Forecasting Volcanic Eruption
Summative Evaluation

Lila Azouz/ ID: 5933501

Assignment 2
Concordia University – ETEC 636
Professor Claude Martel
October 20, 2011
Objectives — Module C / Volcano

Summative evaluation strategy designed for the following population

Target Audience: Quebec Secondary III Students (Grade 9) / Age 14-15

Education Program: Science and Technology (General Education Path)

Sub-category: The Earth and Space

Course: Geological and Geophysical Phenomena

In-class Exam: 60%
Presentation: 40%  
Total 100%  
Graded by the instructor or teacher of the course

Table 1: List of objectives in relation to Bloom’s taxonomy, materials and question types

<table>
<thead>
<tr>
<th>Objective</th>
<th>Bloom’s Taxonomy</th>
<th>Material</th>
<th>Question Type</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective 1: Explain what volcanoes are, how they form, and the rocks they create</td>
<td>Knowledge, Comprehension</td>
<td>1</td>
<td>Open Ended, Association</td>
<td>16 major content elements (either create 16 questions or combination questions) Section 1 (18%) &amp; 2 (10%) in exam</td>
</tr>
<tr>
<td>Objective 2: Identify several types of volcanic eruptions and explain their characteristics</td>
<td>Knowledge, Comprehension</td>
<td>2, 3</td>
<td>Recognition, Open Ended, Association</td>
<td>5 types of volcanoes + 6-12 characteristics (divide 40/60 between knowledge and comprehension) Section 3 in exam (32%)</td>
</tr>
<tr>
<td>Objective 3: Explain the importance of forecasting volcanic eruptions</td>
<td>Knowledge, Comprehension, Application</td>
<td>3, 4, 5</td>
<td>Open Ended, Case Study (Scenario)</td>
<td>Student should list at least 3 reasons Section 4 in exam (16%)</td>
</tr>
<tr>
<td>Objective 4: Explain the different forecasting methods used to predict volcanic eruptions</td>
<td>Knowledge, Comprehension, Application</td>
<td>4, 5</td>
<td>Open Ended, Case Study (scenario)</td>
<td>3 major forecasting methods Section 5 in exam (24%)</td>
</tr>
</tbody>
</table>

Table 2: Material’s List

Materials used for course preparation and evaluation:

1. Introduction to Volcanism (website) ➔ USED AS IS
   http://www.teachersdomain.org/ext/ess05_int_volcanintro/index.htm

2. Types of volcanic eruption (website) ➔ MODIFIED

3. Volcanic Hazards & Benefits (PDF) ➔ USED BY TEACHER TO PRESENT CONTENT

4. Mount Pinatubo: Predicting a Volcanic Eruption (video) ➔ USED AS IS
   http://www.teachersdomain.org/asset/ess05_vid_pinatubo/

5. Forecasting volcanic eruptions (PDF) ➔ MODIFIED
Summative Evaluation Strategy

Background
This module on volcanoes will be taught in 3-4 classes of 1 hour each within the Geological and Geophysical Phenomena course in Secondary 3 under the Science and Technology program within Quebec high schools. Students will have already learned about tectonic plates and orogenesis prior to starting this module. They will learn how volcanoes form, the types of volcanoes, the rocks associated, the types of volcanic eruption and their characteristics, the basic monitoring techniques and why it is important to forecast.

Strategy for Evaluating
I chose to focus on secondary three students because I felt that the objectives provided were suitable for that grade and most of the exam questions will be focusing on the lower level thinking skills within Bloom’s taxonomy: knowledge and comprehension. Some questions may be geared towards application.

I would like to structure this evaluation in two parts, a written exam and an oral presentation that will be conducted after completing the module. The written exam will deal with all the knowledge and comprehension levels, while the oral presentation will require students to use some higher order thinking skills such as application and analysis. By using these two methods, I hope to achieve a well-balanced evaluation strategy that will show how well students understand the content and test their ability to communicate the concepts. This will also enable student’s with different learning styles to demonstrate their knowledge and provide multiple sources of data.

Both the in-class exam and presentation will be valued at 100% total. The exam itself is graded on 100% but it will only be worth 60% of the final grade. The presentation will be valued at 40% to make it a total of 100% for the entire module. The teacher will be correcting all the material and evaluating the presentation.

In-class End of Module Exam

At the end of the module the students will be required to complete a written exam on Forecasting Volcanic Eruptions. Table 1 is used to breakdown each objective and the question style that will be used. Building this table provided me with an overview of the main elements to consider while writing my summative evaluation. I chose to focus mostly on open-ended question and association questions as they fit well the lower of Bloom’s taxonomy. I avoided multiple choice and true or false questions as they may be too easy for the students to guess and I wanted to ensure that the foundational knowledge on volcanoes was learned. In objective three I want to include a case study or scenario for the students to read and have them determine why they think it is important to forecast and predict volcanic eruptions, which is geared toward the affective domain.

I will determine the hierarchy of the content in relation to Bloom’s taxonomy in order to assign the grading scheme. I want to ensure a balance between the amount of content to be assessed and the level of the knowledge. As both knowledge and comprehension are on the lower levels of Bloom’s taxonomy, I will not make too much of a distinction in terms of value given to the questions. For the knowledge questions, points will be allocated based on the amount of content that was correctly answered. For the comprehension questions, points will be given on the bases of how much they understood and whether they were able to provide sufficient information to back up their statements.
List of Assessment Material to be created
- A written exam for the student
- An answer sheet for the teacher

Classroom Presentation – A Volcanic Eruption in History: What happened?

The students will be required to choose from the list of examples of volcanic eruptions on the Wikipedia site and complete a 10 minute presentation. They will be required to answer a series of questions and use all of the course material to help them prepare their assignment. They must explain the type of volcano, the types of rocks that formed in or around that volcano, how and why it erupted, how was the biggest eruption predicted (if no information is provided, they can hypothesize what tools they should have used to predict the volcanic eruptions) and what was the outcome of this volcano (on the landscape, on the people, or town). They must tell a story to the class and not just spill out facts. They can use visual aids to support their narration.

A rubric will be created in order to help the teacher properly evaluate the presentation. It will focus on whether the student met the learning objectives and on presentation style.

List of Assessment Material to be created
- Presentation Handout with instructions and grading criteria
- Teacher grading rubric sheet according to a 4 point descriptive scale

Strategy for using Materials
The “Forecasting Volcanic Eruptions” article is too advanced for these high school students; therefore the basic concepts regarding this subject will be extracted to create a Power Point presentation that the teacher will present to the class. In addition to this presentation, a handout will be provided summarizing the key points regarding the types of tools used to forecast and the key elements to look for in order to determine whether an eruption will occur.

The Wikipedia website on “Types of volcanic eruption” is full of complex information that is irrelevant to the objectives. A document and activity sheet will be created to highlight the five magmatic eruptions (Hawaiian, Strombolian, Vulcanian, Peléan, Plinian) and the characteristics of each. Images from this wiki site will be incorporated to demonstrate the different characteristics of each type of eruption. The section on Phreatomagmatic eruptions will be omitted as is goes beyond the knowledge required. The focus will be kept to surface volcanoes. However, students will be asked to do research on this site for the presentation project.

The three others materials can be used as is. The video can be presented in class in conjunction with the “Forecasting Volcanic Eruptions” content. The content from the “Introduction to Volcanism” website can be taught in class and an activity on this website can be created as homework for the students. The “Volcanic Hazards & Benefits” document will be used by the teacher to present the key elements but will not be handed out to the students as it does not work well for the course as it discusses issues relating to another course which could cause confusion.
Volcanoes are powerful and dynamic visible forces of the earth! Volcanic eruptions can be an amazing phenomenon but can also cause a lot of destruction. We need to understand volcanoes to be able to predict when they erupt.

You have learned a lot about volcanoes. Now it is time to put your knowledge to the test. Please read each question carefully and do your best to answer them.

Section 1: What is a Volcano?

1. What is the difference between a dormant and extinct Volcano?

______________________________________________________________________________________
______________________________________________________________________________________

2. How do you know when a volcano is active? Explain?

______________________________________________________________________________________
______________________________________________________________________________________

3. Name the four possible elements that can erupt from a volcano? Please write your answer below.
   a. ___________________
   b. ___________________
   c. ___________________
   d. ___________________

4. State in your own words what a volcano is and how it forms. Include in your explanation the main elements that a volcano contains.

______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________

Section 2: Volcanoes and Their Rocks

There are four types of volcanoes and a variety of types of volcano eruptions found around the world in different climates and landscapes. With such variety you are sure to find all kinds of rocks and rock formations. Rocks formed from volcanoes are part of the igneous family.

1. There are two classes of igneous rocks, can you name them and state in your own words how they form? (You must provide the alternative names as well)

______________________________________________________________________________________

/100 Total Mark
/18 Total point
/100 Total Mark
/18 Total point
2. Give an example of how the two types of rocks are different in terms of look, texture and/or color?

______________________________________________________________________________
______________________________________________________________________________

3. Volcanic rocks can be found in a wide variety of shapes and sizes. Match the rock to its proper name by drawing a line from the picture to the word.

/4

- a. Dacite
- b. Basalt
- c. Rhyolite
- d. Andesite

Section 3: Volcanic Eruptions

Instructions: On the next page you will find a table with images of types of volcanic eruptions and questions associated to each type.

- Please read each question carefully and complete the entire table.
- Each image has numbers associated to them and you will need to identify each item and write your answer in the section next to it.
- Below each image is a series of question about the volcano; you will need to answer each one.
a. Name the type of eruption: ____________________________
b. What are two unique characteristics about this type of eruption:

_________________________________________

6. Using the information from the previous table, identify which one of these types of volcanic eruptions is most dangerous? Explain why?
7. Based on what you observed from the video, what type of volcano is Mount Pinatubo? On what evidence do you base your answer?

Section 4: Importance of Forecasting Volcanic Eruptions

1. Why do you think it is important to forecast volcanic eruptions? Provide at least three reasons.

2. On the island of Hawaii the Pu’u O’o cinder cone of the Kilauea volcano has been erupting since 1983. This volcanic eruption has added 230 acres of land to the southeast coast. So far the eruption has destroyed 189 building and 14 kilometers of highway, including the coastal highway, and many ancient cite. Still to this day, the volcano is erupting. Do you think it is still important to monitor this volcano? Explain why?

Section 5: Forecasting Methods for Volcanic Eruptions

1. The lives of hundreds of people were saved by evacuating the nearby volcano areas because of the vulcanologists accurate predictions on the timing of the Mount Pinatubo eruption. What evidence did the scientist observe and what monitoring technique did they use to predict the volcanic eruption?
2. What are the main monitoring methods that are used to predict volcanic eruptions and what do they measure?

3. Mount St-Helens has not erupted since 2008, but it is one of the more dangerous types of volcanoes (5 out of 8 VEI) and scientist must keep a close eye on it so that they can monitor its activity and determine when it is probably going to erupt again. What kind of monitoring methods do you think they should use and explain why?
Volcanoes are powerful and dynamic visible forces of the earth! Volcanic eruptions can be an amazing phenomenon but can also cause a lot of destruction. We need to understand volcanoes to be able to predict when they erupt.

You have learned a lot about volcanoes. Now it is time to put your knowledge to the test. Please read each question carefully and do your best to answer them.

Section 1: What is a Volcano?

1. What is the difference between a dormant and extinct Volcano?

Ideal Answer: (A dormant volcano is not currently erupting and has not done so in recent history. However, there is still a chance for it to erupt again because magma may still be moving or cooling deep inside the volcano. An extinct volcano has also not erupted in recent history but will not be likely to erupt again in the future. The magma has drained below the surface or cooled inside the volcano)

Note: This is the ideal answer but the key to obtain the points is if they mention that the extinct volcano will never erupt while the dormant has a chance to erupt. Also, they should mention the difference in the magma. If they only mention one of the two key points, they get half the marks.

2. How do you know when a volcano is active? Explain?

Ideal Answer: An Active volcano is currently erupting or has erupted in recent history. Active volcanoes can have eruptions of gases, pyroclastic material, tephra and lava.

Note: The student must mention all elements to obtain the point, for each missing element half 0.5 will be deducted.

3. Name the four possible elements that can erupt from a volcano? Please write your answer below.
   a. ____________________ (Answer: gases)
   b. ____________________ (Answer: pyroclastic material)
   c. ____________________ (Answer: Tephra)
   d. ____________________ (Answer: lava)

Note: The student must mention all elements to obtain the point, for each missing element half 0.5 will be deducted. The order is irrelevant.

4. State in your own words what a volcano is and how it forms. Include in your explanation the main elements that a volcano contains.
Possible Answer: A volcano is a place on the earth’s surface where molten rocks (hot magma), gases and pyroclastic material can erupt from the earth’s crust (volcano vents or openings). If the magma flows through the conduit up to the vent on the surface, it can possibly cause an eruption and form a volcano. When magma erupts from a volcano it is called lava. The mountain that forms from the layers of lava and tephra is called a volcano.

Note: The student should mention the major underlined sections to get full points. They can explain in their own words how the magma comes to the surface, but they need to state the different elements that form a volcano. Most importantly, they need to say that the mountain that is formed through layers of lava and tephra is what is called a volcano.

Section 2: Volcanoes and Their Rocks

There are four types of volcanoes and a variety of types of volcano eruptions found around the world in different climates and landscapes. With such variety you are sure to find all kinds of rocks and rock formations. Rocks formed from volcanoes are part of the igneous family.

1. There are two classes of igneous rocks, can you name them and state in your own words how they form? (You must provide the alternative names as well)

   Possible answer: The two classes of igneous rocks are intrusive and extrusive. Intrusive rocks also called plutons are formed when magma cools below Earth’s surface. Because the magma is insulated underground it cools slowly and creates harder and more weather resistant rocks. Extrusive rocks also called volcanic rocks are formed when lava and pyroclastic materials cool at or on the surface of the Earth.

   Note: The student must state both names to get point and must also describe how each rock forms

2. Give an example of how the two types of rocks are different in terms of look, texture and/or color?

   Possible Answer: Intrusive rocks or plutons have a type of magma that forms rocks that are usually coarse-grained and have visible crystals. They are usually harder and resist better to weather conditions, while extrusive rocks or volcanic rocks range from black to white in color and can sometimes be as fine (shiny, smooth) as glass.

   Note: They can also compare one type of rock to another, but they have to be from the two types of rocks (intrusive and extrusive). They need at least one point of comparison for each type of rock to get points.

3. Volcanic rocks can be found in a wide variety of shapes and sizes. Match the rock to its proper name by drawing a line from the picture to the word.
Section 3: Volcanic Eruptions

Instructions: On the next page you will find a table with images of types of volcanic eruptions and questions associated to each type.

• Please read each question carefully and complete the entire table.
• Each image has numbers associated to them and you will need to identify each item and write your answer in the section next to it.
• Below each image is a series of question about the volcano; you will need to answer each one.
<table>
<thead>
<tr>
<th>a. Name the type of eruption:</th>
<th>a. Name the type of eruption:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strombolian Eruption</td>
<td>Hawaiian eruption</td>
</tr>
<tr>
<td>b. What are two unique</td>
<td>b. What are two unique</td>
</tr>
<tr>
<td>characteristics about this</td>
<td>characteristics about this</td>
</tr>
<tr>
<td>type of eruption:</td>
<td>type of eruption:</td>
</tr>
<tr>
<td>-There eruptions are noisier;</td>
<td>-They are the calmest type of</td>
</tr>
<tr>
<td>-they produce fewer molten</td>
<td>volcanic events;</td>
</tr>
<tr>
<td>lava flows;</td>
<td>-the name of this eruption</td>
</tr>
<tr>
<td>-eruptions are short-lived</td>
<td>was derived from the island</td>
</tr>
<tr>
<td>and explosive eruption of</td>
<td>of Hawaii because this is</td>
</tr>
<tr>
<td>lavas often ejects high into</td>
<td>where this type of volcanic</td>
</tr>
<tr>
<td>the air.</td>
<td>eruption is most common.</td>
</tr>
<tr>
<td>(Any variation of these</td>
<td>(Any variation of these</td>
</tr>
<tr>
<td>answers is fine but</td>
<td>answers is fine but student</td>
</tr>
<tr>
<td>student must mention at least</td>
<td>must mention at least two</td>
</tr>
<tr>
<td>two characteristic that no</td>
<td>characteristic that no other</td>
</tr>
<tr>
<td>other volcanic eruption has</td>
<td>volcanic eruption has in</td>
</tr>
<tr>
<td>in order to get point)</td>
<td>order to get point)</td>
</tr>
</tbody>
</table>

| 1. Ash Plume                  | 1. Ash Plume                  |
| 2. Volcanic ash rain          | 2. Lapilli                    |
| 3. Lava Dome                  | 3. Lava fountain              |
| 4. Volcanic bomb              | 4. Volcanic Ash               |
| 5. Pyroclastic flow           | 5. Volcanic Bomb              |
| 7. Stratum                   | 7. Layers of lava and ash     |
| 8. Magma conduit             | 8. Stratum                   |
| 9. Magma Chamber              | 9. Sill                      |
| 10. Dike                     | 10. Magma conduit             |
| 11. Magma Chamber             | 11. Magma Chamber             |
| 12. Dike                     | 12. Sill                     |

<table>
<thead>
<tr>
<th>a. Name the type of eruption:</th>
<th>a. Name the type of eruption:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peléan Eruption</td>
<td>Vulcanian Eruption</td>
</tr>
<tr>
<td>b. What are two unique</td>
<td>b. What are two unique</td>
</tr>
<tr>
<td>characteristics about this</td>
<td>characteristics about this</td>
</tr>
<tr>
<td>type of eruption:</td>
<td>type of eruption:</td>
</tr>
<tr>
<td>-It is named after the volcano</td>
<td>-It was named after the volcano</td>
</tr>
<tr>
<td>Mount Pelee in Martinique</td>
<td>Vulcano;</td>
</tr>
<tr>
<td>that erupted in 1902 making</td>
<td>-They are more explosive than</td>
</tr>
<tr>
<td>it one of the worst natural</td>
<td>Strombolian eruptions;</td>
</tr>
<tr>
<td>disasters in the world;</td>
<td>-Vulcanian deposits are</td>
</tr>
<tr>
<td>-It creates massive landslides</td>
<td>andesitic to dacitic rather</td>
</tr>
<tr>
<td>that make them one of the</td>
<td>than basaltic.</td>
</tr>
<tr>
<td>most dangerous eruptions in</td>
<td>(Any variation of these</td>
</tr>
<tr>
<td>the world;</td>
<td>answers is fine but student</td>
</tr>
<tr>
<td>-They are able to withstand</td>
<td>must mention at least two</td>
</tr>
<tr>
<td>more pressure so they make</td>
<td>characteristic that no other</td>
</tr>
<tr>
<td>one large explosion rather</td>
<td>volcanic eruption has in</td>
</tr>
<tr>
<td>than many small ones.</td>
<td>order to get point)</td>
</tr>
<tr>
<td>(Any variation of these</td>
<td>(Any variation of these</td>
</tr>
<tr>
<td>answers is fine but student</td>
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</tr>
<tr>
<td>order to get point)</td>
<td>order to get point)</td>
</tr>
</tbody>
</table>
1. Ash Plume
2. Magma Conduit
3. Volcanic Ash and Rain
4. Layers of lava and ash
5. Stratum
6. Magma Chamber

**NOTE:** The question from 1-12 listing the names associated to the picture count for 1 point for the whole thing. If they answer everything it is 1 point, if they don’t they lose the point.

<table>
<thead>
<tr>
<th>a. Name the type of eruption:</th>
<th><strong>Plinian Eruption</strong></th>
</tr>
</thead>
</table>
| b. What are two unique characteristics about this type of eruption: | - The massive eruptive columns are the distinctive feature and reach up 2 to 45 km into the atmosphere;  
  - Plinian eruptions from sustained eruptive columns that are shaped like mushrooms  
  - This type of eruption buried the Roman towns of Pompeii and Herculaneum  
  - Most dangerous eruptive feature are the pyroclastic flows that can move down the side of the mountain at extreme speeds of up to 700 km/h  
  - The eruptions can reach hundreds of kilometers  
  *(Any variation of these answers is fine but student must mention at least two characteristic that no other volcanic eruption has in order to get point)* |

6. Using the information from the previous table, identify which one of these types of volcanic eruptions is most dangerous? Explain why?

**Possible Answer:** The Plinian eruption is the most dangerous because it is the largest and most violent type of eruption. They can create eruptions of hash and ash that can rise up to 45 km high at speeds of 700 km/hour. They can even obliterise the entire top of a mountain.

**Note:** The student can have a different answer, but as long as they can support their answer with factual information and can explain why they think it is the most dangerous then they get their points. Use your discretion.

7. Based on what you observed from the video, what type of volcano is Mount Pinatubo? On what evidence do you base your answer?

**Possible Answer:** Mount Pinatubo is a Plinian eruption. The video states that it began with a series of explosions rock the mountain and that mountain hadn’t erupted in hundreds of years (which is a characteristic of a Plinian eruption frequency). They called an Alert Level 4: There was a mushroom like eruptive column; continuous eruption punctuated by massive explosions sending ash 100000 feet into the air; 10 miles wide, Pyroclastic flows role down from all of the summits,
Section 4: Importance of Forecasting Volcanic Eruptions

1. Why do you think it is important to forecast volcanic eruptions? Provide at least three reasons.

Possible Answer: Saves lives, warns against disaster, destroy villages and cities, cause health issues do to breathing ash, can give people a warning so that they can evacuate the surrounding region, and provides historical evidence so that we can better understand the volcano.

Note: Student can answer any variation of these answers and if they have another reason that is valid they will get the points. They need 3 answers to get full points and for every missing reason marks will be deducted.

2. On the island of Hawaii the Puʻu Oʻo cinder cone of the Kilauea volcano has been erupting since 1983. This volcanic eruption has added 230 acres of land to the southeast coast. So far the eruption has destroyed 189 building and 14 kilometers of highway, including the coastal highway, as well as many ancient cite. Still to this day, the volcano is erupting.

Do you think it is still important to monitor this volcano? Explain why?

Possible Answer: Even though nobody was killed in this eruption and maybe no one is living close by, it is still important to monitor the volcano as you need to keep an eye on it to make sure it doesn’t get worse or to determine when it may stop. Also, by monitoring it, you can observe and measure how much more land is being added to the southeast coast. You also need to keep monitoring so that you can add new data. The more you know about a volcano the better you can understand the eruptions.

Note: The student can answer any variation of what was stated but they need to provide good reasoning based on factual elements. They cannot merely give their opinion if there is no reason behind what they think. They need to base it on the course material.
Section 5: Forecasting Methods for Volcanic Eruptions

1. The lives of hundreds of people were saved by evacuating the nearby volcano areas because of the vulcanologists accurate predictions on the timing of the Mount Pinatubo eruption. What evidence did the scientist observe and what monitoring technique did they use to predict the volcanic eruption?

Possible Answer: They used a correlation spectrometer, the team measured a type of sulfur dioxide or SO₂ (if magma is rising SO₂ should escape from rocks or cracks above the magma chamber). The first measurements were about 500 tons a day of SO₂ and increased with each successive measurement so that by the end of the month it was 5000 tons a day. In early May, 7 seismic stations surrounded the mountain which transmitted data by radio to a tiny room at Clark’s base. The seismic stations recorded earthquakes five miles beneath the surface. When earthquakes are this deep, they are a sign of possible eruption. However, high SO₂ and seismic activity is not necessarily a sign of a possible eruption because magma can always subside. Another tool they used was a helicopter to observe the volcano and they found a dome of magma which is indicative of a kind of magma that is very explosive. Therefore the equation changed and became more serious.

Note: The student can answer any variation of what was stated but they need to provide at least three measuring tools that were used to monitor the volcano.

2. What are the main monitoring methods that are used to predict volcanic eruptions and what do they measure?

Possible Answer: Seismicity (measures the earthquakes; ascending magma puts stress on the rocks and pushes them apart which leads to fracturing and small magnitude earthquakes), ground deformation (measures the resulting changes on or near the earth’s surface; magma stored in the chambers and flowing along the conduits varies in pressure which can lead to deformations of the surrounding crustal rocks), volcanic gases (remote spectroscopic methods from satellites and ground-based instruments help measure the gas compositions like that of SO₂)

Note: Students need to state what is being measured and the method in order to get full points. They must name all three monitoring methods and they can also state that it is best when you do a combination of all three. The parts in italic are not necessary.

3. Mount St-Helens has not erupted since 2008, but it is one of the more dangerous types of volcanoes (5 out of 8 VEI) and scientist must keep a close eye on it so that they can monitor its activity and determine when it is probably going to erupt again. What kind of monitoring methods do you think they should use and explain why?

Possible Answer: I think that it is best if they use a combination of all three methods, the seismicity, ground deformation, and measure the volcanic gases using a spectroscopic method. The seismicity alone is not enough to predict if a volcano is going to erupt, so you need to keep a close eye on the volcano. Historic data is also a good indicator to help you decide whether an eruption will occur.

Note: The student should use the material from this module to support his explanation. There can be a variety of possible answers and it is important to have the student justify his point. They will not get full points if they merely state the measurement tools.
Presentation: Headlines on a Historic Volcanic Eruption

Behind every volcano there is a story to be told. Individually you are to prepare a 10 minute presentation on a historic example of a specific type of magmatic eruption. Imagine you are a journalist and must research the biggest eruption of that type in order to accurately tell its story. Like every good journalist, you need to get your questions answered and base your information on facts.

Carefully read the guidelines below and make sure to answer all these questions in your presentation in order to get full marks. Do not merely state the information. You must make it into a story and add a dramatic element to describing the volcano and its historic eruption. You may use visuals to include in your presentation to enhance the storytelling.

1. Select an example from the list of types of volcanic eruption taken from the Wikipedia site.


<table>
<thead>
<tr>
<th>VEI</th>
<th>Plume height</th>
<th>Eruptive volume</th>
<th>Eruption type</th>
<th>Frequency</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>&lt;100 m (330 ft)</td>
<td>1,000 m² (35,300 cu ft)</td>
<td>Hawaiian</td>
<td>Continuous</td>
<td>Kilauea</td>
</tr>
<tr>
<td>1</td>
<td>100–1,000 m (300–3,300 ft)</td>
<td>10,000 m³ (353,000 cu ft)</td>
<td>Hawaiian/Strombolian</td>
<td>Months</td>
<td>Stromboli</td>
</tr>
<tr>
<td>2</td>
<td>1–5 km (1–3 mi)</td>
<td>1,000,000 m³ (353,300,000 cu ft)</td>
<td>Strombolian/Vulkanian</td>
<td>Months</td>
<td>Galeras (1992)</td>
</tr>
<tr>
<td>3</td>
<td>3–15 km (2–9 mi)</td>
<td>10,000,000 m³ (353,300,000 cu ft)</td>
<td>Vulcanian</td>
<td>Yearly</td>
<td>Nevado del Ruiz (1985)</td>
</tr>
<tr>
<td>4</td>
<td>10–25 km (6–16 mi)</td>
<td>100,000,000 m³ (0.024 cu mi)</td>
<td>Vulcanian/Peléan</td>
<td>Few years</td>
<td>Eyjafjallajökull (2010)</td>
</tr>
<tr>
<td>5</td>
<td>&gt;25 km (16 mi)</td>
<td>1 km³ (0.24 cu mi)</td>
<td>Plinian</td>
<td>5–10 years</td>
<td>Mount St. Helens (1980)</td>
</tr>
<tr>
<td>6</td>
<td>&gt;25 km (16 mi)</td>
<td>10 km³ (2 cu mi)</td>
<td>Plinian/Ultra Plinian</td>
<td>1,000 years</td>
<td>Krakatoa (1883)</td>
</tr>
<tr>
<td>7</td>
<td>&gt;25 km (16 mi)</td>
<td>100 km³ (20 cu mi)</td>
<td>Ultra Plinian</td>
<td>10,000 years</td>
<td>Tambora (1815)</td>
</tr>
<tr>
<td>8</td>
<td>&gt;25 km (16 mi)</td>
<td>1,000 km³ (200 cu mi)</td>
<td>Ultra Plinian</td>
<td>100,000 years</td>
<td>Lake Toba (74 ka)</td>
</tr>
</tbody>
</table>

2. Name the type of volcano you have chosen.
3. Explain the history of the volcano and how it was formed.
4. Describe the types of rocks that this volcano created.
5. Provide an example of the biggest eruption that this volcano had.
6. Explain how the volcano erupted and what is the frequency of eruptions.
7. Judge what monitoring methods were used and if no information was provided on this, infer what types of methods should they have used to predict the eruption.
8. Explain what impact this eruption had on people, the landscape, its surrounding and why it is important to forecast.