the top of the vent. A volcano is a vent that uses magma from within the Earth’s crust to connect to the surface. Typically a volcano erupts when the pressure inside the magma chamber and vent are so high that there is no more room for gases to build up. This causes magma, rock, ash, and gases to shoot through the vent and into the air. There are some volcanoes that even exist under water, in the ocean. Volcanoes typically occur at convergent and divergent plates, though there are volcanoes that happen over “hot spots,” an example would be the islands of Hawaii. There are three types of volcanoes, Shield Volcanoes—ones with easy sloping sides, Composite Volcanoes, or Stratovolcanoes—made up of alternating layers of rock and ash, and Cinder Cone Volcanoes—which are cone shaped volcanoes that are bult by the accumulation of loose bits of magma and ash. |

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| **Elaborate** |
| Have students color and label the picture (below) from what they have learned in today’s class. |

**Resources**

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| **Additional Resources**  **Resources Used**:  Teach Engineering: Volcanic Panic  <http://www.teachengineering.org/view_lesson.php?url=collection/cub_/lessons/cub_natdis/cub_natdis_lesson04.xml>  Environmental Atlas: of Abu Dhabi Emirate  <http://edu.environmentalatlas.ae/downloads/Lesson%20Plan_Volcanoes.pdf>  About.com: How to Build a Baking Soda Volcano  <http://chemistry.about.com/cs/howtos/ht/buildavolcano.htm> |
| Youtube.com: Mount Etna Volcano Erupts in Italy  <http://www.youtube.com/watch?v=l0Pbna2zWuM> |



Color and label the volcano.

Use the information that you learned today.