Mount St Helens National Volcanic Monument – Teacher's Corner 2008
Gifford Pinchot National Forest
USDA Forest Service

The Case of the Big Blast

Outdoor Activity

Time Commitment:	30 to 45 minutes
Site:	Johnston Ridge Observatory
Location:	The Eruption Trail

The purpose of this activity is to familiarize students with characteristics of the May 18, 1980 eruption. Through small group exploration, students will observe, and identify landscape features, then develop models about the composition of the lateral blast. Students will be better served if they watch the movie and review the exhibits in the Johnston Ridge Observatory before conducting this activity.

Goal:

The student will understand the factors that affected the composition of the lateral blast and its impact to the landscape.

Objectives:

1) The student will use the scientific process to deduce a reasonable explanation.
2) The student will compare, contrast and sort observations.
3) The student will reach a conclusion and be able to support it with evidence in writing.
4) Students will abide by all monument regulations while on the trail.

Washington Essential Academic Learning Requirements

1.1.2 Motion of Objects
Understand the relative position and motion of objects.

- Describe the motion of an object in terms of distance, time, and direction as the object travels in a straight line.

1.1.5 Nature and Properties of Earth Materials
Understand physical properties of Earth materials including rocks, soil, water and air.

- Describe and sort rocks based on physical properties.

1.2.1 Structure of Physical Earth/Space and Living Systems
Analyze how the parts of a system go together and how these parts depend on each other.

- Identify parts of a system and how the parts go together.
- Describe the effect on a system when an input in the system is changed.

1.2.4 Components and Patterns of Earth Systems
Understand the Earth's systems include a mostly solid interior, landforms, bodies of water, and an atmosphere.

- Identify and describe various landmasses, bodies of water, and landforms.

1.3.1 Nature of Force
Understand forces in terms of strength and direction.

- Compare the strength of one force to the strength of another force.

1.3.2 Forces to Explain Motion
Understand how balanced and unbalanced forces can change the motion of objects.

- Investigate and report how the position and motion of objects can be changed by a force.
- Investigate and report how a larger force acting on an object causes a greater change in motion of that object.

1.3.3 Conservation of Matter and Energy
Understand that a substance remains the same substance when changing state.
Understand that two or more substances can react to become new substances.

- Observe and describe how a substance is the same substance before and after heating and cooling.

1.3.4 Processes and Interactions in the Earth's system
Know processes that change the surface of the Earth.

- Describe how earthquakes, landslides, and volcanic eruptions change the surface of the Earth.

2.1.3 Limitations of Science and Technology
Understand how to construct a reasonable explanation using evidence.

- Generate a scientific conclusion including supporting data from an investigation.
- Describe a reason for a given conclusion using evidence from an investigation. Generate a scientific explanation of observed phenomena using given data.

2.2.5 Evolution of Scientific Ideas
Understand that scientific comprehension of systems increases through inquiry.

- Describe how scientific inquiry results in facts, unexpected findings, ideas, evidence, and explanations.
- Describe how results of scientific inquiry may change our understanding of the systems of the natural and constructed world.

The Case of the Big Blast

Outdoor Activity

Mission:

Use the 'case facts' and evidence along the trail to answer the questions. Use your answers to determine which explanation is best.

Possible Explanations:

1. The lateral blast was composed of hot gas, ash, and rocks.
2. The lateral blast was composed of hot gas, ash, rock and wood.

Case Facts:

A. Mount St. Helens has erupted basalt lava (black or red rocks), andesite lava (dark gray rocks) and dacite (light gray rocks).
B. An old-growth forest grew on top of this ridge before the May 18, 1980 eruption of Mount St. Helens.
C. Dacite magma pushed the north side of Mount St. Helens out sideways about 500ft between March 20 and May 17, 1980.
D. On May 18, 1980, the north side of the volcano collapsed and caused an explosion to burst out sideways.
E. The sideways explosion or lateral blast traveled 300 mph to 500 mph.

Stop at a spot where you see many large rocks along the side of the trail.

1) Molten rock is like soda because gas is dissolved in liquid. What happens if you shake a soda bottle to build up gas pressure and then open it?

_____

a) What might happen to gas-rich dacite magma if it was suddenly released from the same type of pressure?

_____

_____

b) Could gas make rocks fly as fast as jets?

_____

_____

c) Find a light gray rock. What kind of rock is it and how did it get here?

_____

_____

Stop at a spot where you can see a stump or log.

2) When gas bubbles in magma expand quickly, molten rock is broken into tiny pieces called ash. Can you see ash on the stump or log?

_____

a) Based on the size of the stump or log do you think the trees were small, medium or large? _____

b) Describe what's missing from the tree and where you think it went?

_____

_____

Conclusion:

I think that explanation is best (circle)

1) The lateral blast was composed of hot gas, ash, and rocks.
2) The lateral blast was composed of hot gas, ash, rock and wood.

In complete sentences, explain the evidence you used to support your conclusion or reach a different conclusion.

_____

_____

Answer Sheet for 'The Big Blast'

Outdoor Activity

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Case Facts:

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E. The sideways explosion or lateral blast traveled 300 mph to 500 mph.

Stop at a spot where you see many large rocks along the side of the trail.

1) Molten rock is like soda because gas is dissolved in liquid. What happens if you shake a soda bottle to build up gas pressure and then open it?

Gas bubbles rapidly expand as they are released pressure and cause soda to spray out of the top of the bottle.

a) What might happen to gas-rich dacite magma if it was suddenly released from the same type of pressure?

When gas bubbles in dacite magma expand rapidly molten rock is broken apart into large and tiny pieces, and the volcano to explodes violently.

b) Could gas make rocks fly as fast as jets?

Yes! New and old rocks burst out of the side of Mount St. Helens at speeds of 300 mph to 500 mph. Commercial jetliners fly at speeds of 500 mph hour.

c) Find a light gray rock. What kind of rock is it and how did it get here?

They are dacite lava rocks. Some of the dacite rocks are from old eruptions of Mount St. Helens, while others are pieces of the molten rock that pushed into the north side of the volcano in 1980.

Stop at a spot where you can see a stump or log.

2) When gas bubbles in magma expand quickly molten rock is broken into tiny pieces called ash. Can you see ash on the stump or log?

There is ash embedded in the splintered stumps and within the cracks and crevices of the large logs. The lateral blast deposit on Johnston Ridge is one to eight feet deep!

a) Based on the size of the stump or log do you think the trees were small, medium or large? *These were large old growth trees.*

b) Describe what's missing from the tree and where you think it went?

The lateral blast stripped needles, branches and bark from the trees, and shattered the trunks into tiny pieces. Needles, branches, bark, and pieces of wood from the tree trunks are not visible here so they must have been carried away by the blast.

Conclusion:

I think that explanation is best (circle)

1) The lateral blast was composed of hot gas, ash, and rocks.
2) The lateral blast was composed of hot gas, ash, rock and wood.

In complete sentences, explain the evidence you used to support your conclusion or reach a different conclusion.

Both answers are acceptable. However, answer number two is more accurate at Johnston Ridge. The lateral blast began as a cloud of hot gas, ash and rock as it burst out of the north side of the volcano, but transformed rapidly as it shattered the forest in its pathway. Scientists estimate that the blast cloud doubled in volume the first five miles it traveled by consuming the forest in its path.

This bulldozer is located on the ridge behind Johnston Ridge. Note the large chunks of tree trunks and smaller pieces of wood lodged in the operator's protective gage.

Instructional Sequence for "The Case of the Big Blast"

1. Send a chaperone up the eruption trail ahead of the group and have the adult stop at the first interpretive sign on the right side of the trail. Make sure the adult is standing next to the sign and is clearly visible to the students at the trailhead. The adult's role will be to orient students to a maximum distance to travel before stopping.

2. Gather students at the trailhead, located on the outdoor viewing plaza at the Johnston Ridge Observatory. Divide students into groups of five and assign one chaperone to assist each student group. Explain that the students will need a pencil, "*The Case of the Big Blast*" worksheet and clipboard or notebook to write on.

    a) Explain that the area around them was forested prior to the May 18, 1980 eruption, and that this ridge was scoured and buried by the lateral blast.

    b) Explain the importance of staying on trail at all times. It has taken over 28 years for plant life to get a foothold on this ridge. **Hiking in this area is a privilege and that student behavior will determine if future groups will be able to use this site.** Students will be examining rocks and shattered tree stumps, but they are **not to get off the paved trail or collect, ash, rocks, wood or plants.**

2. Point to the chaperone standing next to the interpretive sign (see picture below) and explain that the students are not to proceed beyond that point. Students will present their conclusions to the group where the adult is stationed.

The best examples of stumps and logs for questions 2a-b are located near the interpretive sign--100 feet before it.

The best examples of large rocks for question 1a-c are located along this section of the trail.

3. Point out the best areas along the trail to answer questions 1 & 2. Explain that the student groups will need to spread out along the trail and that the 'case facts' will be critical to answering the questions. Allow the students 15 to 20-minutes to make observations, answer the questions, and to answer the concluding question. Move between groups and assist where needed.

4. Gather students by the interpretive sign and review answers to the concluding question. Return to the visitor center or continue on the eruption trail to the parking lot. If returning to the parking lot use your chaperones to safely direct students across the parking lot to the busses.