A Sixth Grade Unit on Volcanoes

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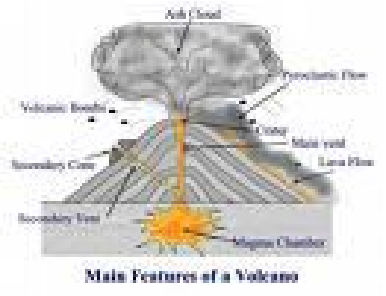

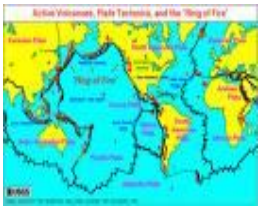

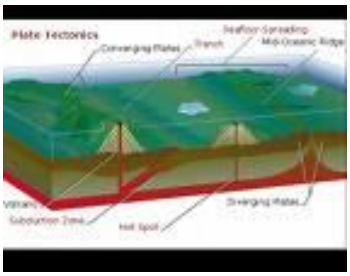

Volcanoes

Unit Overview:

This unit is based on the **Science and Technology Concepts for Middle Schools curriculum, Catastrophic Events,** published by *Carolina Biological Supply Company, Burlington North Carolina.* In this unit students will explore, experiment and uncover various facts about volcanoes which they hadn't been aware of and lay to rest some misconceptions they have harbored.

In this unit students will categorize volcanoes as a catastrophic event, discuss causes and effects, plot the locations, learn about the inside, and understand why magma rises in a volcano, when and why an eruption may occur, types of volcanoes and types of eruptions.

Students will work in groups throughout this unit and do the various activities for each lesson in a cooperative manner, helping each other when necessary and be willing to listen to others point of view. They will not jump to conclusions but look at a matter from many different sides before drawing one. They will be curious, careful and accurate in their observations and be prepared to support their findings with reliable data.

Activity 1: Volcanic Eruptions

Students are introduced to volcanoes by watching a National Geographic video, so they understand that an eruption can be a natural catastrophe. This allows them to make comments and come up with questions they would like answered about volcanoes, setting the tone for the unit.

Activity 2: Where are volcanoes located in the world?

By plotting latitude and longitude locations of some of the volcanic areas, students will be able to see and understand that most volcanoes are located along plate boundaries but there are some that are located far away from the boundaries.

Activity 3a & 3b: How do we explain volcanoes that are found within plate boundaries?

Students will design a procedure and model it to explain the occurrence of "Hot Spot" volcanoes in the middle of an oceanic plate. They will understand that a hot spot is an area where the hot magma from Earth's mantle burns through the crust and reaches the surface.

Activity 4: Anatomy of a volcano

By piecing together a puzzle students will understand what the inside of a volcano looks like. They will then trace the movement of lava when an eruption occurs.

Activity 5: Why does magma rise?

Students will recognize that it is the gases in the magma that make magma rise to the surface. They will then model this movement using baking soda, vinegar, water and raisins.

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Activities that will follow:

Though this unit is not a complete one, the next few activities should help students understand the different kinds of eruptions of volcanoes, how volcanic eruptions differ depending on the characteristics of magma, how lava flows depending on the characteristics of magma, what lava looks like, what are some other things that come out during an eruption, what happens when lava cools down, what are some other forms of volcanic activity and so on.

Final Activities (covered in two blocks of 50 minutes): Volcanic eruptions are both constructive and destructive.

This activity will help students clear the common misconception that volcanoes are only destructive. They will watch a video on *Geothermal Energy* and realize some of the constructive values of volcanic activity.

Brief Description of Group to be Taught: This lesson on Volcanoes will be taught to a team of 6th graders. The team has 95 students who are divided in to four blocks. Number of inclusion students in each block varies from two students in one to five in another block. Students are on IEP's for various reasons ranging from hearing impairment, English language learning to being diagnosed with ADHD. Almost all these students are seated in the front center of the classroom. These students have worked in groups in earlier units and are familiar with how the group functions and group roles. Teacher will remind students about group roles at the beginning of the unit.

Students' Prior Knowledge: This unit on Volcanoes follows the unit on Earthquakes and will be followed by a unit on Minerals and Rocks. Given that these sixth grade students have just completed their unit on Earthquakes:

1. They have prior knowledge of the Earth's interior and how it is divided by its composition into three concentric layers: **crust, mantle** and **core** and that the **Earth's interior** is extremely **hot**.
2. They also understand that Earth is divided into layers based on its physical properties.
3. The top two layers as it is divided by physical properties – the **lithosphere** and the **asthenosphere** are mainly responsible for how mountains, volcanoes and earthquakes occur in the world.
4. That the lithosphere consists of plates that are constantly moving. At the plate boundaries, plates are moving towards each other (**convergent plate boundaries**), moving away from each other (**divergent plate boundaries**) or sliding one under the other (**subduction**).
5. Students have finished studying slow changes to earth's surface (the formation of mountains an sea-floor spreading) and are now studying rapid changes (earthquakes and volcanoes).

Unit Length: A minimum of fifteen 50 – minute science blocks.

Driving Question for the Unit: ***How prepared should we, the citizens of Massachusetts be for a volcanic eruption?***

Other resources available to students throughout this Unit:

Leap Through Time Volcano, Peter Dennis

Time For Kids – Volcanoes, Editors of Time for Kids

Volcanoes and Other Natural Disasters, Harriet Griffey

Volcanoes, Seymour Simon

Volcanoes, Franklin M. Branley

Yellow Stone National Park

Rocking and Rolling, Phillip Steele

The Magic School Bus – Blows Its Top

Geysers, Larry Dane Brimmer

Exploring Natural Disasters, Sands

Strange Science: Planet Earth, Q.L. Pearce

Earthshake Poems from the ground Up, Lisa Westberg Peters

Forces of Nature, Catherine O'Neill

Earthquakes and Volcanoes, Fiona Watt

Volcanoes, John Calderazzo

http://www.classzone.com/books/earth_science/terc/navigation/visualization.cfm-This website is extremely good as it has many different topics to choose from. Students will be able to see various animations to get an overall picture.

http://www.wwnorton.com/college/geo/egeo/flash/2_10.swf - Activity 3a and 3bhttp://www.wwnorton.com/college/geo/egeo/animations/ch2.htm - As there are several animations available, this website can be used throughout the unit.http://www.pbs.org/wnet/savageearth/animations/volcanoes/index.html - animation of a volcanic eruption and what leads to one
http://static.howstuffworks.com/flash/volcano-eruption.swf - Various stages of a volcanic eruption
http://news.bbc.co.uk/2/hi/science/nature/4972366.stm - How volcanoes are formed and what happens during an eruption.
http://esminfo.prenhall.com/science/geoanimations/animations/35_VolcanicAct.html - How volcanoes are formed at plate boundaries – diverging, converging, subduction zones, hot spots and island arcs.

Volcanoes

Day 1 – Activity 1

Volcanic Eruptions

Relationship of this Lesson to the unit: Students have definitely heard about volcanoes, but when asked what volcanoes are they may not be able to provide an appropriate explanation or they might be carrying a misconception. By watching a video all students get to see a volcanic eruption first hand which will help them join in, in the conversation with the class. All students will have something to say during this first lesson of the unit.

Massachusetts Frameworks Strand and Learning Standard: Earth and Space Science, Grades 6 – 8, Earth's History:

Learning Standard 5: Describe how the movement of the Earth's crustal plates causes both slow changes in the earth's surface (e.g., formation of mountains and ocean basins) and rapid ones (e.g., volcanic eruptions and earthquakes).

Concept:

- Volcanic eruptions are a catastrophe.
- Relate their learning to the recent eruption of Mt. Redoubt in Alaska. (Connection to everyday life)

Processes:

- Students will observe (watch a video) and communicate with other students in their group, class and to the teacher their impressions about a volcanic eruption.

Science Habit of Mind:

- Students will go to reliable sources for evidence. They will challenge sources to make sure they are reliable.
- Students will be curious, careful and accurate in their observations.
- Students will keep records of their observations.

Other Subject Area Objectives: Current Events (Social Studies)

Students will read about the recent volcanic eruption of Mt. Redoubt in Alaska and research to find possible signs, causes, and effects of this eruption.

Materials Needed: (Per group of 4)

- ❑ 4 Recording Sheets

Session Length: This lesson will be covered in one 50 minute block.

Volcanoes

TIME	PROCEDURE	CONCEPT
Preparation done the previous day.	Teacher takes time the previous day to form groups in each block. Students are in groups of four. They are reminded of the roles of the **getter, starter, recorder and reporter.** Members of each group get to pick numbers 1 - 4 from a bag without seeing. So the student who picks a 1 is the getter, 2 the starter, 3 recorder and 4 will be the reporter for the first day. The next day they will rotate to the next role in the group and so on. **The roles and responsibilities are also posted in the classroom.** Students will work in these groups for the length of this unit. Teacher once again clarifies the roles of each member in the group. **1** – **Getter** – Gets the materials needed for the group and is the one who will ask the teacher, questions his/her group may have. **2 – Starter –** Focuses the group's attention on the task at hand. **3 – Recorder –** Records data, scribes for the group and also makes sure that everyone in the group is taking notes so that if one member is absent, the group can still continue to work as they will have all the information. **4 – Reporter –** Reports back to the class. Teacher also reminds students that their roles will be changing every day, so each one should be a willing and sincere participant.	Groups and Roles.
Teacher prep. Before class	Teacher will have a Video player, a TV monitor and the video-National Geographic – *Forces of Nature* Closer Than You'd Ever Want To Be. Teacher will preview the video and select the portion about volcanoes that students will watch.	
9:00 to 9:15	Introduction: As students have just finished the unit on Earthquakes, which is a catastrophic event, they are asked if they can think of other natural catastrophic events. Teacher clarifies that catastrophe means something that is often sudden and disastrous and that when things happen naturally we have very little or no control at all. Possible responses: • Hurricanes • Tsunamis • Tornadoes • Volcanoes	Brainstorming.

	• Storms • Avalanches • Floods • Drought • Sand Storms • Winds • Extreme temperatures Teacher records all of the responses on chart paper and then circles "Volcanoes," and asks students what a volcano is? How many of you heard about the eruption of Mt. Redoubt in Alaska just this week? (Week of March 22, 2009) Did anyone get to see pictures in newspapers or on TV? <u>Possible student responses:</u> • Yes, I heard that it sent up ash clouds as high as 65,000 ft. • I heard that it was almost 10 miles high. • I heard there have been more eruptions since last Sunday. • People say that there could be ice melting, floods because of that and may be even earthquakes. • Volcano is a mountain which blows up lava every now and then. • Hills or mountains that have an opening at the top through which hot rocks come out. • Hills or mountains that explode and throw hot lava out. • Gases and ash also come out. Teacher acknowledges their responses and tells the class that they will begin to study Volcanoes which is another part of Catastrophic Events Unit. Tell students that they will get time to research about the recent eruption of Mt. Redoubt in the coming days. The class will watch a portion of the video *Forces of Nature* which is about the eruption of Mt. Soufriere in Montserrat, West Indies. Have them record the answers to the following questions in the sheet provided to them. 1. What signs did they see that the volcano was about to erupt? 2. Possible causes for the eruption. 3. What were the effects of the volcano's eruption? 4. How did the scientists monitor the volcano? Were they in any danger?	

	5. Were scientists able to predict the eruption and issue an alert? 6. Was there enough time for people to be evacuated or was there loss of human life?	
9:15 to 9:25	Students watch the video.	
9:25 to 9:30	Students work in their groups to answer the questions given to them. As they are discussing and writing answers teacher will move around the classroom observing and listening to student conversations. <u>Facilitating questions:</u> 1. When did the eruption take place? Have there been other eruptions since then? How can we find out? 2. Did you notice any instruments that the scientists used? 3. What were the risks scientists faced? 4. How does an earthquake affect a volcanic eruption? 5. Does life return to the way it was? 6. What do scientists base their predictions on? 7. Can scientist make accurate predictions about volcanic eruptions? 8. Would you blame scientists for <u>not</u> making accurate predictions? 9. What challenges do scientists face in deciding whether to issue an alert? 10. What would people's reaction be if predictions are not accurate?	
9:30 to 9:45	Each group will get to share their answer to one of the questions listed above. (Question 1 – 6, as there are 6 groups of 4 students). As groups share, other groups listen and add to that answer if they have something more or note ideas that they may have missed. This will help all students to have all the information.	
9:45 to 9:50	Teacher will ask students to think about what they would do if they were told that there is going to be a volcanic eruption where they lived. (State of Massachusetts) This question is sure to spark a flurry of other questions like: 1. Are there volcanoes in Massachusetts? 2. Has there been an eruption in Massachusetts? 3. Are we in danger?	

	4. Are there volcanoes in America? 5. When did a volcano erupt in America? 6. How far do we have to go to escape an eruption? Tell students that they will be plotting the locations of volcanoes on a world map and they will find out if there are any volcanoes in Massachusetts the next day. So they can figure out if they are in any immediate danger. **Homework:** Students will come up with at least two questions that they would like answered about volcanoes. They will read either a newspaper or internet article about the recent eruption of Mt. Redoubt in Alaska and answer the questions, describing the eruption and what signs were noticed that told scientists that an eruption was impending. Teacher will provide copies of an article for those students who might not have access to a newspaper or computer.	

Volcanoes

Sample recording Sheet:

Name: _____ Block: _____ Date: _____

Activity: Watching the video – National geographic: *Forces of Nature*

1. Signs that the volcano was about to erupt?

2. Possible causes for the eruption.

3. What were the effects of the volcano's eruption?

4. How did the scientists monitor the volcano? Were they in any danger?

5. Were scientists able to predict the eruption and issue an alert?

6. Was there enough time for people to be evacuated or was there loss of human life?

Volcanoes

Sample Home Work Sheet:

Name: _____ Block: _____ Date: _____

1. Two questions you would like answered about volcanoes.

2. Read either a newspaper or internet article about the recent eruption of Mt. Redoubt in Alaska.
   a. Describe in your own words about the eruption.

   b. Write about what signs were noticed that told scientists that it was about to erupt.

Sample rubric for Activity 1

	Novice	Competent	Expert
Observe and Communicate	Student watches the video, but is unable to process the information to effectively communicate to the class.	Student watches the video, observe and process the information and effectively communicate it to the class.	Student watches the video, observe and process the information, infer other factors and effectively communicate it to the class.
Keep records of their observations	Student's notes on observations are not complete. So unable to answer questions that follow	Student's notes are complete and student is able to answer questions that follow completely.	Student's notes are well composed and organized. Student is able to answer questions that follow in depth.
Volcanic eruptions are a catastrophe Relate it to the recent eruption on Mt. Redoubt	Student is unsure of what a catastrophe means. Is unable to relate the recent eruption to a catastrophic event.	Student understands that the recent eruption is a catastrophe, and it will continue for some more weeks.	Student understands that the recent eruption is a catastrophe that will continue for some more weeks. Is able to predict some of the effects of such an eruption even to our lives in the state of Massachusetts.

Day 2 – Activity 2

Where are volcanoes located?

Relationship of this Lesson to the unit: Students will relate the recent eruption to their lessons every day. As students explore volcanoes, one of their queries is "Where are volcanoes located?" To answer this question they will plot the locations of some volcanoes on a world map, using latitudes and longitudes given to them. By doing this they will realize that most of the volcanoes are located along plate boundaries of Earth's lithosphere. They will also find out where volcanoes are located in the US and if there are any volcanoes in the state of Massachusetts.

Massachusetts Frameworks Strand and Learning Standard: Earth and Space Science, Grades 6 – 8, Earth's History:

Learning Standard 5: Describe how the movement of the Earth's crustal plates causes both slow changes in the earth's surface (e.g., formation of mountains and ocean basins) and rapid ones (e.g., volcanic eruptions and earthquakes).

Concept:

- Volcanoes are concentrated along the plate boundaries of the lithosphere.
- There are some exceptions to this – there are volcanoes found far away from plate boundaries.

Processes:

- Students will <u>interpret data</u> to plot the locations of volcanoes.
- By plotting the locations of some volcanoes on a world map which indicates the plate boundaries, students will <u>infer</u> that volcanoes are concentrated along plate boundaries.
- Students will formulate a hypothesis regarding the locations of volcanoes.

Science Habit of Mind:

- Students will look at a matter from many sides before drawing a conclusion. Do not jump to conclusions or decide on the basis of one observation; they will deliberate and examine until they are as sure as they can be.
- They will be careful and accurate in their observations.
- They will offer reasons for their findings and consider reasons suggested by others

Other Subject Area Objectives:

- **Math** – Relate latitude and longitude as the x and y coordinates of the world.

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- To locate any place accurately on the map we need two coordinates, just like plotting points on a piece of graph paper with x and y coordinates.
- **Geography –** Understand that the earth's coordinate plane is made of latitudes that are imaginary lines to the north and south of the Equator (x-axis), and longitudes are imaginary lines running east and west of the Prime Meridian (y-axis).

Materials Needed: (Per group of 4)

- ❑ Outline of a world map showing latitude, longitude and plate boundaries – 4 copies.
- ❑ Table listing the longitude and latitude of volcanic eruptions – 2 copies.
- ❑ 4 red color pencils.
- ❑ 4 question sheets.

Session Length: This lesson will be covered in one 50 minute block.

Volcanoes

TIME	PROCEDURE	CONCEPT
Before class prep. To be done by teacher	Have a chart paper with "Questions I would like answered about Volcanoes" written at the top displayed in class. Transparency of World map with plate boundaries marked, and another transparency of the map with locations of volcanoes plotted. Copies of world map and a table with latitude and longitude locations for students.	
9:00 to 9:10	Groups and roles are clarified. Discussion about Homework: Teacher will call on some students to share what they learned about Mt. Redoubt. Tell students that different students will be called each day to share about Mt. Redoubt. Ask students to share "Questions they would like answered about volcanoes." Record them on the chart. Let students know that if some other student has already shared a question that is similar to theirs, they can come up with a different one if possible. Let students know that most of their questions will be answered during the course of this unit, and today the question about locations of volcanoes will be answered.	Community of Learners.
9:10 to 9:15	Students are told that they will be plotting the locations of volcanoes on a world map. Each group of four is split in two for this activity. Students will work in pairs – for example teacher can say that students 1 and 4 will work together and students 2 and 3 will work together. Each one in the pair will take turns to plot and read out the latitude and longitude locations. **Getters** will get all the necessary material for the group. Once the materials are collected and handed to each group, teacher does a demonstration of what each pair is expected to do. Has a student volunteer come up and using a transparency of the world map the students will have, has the student call out the first location of a volcano, teacher plots it on the world map by writing the letter "V" to indicate volcano. She then reads another location and has the student plot it on the map. She tells the class that there are 20 different locations given, so each student will take turns to plot the locations while their partner calls out and then reverse the roles.	

9:15 to 9:30	**Highlight: Students will plot the location of Mt. Redoubt, Alaska.** Teacher will observe the students at work and will have facilitating questions to direct student attention to a particular fact or to assess comprehension. <u>Facilitating questions:</u> 1. What do you notice about the locations of the volcanoes? 2. Does this remind you of something that we have done earlier? (plotting earthquake locations) 3. Why do you think most volcanoes are located near plate boundaries? 4. How can we explain some volcanoes that are located away from plate boundaries? 5. Why do you think most volcanoes are located along plate boundaries? 6. What kinds of movements occur at the boundaries? 7. How do you think this affects volcanoes? 8. Can you illustrate what happens at the boundaries? 9. What did you notice when you plotted the location of Mt. Redoubt, Alaska? 10. Does it lie near a plate boundary? <u>Connections to Math:</u> What can you compare latitudes and longitudes to? Is it the latitude or longitude that is always stated first when given the coordinates of a location? What is the difference between plotting the x and y coordinates on a graph and plotting latitudes and longitudes?	
9:30 to 9:40	They get back as a group and compare their maps, which should look identical. They discuss their observations and then the recorder and the other three members write their ideas and answers to the following questions about the locations of volcanoes? a. Are they scattered evenly over the Earth's surface? b. Are they concentrated in certain areas? c. From the map, can you infer the relationship between volcanoes and plate boundaries? d. Compare the locations of earthquakes (which you plotted in the previous unit) and volcanoes. Do you see a pattern? e. Are there volcanoes that are located away from the plate boundaries?	
9:40 to 9:45	Teacher will share the transparency with all the volcanoes located with the class.	

9:45 to 9:50	Teacher will ask what they noticed about the locations of volcanoes. Possible Response: Most of the volcanoes are located at plate boundaries. Teacher will point to the belt of volcanoes that circles the Pacific Ocean, let students know that this is called "The Ring of Fire." Teacher will ask students if they notice other belts like The Ring of Fire. Do you notice anything else? Yes, there are some volcanoes that are far away from the boundary. Teacher will then ask the students to formulate a hypothesis. <u>Possible Hypothesis</u>: Most of the world's volcanoes are located at plate boundaries. Some volcanoes are located within plate boundaries. Teacher will record this on a chart paper that will be posted next to the "What we want to know about Volcanoes?" This will help students see answers emerging for their questions each day. Questions that are answered can be checked off on the "What we want ….." chart. Teacher will pass the home work sheet. For homework students will answer the following questions: 1. Which parts of the United States is more prone to volcanic activity? 2. Should we be concerned about a volcanic eruption in Massachusetts? Why or why not? 3. What causes can be attributed to the eruption of Mt. Redoubt in Alaska? Students will file all papers in their binders. Class concludes.	Formulating a Hypothesis.

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Sample Table of Latitude and Longitude Locations of some of Earth's Volcanoes

Volcanoes	
Latitude	**Longitude**
60°N	**150°W**
35°S	**70°W**
45°N	**120°W**
15°N	**61°W**
20°N	**105°W**
0°	**75°W**
40°N	**122°W**
40°N	**30°E**
30°N	**60°E**
55°N	**160°E**
3°S	**37°E**
40°N	**145°E**
10°S	**120°E**
41°N	**14°E**
5°S	**105°E**
15°N	**35°E**
30°S	**70°W**
39°S	**175°E**
38°N	**123°E**

Students will use the table above to plot the locations of volcanoes and answer the following questions.

a. Are they scattered evenly over the Earth's surface?

b. Are they concentrated in certain areas?

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c. From the map, can you infer the relationship between volcanoes and plate boundaries?

d. Compare the locations of earthquakes (which you plotted in the previous unit) and volcanoes. Do you see a pattern?

e. Which areas in North America have the greatest risk of being affected by volcanic activity?

f. Why would knowing this information be important to city planners, engineers and builders in this area?

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Sample Homework Sheet:

Name: _____ Block: _____ Date: _____

1. Which parts of the United States is more prone to volcanic activity?

2. Should we be concerned about a volcanic eruption in Massachusetts? Why or why not?

3. What causes can be attributed to the eruption of Mt. Redoubt in Alaska?

Sample rubric for Activity 2

	Novice	Competent	Expert
Interpreting Data	Student has difficulty in plotting volcano locations using the given table.	Student is able to plot volcano locations with some initial assistance.	Student is able to plot volcano locations independently.
Open-minded, willing to change their mind in the face of reliable evidence. **Offer reasons for findings.**	Student is not able to relate the locations of volcanoes and plate boundaries. Student is unable to explain the locations of volcanoes.	. Student understands the relation between the location of volcanoes and plate boundaries. Student is able to explain the locations with some guidance.	. Student understands the relation between the location of volcanoes and plate boundaries. Student is able to explain the locations independently.
Formulating Hypotheses that Volcanoes are located along plate boundaries, but there are some exceptions.	Student is not sure how to formulate a hypothesis even with assistance.	Student is able to form a hypothesis with little guidance to infer data.	Student independently formulates the hypothesis that “most volcanoes are located along plate boundaries but there are some that are located away from plate boundaries.

Volcanoes

Day 3 – Activity 3a

How do we explain volcanoes that are located far from boundaries of continental or oceanic plates?

Relationship of this Lesson to the unit: As students have plotted the locations of volcanoes and have come to realize that there some of them are located away from the boundary of continental or oceanic plates. Given the materials students first design an activity that will help them demonstrate a "Hot Spot." By designing and demonstrating they will understand and be able to explain the formation of Hot Spot volcanoes in Earth's oceanic plates.

Massachusetts Frameworks Strand and Learning Standard: Earth and Space Science, Grades 6 – 8, Earth's History:

Learning Standard 5: Describe how the movement of the Earth's crustal plates causes both slow changes in the earth's surface (e.g., formation of mountains and ocean basins) and rapid ones (e.g., volcanic eruptions and earthquakes).

Concept:

- Some volcanoes form at "Hot Spots" away from plate boundaries.

Processes:

- Students will design and <u>model</u> "Hot Spot" volcanoes that occur at oceanic plates.

Science Habit of Mind:

- Students will be careful and accurate in their observations.

Other Subject Area Objectives: Writing

Students will learn to write good experimental procedures that are accurate, clear and easy to follow.

Materials Needed: (Per group of 4)

- ❑ Plastic shoe box.
- ❑ Cold water enough to fill half the shoe box.
- ❑ Small narrow necked bottle, small enough to submerge in the shoebox half filled with water.
- ❑ Red food coloring.
- ❑ Hot water.
- ❑ A piece of plastic foam.
- ❑ 4 Procedure recording sheets.

Volcanoes

Session Length: This lesson will be covered in two 50 minute blocks.

TIME	PROCEDURE	CONCEPT
9:00 to 9:05	Introduction: Groups and roles are clarified. Teacher will ask each group to work on presenting a two minute summary of what they had learned in the previous lesson and what they found out by answering their homework questions. Call on one group to present their summary.	
9:05 to 9:10	<u>Groups Share-</u> <u>Possible Response:</u> We learned that volcanoes are concentrated along the plate boundaries of Earth, but there are volcanoes that are away from the boundaries and these are within continental and oceanic plates. Volcanoes are concentrated along the western part of the United States. So people who live in the western part of the US will have to be very concerned about volcanic eruptions. As we live in the east coast, we don't have to be concerned. Mt. Redoubt is located at the plate boundary too. Teacher will ask if other groups would like to add to what the first group had presented. <u>Possible Additions:</u> The volcanoes belt that circles the Pacific Ocean is called The Ring of Fire. Volcanoes can actually occur at any place, so we in the east coast are not completely out of danger. Mt. Redoubt is formed because of subducting plates – the North American and the Pacific. More volcanoes are in the western part as it is very close to the North American plate boundary. Teacher will acknowledge and credit all their responses. Will let students know that the next activity will demonstrate Hot spot volcanoes in oceanic plates.	Community of Learners.
9:10 to 9:15	Open the class to discuss what a "Hot Spot" volcano is. Have students share what they know. Teacher will be prepared to start, steer and keep the discussion on topic. <u>Facilitating Questions:</u> 1. What do you think Hot Spots are? How are they formed? 2. Where are they found? 3. How do volcanoes form in the spots?	

	4. Do we know of any hot spot areas or hot spot volcanoes? 5. What can you do to find more information about hot spot volcanoes? Teacher will then tell students materials that will be available to each group to demonstrate Hot Spot Volcanoes. ❑ Plastic shoe box. ❑ Cold water enough to fill half the shoe box. ❑ Small narrow necked bottle, small enough to submerge in the shoebox half filled with water. ❑ Red food coloring. ❑ Hot water. ❑ A piece of plastic foam. Teacher can let students know that if they need anything else, they would have to let him/her know and that the teacher will try to provide it if possible. Using these materials, Students will come up with a procedure to model and demonstrate. Encourage students to refer to resources available to them, to understand and conceive a procedure. Tell students that they should have a written procedure to share with the class at the end of the block. Each group will share their procedure with the class and will make a comment, suggestion or ask a question to another group.	
9:15 to 9:30	Students work in their groups to come up with a procedure to demonstrate "Hot Spot" volcanoes that occur in an oceanic plate. Teacher will observe groups at work and spend time with each group to facilitate and understand their thinking. <u>Facilitating Questions:</u> 1. What does the plastic shoe box half full of cold water represent? 2. What does the red food coloring mixed with hot water represent? 3. What does the piece of plastic foam represent? 4. Predict what is going to happen when the capped colored hot water bottle is put into the shoe box containing cold water and released? 5. Briefly describe how this might model a hot spot volcano.	
9:30 to 9:45	Each group shares the procedure they have come up with. After every group has shared:	

	Group 2 will make a comment, a suggestion or ask a question to group 1; similarly group 3 will do so to group 2 and so on. This will ensure that every group is carefully listening and considering others point of view. **Sample Procedure written by students:** 1. Fill the plastic box with cold water. 2. Fill the small bottle with hot water, add food coloring to represent magma. 3. Dip the small bottle in the cold water in the shoe box. 4. Float the plastic foam in the water. 5. Watch what happens and take notes. **Notes:** The plastic shoebox with the cold water will represent the ocean, and the small bottle with the hot water will represent the volcano. The foam piece represents a plate. **Predict what will happen:** The hot water from the bottle will rise as hot stuff moves up. The hot water will soak through and you will see the red color spot on the foam. **Procedure that students are expected to come up with:** 1. Fill the plastic box with cold water (not all the way up to the brim), so water does not overflow. This represents the ocean. 2. Mix red food coloring with hot water in the small narrow necked bottle. This represents magma. 3. Lower the small narrow necked bottle in to the box with cold water. Make sure you close the small bottle with your finger when you lower it in to the box. The mouth of the bottle must be under water. 4. Place the plastic foam directly above the narrow necked bottle. This represents a tectonic plate. 5. Open the bottle by removing your finger. 6. Observe what happens to the magma.	
9:45 to 9:50	Students file their procedures in their binders. Any materials or resources taken will be returned. Class concludes. Teacher will tell students that they will think about the suggestion, comment or question their groups were asked, and see if they would want to alter or change anything in their procedure. I f so why they would want to do it? <u>Homework</u>: Students will come up with a definition of a “Hot Spot” and where they may be found?	

Volcanoes

Sample Procedure Sheet: **Date: _____**

Hot Spot volcanoes

Group Members: _____

_____

Materials Provided:

- ❑ Plastic shoe box.
- ❑ Cold water enough to fill half the shoe box.
- ❑ Small narrow necked bottle, small enough to submerge in the shoebox half filled with water.
- ❑ Red food coloring.
- ❑ Hot water.
- ❑ A piece of plastic foam.

Request for any additional materials:

Procedure: _____

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Volcanoes

Day 4 – Activity 3b

How do we explain volcanoes that are located far from boundaries of continental or oceanic plates?

Relationship of this Lesson to the unit: As students have plotted the locations of volcanoes and have come to realize that there some of them are located away from the boundary of continental or oceanic plates. Given the materials students first design an activity that will help them demonstrate a "Hot Spot." By designing and demonstrating they will understand and be able to explain the formation of Hot Spot volcanoes in Earth's oceanic plates.

Massachusetts Frameworks Strand and Learning Standard: Earth and Space Science, Grades 6 – 8, Earth's History:

Learning Standard 5: Describe how the movement of the Earth's crustal plates causes both slow changes in the earth's surface (e.g., formation of mountains and ocean basins) and rapid ones (e.g., volcanic eruptions and earthquakes).

Concept:

- Some volcanoes form at "Hot Spots" away from plate boundaries.

Processes:

- Students will design and <u>model</u> "Hot Spot" volcanoes that occur at oceanic plates.

Science Habit of Mind:

- Students will be careful and accurate in their observations.

Materials Needed: (Per group of 4)

- ❑ Plastic shoe box.
- ❑ Cold water enough to fill half the shoe box.
- ❑ Small narrow necked bottle, small enough to submerge in the shoebox half filled with water.
- ❑ Red food coloring.
- ❑ Hot water.
- ❑ A piece of plastic foam.
- ❑ 4 Recording sheets.

Volcanoes

TIME	PROCEDURE	CONCEPT
Advance prep. To be done by teacher	6 clear plastic shoe boxes, 1 for each group. Cold water in buckets. Set up hot plates to boil water. Red food coloring. At least 6 small narrow necked bottles.	
9:00 to 9:05	Introduction: Teacher will ask groups if they have made any alterations or changes to the procedures they had come up with the previous day. If they have, the group will explain what they are and why they are doing it. Teacher will not make any comment at this time, but will allow groups to try their procedure and figure out what changes they might want to make. Roles and groups are clarified.	
9:05 to 9:10	Getters will gather all the materials and take it to their tables. As materials are dropped off by the getter, the other group members will check to make sure they have everything they need.	
9:10 to 9:25	Students will model the procedure they have come up with. Students set up their demonstration in the middle of the table so all can observe clearly. <u>Possible mishaps:</u> • The narrow necked bottle is lowered without the mouth of the bottle being closed which results in the cold and hot water mixing or the hot water just pouring out of the bottle. • The plastic foam piece is not even in place to observe the effects of the hot water hitting it. • The level of cold water is not enough to submerge the narrow necked bottle completely. This means that students will have to try at least two or three different times before they are able to observe the hot water from the bottle rise. The plastic foam must be directly above the narrow necked bottle for the students to observe the “magma” hitting the “plate.” <u>Facilitating Questions:</u>	Model a Hot Spot Volcano Identifying and controlling variables – level of water in the box, closing the small bottle when lowering it in to the box, placing the plastic foam at the right spot to be able to

	As teacher walks around and observes the groups in action, these questions are posed to the students to help guide them in the right direction. 1. Why do we use cold water to represent the ocean? 2. How do you know that the water from the narrow necked bottle is rising? 3. Why does the hot water from the narrow necked bottle rise? 4. Can we make the hot water rise more rapidly? How? 5. What do you think will happen if the bottle is corked, and we are able to increase the temperature of the water in the bottle? Why? 6. What will happen when the plate keeps moving over many years? 7. Did your predictions come true? 8. If it did not, do you understand why? What are your thoughts now? 9. What do you think will happen if there is a continental plate over the hot spot? 10. Can you think of a way to simulate a hot spot in the middle of a continental plate?	observe.
9:25 to 9:40	Groups share their experiences, ▪ What went well and what did not. ▪ What part of their procedure they had to change or alter ▪ Did their predictions come true? ▪ Were they wrong about something? ▪ If they were what changes have they made in their thinking to correct their ideas? ▪ Did they learn something that had no idea about? Groups will also share their definitions of “Hot Spots” which was their homework.	Community of Learners.
9:40 to 9:45	Teacher explains that she would like the students to rewrite their procedure to reflect what they had actually done this day. The second part is for students to write how this activity mirrors a volcano forming at a hot spot.	
9:45 to 9:50	Getters return all the materials back to its place. Tables are cleaned up, any water spill is mopped and the class is ready for the next block to come and repeat the procedure.	

Volcanoes

Sample Homework Sheet:

Name: _____ Block: _____ Date: _____

"Hot Spot" Volcanoes in a Box – Procedure

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If I had Time:

I would include this activity as part of activities in Lesson 3a and 3b, when students learn about "Hot Spot" volcanoes.

This is an activity that students could do to simulate the mapping of an ocean floor. This activity will help students understand how experiments are conducted to study the depths, other landforms that may be found in the ocean floor. Students will also understand that this will help researchers and scientists identify trenches, ridges or even mountains in the ocean.

Materials Needed:

Passport motion sensor

Xplorer GLX

Stacks of books and other objects that could be used to simulate the ups and downs of the ocean floor.

Procedure:

The motion sensor will be plugged into the Xplorer GLX, which will the record the heights of objects found. So the higher objects are from the ocean floor, the depth is less and vice versa. So the resulting graph will look like it is upside down, which will have to be explained to the students.

Volcanoes

Name: _____ Block: _____ Date: _____

How does the “Hot Spot” in a box reflect the formation of “Hot Spot” Volcanoes? Illustrate your answer.

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Volcanoes

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Sample rubric for Activity 3a and 3b

	Novice	Competent	Expert
Modeling **Identifying and Controlling variables**	Student is able to model with assistance. Student is not able to identify any variable.	Student is able to model with little assistance. Student identifies 2 to 3 variables.	Student is able to model without any assistance. Student identifies all variables.
Careful and Accurate observations	Student keeps some records of what was observed. Student is not able to explain observations.	. Student keeps good record of what was observed. Student is able to explain observations with some assistance.	. Student keeps good record of what was observed. Student is able to explain observations and infer from observations.
Some Volcanoes form at Hot Spots way from plate boundaries.	Student is unsure of what hot spots are and how they are formed.	Student is able to say explain what hot spots are and how they are formed.	Student is able to say explain what hot spots are and how they are formed. Student is able to explain what happens to volcanoes over a long period of time when plates keep moving.

Day 5 – Activity 4

Anatomy of a Volcano

Relationship of this Lesson to the unit: Students have located volcanoes around the world and have understood that volcanoes occur mostly at plate boundaries, subduction zones and hot spots. The will now explore what the inside of a volcano looks like, which will help to understand the working of a volcano.

Massachusetts Frameworks Strand and Learning Standard: Earth and Space Science, Grades 6 – 8, Earth's History:

Learning Standard 5: Describe how the movement of the Earth's crustal plates causes both slow changes in the earth's surface (e.g., formation of mountains and ocean basins) and rapid ones (e.g., volcanic eruptions and earthquakes).

Concept:

- Describe the movement of magma inside a volcano.

Processes:

- Students <u>model</u> the inside of a volcano and understand the movement of magma by piecing together a puzzle and tracing the movement of magma inside a volcano during an eruption.

Science Habit of Mind:

- Students will go to reliable sources for evidence, be open-minded and willing to change their minds in the face of reliable evidence.

Other Subject Area Objectives: Visual Arts

Students will create a complete picture of the inside of a volcano by piecing together pieces of a puzzle.

Materials Needed: (Per group of 4)

- ❑ 4 - Puzzle pieces in a bag for each student
- ❑ 4 - Card stock paper to glue the pieces of the puzzle together.
- ❑ A sheet with labels for the puzzle. (Vocabulary- crater, vent, side vent, magma chamber, magma, lava, pipe)
- ❑ 4 - Glue sticks
- ❑ 4 – scissors
- ❑ Drawing paper
- ❑ Movement of magma – Description sheet

Volcanoes

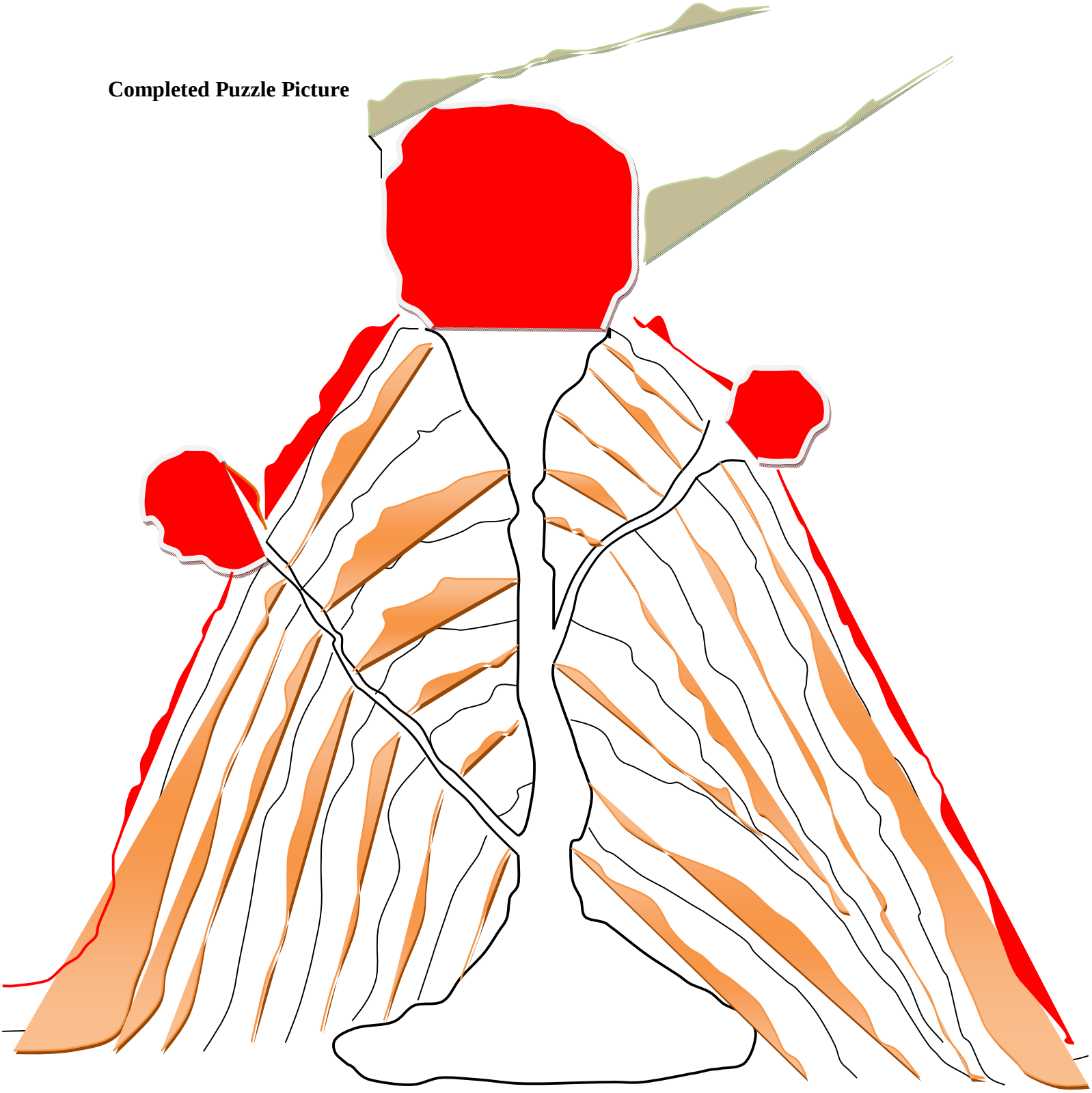
Session Length: This lesson will be covered in one 50 minute block.

TIME	PROCEDURE	CONCEPT
Before class prep.	Teacher will have to make copies of the completed puzzle on oak tag paper and cut it out so students can piece them together. Have copies of the vocabulary words for every student, or at least two copies per group.	Brainstorming.
9:00 to 9:10	Introduction: Groups and roles are verified. Getters will get the materials for their group. Teacher will let them know that students will not take the puzzle pieces until instructed to do so. Students have now learned the locations of volcanoes; how they form and why. In this activity, students will learn the anatomy of a volcano which will help them understand the working of a volcano. Teacher will tell students that they will be piecing together a puzzle by which they will be able to see what the inside of a volcano looks like. Ask students if it is possible to go inside a volcano to see what it looks like? Since it is impossible have students brainstorm ideas of how one can learn what the inside looks like. Let students know that some of the very old volcanoes have eroded over a long period of time and have been exposed, which has helped geologists to examine them which has supported theories about the earth's interior. Teacher will let students know that they are going to be given pieces of a puzzle to piece together to see what the inside of a volcano looks like. But before that they will draw a picture of what they think it will look like. They will then compare their drawing to the finished puzzle.	
9:10 to 9:15	Have students draw what they think the inside of a volcano looks like. Students will label what they have drawn. Teacher will not make any comments about any of the labels students have come up with.	
9:15 to 9:20	Teacher will call on students and have them describe their drawing and have them explain why they think the inside looks that way.	

9:20 to 9:35	Students will work individually to piece together the puzzle. Have students glue the completed puzzle on to the card stock paper provided. One the puzzle is complete, students will label it using the word list given to them. Encourage students to refer to resources provided to figure out the parts that make a volcano. Ask students to compare their original drawing to the completed puzzle. Have them tell the others in their group what they had predicted correctly and what they hadn't.	
9:35 to 9:45	Have students make another sketch of the inside of a volcano and describe the movement of lava during an eruption on their description sheet. Teacher will observe students and guide them with the following questions. <u>Facilitating Questions:</u> 1. What is magma? 2. Where do you think magma comes from? 3. How does the magma rise? 4. How does the magma flow out of a volcano? 5. When do you think magma will be blown out of a volcano? 6. When magma reaches the surface it is called _____? 7. Why would magma flow to a side vent? 8. What factors might affect an eruption being explosive or quiet?	
9:45 to 9:50	All materials – scissors, glue sticks, any extra cardstock paper is returned. Any scrap pieces of paper is put in the recycle bin. Clean up is followed by students submitting their finished puzzles and their description sheet to the teacher. Teacher will assess student understanding based on these two artifacts.	

Volcanoes

Completed Puzzle Picture



Volcanoes

<u>Labels:</u> Magma chamber, Ash cloud, Magma, Lava, Pipe, Vent, Side vent,

Crater, Lava flow

Sample Description Sheet:

Imagine what the inside of a volcano looks like. Make a sketch in box 1. Label your sketch. After you complete the puzzle draw a sketch of what the inside of a volcano looks like. Trace the movement of magma during an eruption.

1.

2.

Briefly compare your sketches in Box 1 and Box 2.

Describe the movement of magma during an eruption.

Volcanoes

	Novice	Competent	Expert
Model the inside of a volcano and trace the movement of magma during an eruption.	Student is able to model and label with assistance.	Student is able to model and label with little assistance.	Student is able to model and label without any assistance.
Be able to explain using reliable evidence	Student is not able to explain the movement of magma inside a volcano during an eruption.	Student is able to explain the movement of magma inside a volcano during an eruption with some assistance.	Student is able to explain the movement of magma inside a volcano during an eruption with good reasoning.
Describe the movement of magma inside a volcano during an eruption.	Student shows poor understanding of why magma rises, and the path it takes to reach Earth's surface during an eruption.	Student shows some understanding of why magma rises, and the path it takes to reach Earth's surface during an eruption.	Student shows good understanding of why magma rises, and the path it takes to reach Earth's surface during an eruption.

Day 6 – Activity 5

Why magma rises and how it reaches the Earth's surface?

Relationship of this Lesson to the unit: Students just learned about the anatomy of a volcano and traced the movement of magma inside a volcano. Now they will model why magma rises and how it reaches the earth's surface.

Massachusetts Frameworks Strand and Learning Standard: Earth and Space Science, Grades 6 – 8, Earth's History:

Learning Standard 5: Describe how the movement of the Earth's crustal plates causes both slow changes in the earth's surface (e.g., formation of mountains and ocean basins) and rapid ones (e.g., volcanic eruptions and earthquakes).

Concept:

- Gases in the magma make it rise and reach the earth's surface.

Processes:

- Students will design and <u>model</u> gas bubbles in a volcanic eruption, to see how they carry the magma up to the Earth's surface.

Science Habit of Mind:

- Students will be careful and accurate in their observations.
- Keep records of investigations and observations.
- Offer reasons for their findings and relate it to the actual eruption of a volcano.

Other Subject Area Objectives:

Materials Needed: (Per group of 4)

- ❑ One clear capped plastic bottle of soda water
- ❑ 4 hand lenses
- ❑ 1 funnel
- ❑ 4 Safety goggles
- ❑ 6 tsp. of baking soda
- ❑ A small box of raisins
- ❑ A small beaker of vinegar
- ❑ A small bottle of water
- ❑ Paper towels
- ❑ 4 Recording sheets

Volcanoes

Session Length: This lesson will be covered in one 50 minute block.

TIME	PROCEDURE	CONCEPT
Before class prep.	Teacher will get ready a tray with the following items for each group of four. Soda bottle, baking soda in a dish, vinegar in a beaker, a small box of raisins, a funnel, hand lenses and safety goggles. Have copies of the recording sheet.	
9:00 to 9:10	Groups and roles are verified. Getters will get the tray of materials for their group and the recording sheets. Teacher will tell students that they are not to do anything yet. Teacher will tell students that they have learned what the inside of a volcano looks like and they have traced the movement of magma during an eruption. Question for the day is – Why does magma rise? How does it reach the Earth's surface? Possible responses given by students and follow up questions asked by the *teacher:* Magma is hot, and hot things rise. *Hotter than what?* May be the surrounding parts…. Magma is less dense. When it is less dense it rises to the top. *Less dense than what?* The air… I'm not sure. *Let's see, what is magma?* It is molten rock. *So you think rocks are less dense than air? Throw a rock in the air and will it float?* Magma rises because pressure builds up and this makes the magma rise. Teacher will acknowledge all answers without comment or corrections at this time.	Brainstorming.
9:10 to 9: 30	Ask students to now observe the capped soda bottle. Ask them what they see. Students may use the hand lenses to observe. Some may report they see bubbles on the side of the bottle. Have students explain what will happen what might happen when they slowly open the bottle. <u>Possible responses:</u> We'll hear a noise. We'll release pressure. There will be lots of bubbles that come up. Soda may overflow from the bottle.	

	Bubbles will move up from the bottom of the bottle. Isn't there supposed to be carbon dioxide in the soda? Have students open the bottle carefully and slowly. Accidents may happen. Let students observe the soda bottle. <u>Ask students to think about:</u> Why they might hear the noise? Where are the bubbles coming from? Why are they moving up? What will happen when the bottle has been open for a long period of time? Have students think how this relates to volcanic activity and fill out the first part of the recording sheet. Tell students that for the next activity they will mix the baking soda with the water and then add about 5 or 6 raisins. They will swirl the mixture as they carefully add vinegar. Tell students to observe and think about the following: What happened when you added the vinegar? What happened to the raisins? <u>Facilitating Questions:</u> 1. What happened when you added the vinegar? 2. What do the bubbles represent? 3. What do the raisins represent? 4. How is this model similar to a volcano and how is it different? 5. Would it make a difference if you did the same experiment in a narrow necked bottle?	
9:30 to 9:40	After completing the activity and observing, they will fill out the second part of the recording sheet.	
9:40 to 9:45	All materials are returned. Students empty the soda water in the sink; any spills are wiped and cleaned.	
9:45 to 9:50	Students get their homework sheet, file their observations in their binders and prepare to get to their next class. Their homework is for them to draw a cartoon of the activity they did in class and write how it is similar to volcanic activity.	

Volcanoes

Sample Recording Sheet:

Observing a Soda Water Bottle

Draw a sketch to show the soda bottle when it is closed. Then make a sketch to show what happened when you opened the soda bottle slowly. Describe your observations.

How does this compare to volcanic activity?

Volcanoes

Sample Recording Sheet:

Modeling Volcanic Activity

1. What happened when the vinegar was added?

2. What did the gas bubbles and raisins represent?

3. Compare and contrast this activity to a volcanic eruption.

Volcanoes

Sample Home Work Sheet:

Use the boxes to draw a cartoon showing how and why magma erupts from a volcano. Use the lines to describe what is happening in the boxes.

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Volcanoes

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	Novice	Competent	Expert
Model a volcanic eruption	Student is able to model with some assistance.	Student is able to model independently.	Student is able to model independently and is able to relate it To actual volcanic activity.
Be careful and accurate in their observations	Student's observations and records are not accurate.	Most of student's observations and records are accurate.	All of student's observations and records are accurate.
Student is able to explain why and how magma rises to earth's surface	Student shows poor understanding of how why magma rises during an eruption. Is not able to compare and contrast the activity to an actual eruption.	Student shows some understanding of how and why magma rises during an eruption. Is able to compare and contrast the activity to an actual eruption.	Student shows good understanding of how and why magma rises during an eruption. Is able to compare and contrast the activity to an actual eruption with very good detail and understanding.

Day 15 – Activity 15

Are volcanoes only destructive?

Relationship of this Lesson to the unit: Students most of the time think of volcanoes as only destructive as they have probably seen in documentaries, news clippings or even movies and they are unaware of the constructive effects of volcanoes. In this first activity, students get to see other aspects of volcanoes (constructive effects) which will shed new light and help alleviate the commonly held misconception that volcanoes are only destructive.

Massachusetts Frameworks Strand and Learning Standard: Earth and Space Science, Grades 6 – 8, Earth's History:

Learning Standard 5: Describe how the movement of the Earth's crustal plates causes both slow changes in the earth's surface (e.g., formation of mountains and ocean basins) and rapid ones (e.g., volcanic eruptions and earthquakes).

Concept:

- Volcanic eruptions can be both constructive and destructive.

Processes:

- Classifying the effects of volcanoes as constructive or destructive.

Science Habit of Mind:

- Students will be open-minded and willing to change their mind if they are have reliable evidence and respect each other's point of view.
- Students will look at volcanic eruptions from many different sides before drawing a conclusion.
- Students will be curious, careful and accurate in their observations.

Other Subject Area Objectives: Technology and Design

Have students design specifications for building in volcano prone areas.

Materials Needed: (Per group of 4)

- ❑ 4 Recording Sheets

Session Length: This lesson will be covered in one 50 minute block

Volcanoes

TIME	PROCEDURE	CONCEPT
Teacher prep. Before class	Teacher will have a Video player, a TV monitor and the two videos: NOVA: In the Path of a Killer Volcano Newton's Apple: Geothermal Energy Teacher will preview the video and select the portion that students will watch.	
9:00 to 9:10	Introduction: Teacher will ask the class about some possible effects of volcanoes and volcanic eruptions. <u>Possible student responses:</u> • Fire • Death • Heat • Earthquakes • Rivers of lava burning everything in its path • Poisonous gases • Rocks being blown • Ash falling	Brainstorming
	Teacher sums it up as volcanoes being very destructive. Then she asks the class if they think there are any constructive effects of volcanoes? Most of the students say that it is destructive. Some students are quiet and thoughtful, so teacher calls on couple of students whom she hasn't heard from. <u>Possible student response:</u> I'm not sure, may be they have some uses. <u>Teacher response:</u> Asks student if he/she can think of any advantages of volcanic eruption or activity. Student is still unsure – Or <u>Student</u> may say that they have heard that volcanic material is fertile and supports farming. May be we can use the heat from the volcanoes for something. <u>Teacher response:</u> Do you think that is possible? The volcanic material is going to be so hot. <u>Student response:</u> Well it will cool down. <u>Teacher response:</u> So you think that after it cools down it becomes fertile and supports plant life?	Community of learners.

	<u>Student:</u> Yeah, something like that. <u>Teacher:</u> What do you think the enormous heat produced can be used for? <u>Student:</u> Well we use solar energy for so many things, so maybe we can use the volcanic heat for something. This conversation has made other students rethink their initial answer. Teacher will acknowledge all the ideas put forth by the students, encouraging them to voice their prior knowledge, thoughts and ideas without giving away much as students are going to be watching the two videos which will be an eye opener in many ways. Teacher then tells the students that they will be watching a portion of two videos: NOVA: In the Path of a Killer Volcano Newton's Apple: Geothermal Energy Students are told that the first video shows them the volcanic eruption of Mt. Pinatubo in the Philippines, and how scientists and volcanologists study, monitor and try to forecast the eruption of Mt. Pinatubo. And that the second video talks about using geothermal energy. Teacher does not elaborate what geothermal energy is at this time.	
9:10 to 9:20	Students will watch the portion of the video that has been previewed and selected by the teacher, keeping in mind that they will report about the effects of volcanoes after they have viewed the video.	Observations.
9:20 to 9:25	Groups are invited to share their ideas with the class. Teacher will record the effects reported by the students.	Reporting
9:25 to 9:35	Students then watch the second video *Geothermal Energy*. They are asked to think about how this video compares to the one they had watched the previously. They are again asked to think about the effects of volcanoes.	Observations
9:35 to 9:40	Groups are invited to share their ideas with the class. Teacher will record the effects reported by the students.	Reporting
9:40 to 9:48	Students are asked to pick any two effects they listed from each of the videos they have seen, classify them as destructive or constructive and explain why they are either destructive or constructive. If they do not get to finish it, they can complete it for homework. Teacher hands out their homework.	Classifying

9:48 to 9:50	Homework for that night is for students to research and write about two short term and two long term effects of the recent eruption Mt. Redoubt in Alaska.	Application

Sample Recording Sheet

List two effects of volcanoes from each of the videos you saw in class today and classify them as destructive or constructive.

Destructive Effects	Constructive Effects
1. Reason:	1. Reason:
2. Reason:	2. Reason:

Volcanoes

Sample Home Work Sheet

List and explain two long term and two short term effects of the recent eruption of Mt. Redoubt in Alaska. Classify them as destructive or constructive.

Reflection for the Unit:

As I reflect on the planning of this unit, I feel I need to make some of the activities more Inquiry based, like the activity “Why does Magma Rise?” I would like students to come up with what they would do to demonstrate this. For the students to be able to do this, I will have to spend more time on getting them to understand the working of a volcano.

I would definitely include an activity to demonstrate different kinds of eruptions and lava flows. This will help the students to visualize the formation of different kinds of landforms that result from volcanic eruptions.

I also found myself doing the plan for an activity, and then having to go and change something else in a previous activity or something I had written earlier, thus having to alter, change or adjust time allotted, or something in the activity, facilitating questions and so on. This was the most difficult part, as one change led to a series of changes in several activities.

Students will be given more time to read picture books, other books about volcanoes, or be given access to computer labs to do some research, view the animations of different volcanic activities as when they may need to reinforce their understanding.

Revisions for the Unit:

I might want to change the order of activities in this unit, depending on students’ prior knowledge and what they have learned in the unit before and where they go from this unit. I would also have students self assess more periodically as this will be a great source of feed back to me as a teacher.