

Team Members \_\_\_\_\_

Date \_\_\_\_\_

**Directions:** Read the Project Outline and be sure you understand the Driving Question and Project Objectives.

## PBL Topic: Protecting People from a Volcanic Eruption

### Background

Some of Earth's most interesting yet dangerous landforms are volcanoes. Underneath Earth's crust, or surface layer, there is extremely hot, melted rock called *magma*. A *hot spot* is an area in Earth's crust where magma rises up through the crust to Earth's surface. The magma then seeps out through cracks or vents in the crust and forms a volcano. When magma comes in contact with air, it is called *lava*. An erupting volcano emits lava, gas, dust, and ash into the surrounding area. Some volcanoes eject lava that spews like a fountain, while others eject lava that oozes like thick syrup. Still others only release ash and dust.

Volcanoes have three different classifications. An *active* volcano is one that has either erupted in the last ten thousand years or will erupt soon. A *dormant* volcano is one that has not erupted in the last ten thousand years but may erupt again in the future. An *extinct* volcano is one that erupted thousands of years ago and will not erupt again.

Lava is extremely hot and burns everything in its path, including trees, structures, and roadways. Some lava, like *aa* (AH-ah) lava, moves very quickly. It can spew from a volcano and destroy buildings that are far from the volcano. Lava can also be harmful when it reaches the ocean and cools. As the lava cools and hardens in cold water, a lava haze, or *laze*, is formed. This haze is made of poisonous gas that can kill people who inhale the vapors. Despite the dangers of living near an active volcano, people can take precautions to stay safe, such as keeping a mask and goggles available, keeping a full tank of gas in the car, and knowing the evacuation route.

Team Members \_\_\_\_\_  
\_\_\_\_\_ Date \_\_\_\_\_

### The Problem

Suppose scientists discover that an active volcano is likely to erupt in six months. There is a human population living near the volcano. When this volcano erupts, it may give off ash, poisonous gas, or quickly flowing lava. Evacuation or relocation of all the people is not an option. Your team must create a plan that will protect the community living near the volcano.

**Driving Question:** How can you protect people from a volcanic eruption?

### Project Objectives

When we finish our project, we will be able to:

- Describe how volcanoes form
- Explain the impacts of volcanic eruptions on the surrounding land
- Create a plan to protect a human population from a volcanic eruption
- Construct a model of the volcano and the populated area to demonstrate your plan
- Create a presentation

Team Members \_\_\_\_\_

Date \_\_\_\_\_

**Driving Question:** How can you protect people from a volcanic eruption?

**Directions:** Set goals to manage your time. Plan what your team will do throughout the project. Keep track of when each task is due and the date when each task is completed. Review your plan every time your team meets. Determine what additional work needs to be done to meet your goals.

Tasks	Due Date	Completed Date
Read the Project Outline		
Complete an Activity		
Learn Key Vocabulary		
Complete the <i>KWLS (Part One)</i>		
Learn About the Topic		
Start the <i>KWLS (Part Two)</i>		
Plan Your Project		
Pitch Your Project to the Class		
Learn More About the Topic		
Start Your Project		
Project Checkup		
Finish Your Project		
Finish the <i>KWLS (Part Two)</i>		
Create Your Project Presentation		
Practice Your Presentation		
Present Your Final Presentation		

Team Members \_\_\_\_\_

Date \_\_\_\_\_

**Driving Question:** How can you protect people from a volcanic eruption?

**Directions:** Read the Background, Problem, and Driving Question again. Write any important words in the *Words About the Topic We Need to Learn* and *Other Important Words We Need to Learn* sections. Look up the meaning of each word and write the definition next to it. Use your *SAZ Journal* if you need more space.

**Words About the Topic We Need to Learn**

Word	Definition

**Other Important Words We Need to Learn**

Word	Definition

Team Members \_\_\_\_\_

Date \_\_\_\_\_

**Driving Question:** How can you protect people from a volcanic eruption?

**Directions:** Before and during your project, ask and answer the *K* and *W* questions with your team. Use the following pages to record your answer to each question. Use your *SAZ Journal* if you need more space.

**Before the Project – K**

*What do we know about the topic?*

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**Before the Project – W**

*What do we want to know about the topic?*

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PBL Sheet 5: Recommended Reading

Team Members \_\_\_\_\_

Date \_\_\_\_\_

**Driving Question:** How can you protect people from a volcanic eruption?

**Directions:** Below is a list of reading materials that will help you build your knowledge and prepare you to create a project. Complete the *K* and *W* sections of the *KWLS* worksheet before using these resources. Fill in the *L* section of the *KWLS* as you complete your research. If you use additional materials, describe them in your *SAZ Journal*.

Resource	Title	Summary
Nonfiction Book	<i>Earth's Changing Face</i>	This book explores some of the many ways our planet changes over time, including by volcanic eruption.
Quick Read	<i>From Fire to Land</i>	This sheet describes how volcanic eruptions in Hawaii result in new land being formed.
FOCUS Book	<i>The Heat of Kilauea</i> (Heat Energy unit)	This book explains that magma reaching Earth's surface creates dangerous volcanoes such as Kilauea.
I.File	<i>Lava</i> (Solids, Liquids, and Gases unit)	This file describes how lava flows from volcanoes and describes the dangerous conditions that lava can produce.
Quick Read	<i>Volcanoes and Climate</i> (Atmosphere and Climate unit)	This sheet explores the effects of volcanic eruptions on the atmosphere.
Science Video	<i>Deep Ocean Volcanoes</i>	This video shows the West Mata volcano during an active eruption.
Career File	<i>Volcanologist</i>	This file describes the work of volcanologists—scientists who study volcanoes.

Team Members \_\_\_\_\_

Date \_\_\_\_\_

**Driving Question:** How can you protect people from a volcanic eruption?

**Directions:** During and after your project, ask and answer the L and S questions with your team. Use the following pages to record your answer to each question. Use your *SAZ Journal* if you need more space.

**During and After the Project – L**

*What have we **learned** about the topic?*

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**After the Project – S**

*What do we **still** want to learn about the topic?*

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Team Members \_\_\_\_\_

Date \_\_\_\_\_

**Driving Question:** How can you protect people from a volcanic eruption?

**Directions:** Brainstorm to generate project ideas that will help your team answer the Driving Question. The project ideas should also help answer something your team truly wants to learn (refer to the *W* section of your *KWLS* chart). The project should be fun and challenging, and should allow everyone on the team to contribute.

Your teacher will provide guidelines for your project, such as materials you may use, the amount of time you have to complete it, and safety rules to follow. List at least three project ideas below. Write reasons you think each idea would or would not make a good project. Keep the project guidelines in mind!

Project Ideas	It <i>would</i> make a good project because...	It <i>would not</i> make a good project because...

Now discuss all the project ideas with your team. Consider which project will fit the guidelines best. Circle the project your team selects.

We chose this project because \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



Team Members \_\_\_\_\_  
\_\_\_\_\_ Date \_\_\_\_\_

**Driving Question:** How can you protect people from a volcanic eruption?

**Directions:** Give your PBL project a name that describes what you will do or learn. Then briefly explain what you plan to do and how you expect to do it. Finally, list the materials you think you will need. This list may change as you work on the project.

**Project Name** \_\_\_\_\_

**Project Description**

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**Materials Needed**

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2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_

Team Members \_\_\_\_\_  
\_\_\_\_\_ Date \_\_\_\_\_

**Driving Question:** How can you protect people from a volcanic eruption?

**Directions:** Present your team’s project idea to your peers and teacher.

- Explain which project idea you selected and why.
- Tell how it will help your team answer the Driving Question and follow the project guidelines.
- Explain how you plan to complete the project and what materials you will need.

**Feedback**

Your peers and teachers will listen to your project idea and give you feedback. They will make suggestions about how you might improve or change portions of your project. Record notes on *all* their ideas and suggestions, even if you don’t agree with them. Use your *SAZ Journal* if you need more space.

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**Revised Project Plan**

Make changes to your original project plan using the feedback provided by your peers and teacher. If your project is staying the same as your original plan, explain why.

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Team Members \_\_\_\_\_

Date \_\_\_\_\_

**Driving Question:** How can you protect people from a volcanic eruption?

**Directions:** Partway through the project, discuss your team’s progress. Answer the questions below before meeting with your teacher.

1. Will your team finish on time? YES NO

If not, how will you catch up?

\_\_\_\_\_  
\_\_\_\_\_

2. Is everyone on your team helping enough? YES NO

If not, how can you make sure everyone helps?

\_\_\_\_\_  
\_\_\_\_\_

3. Has your team faced any challenges? YES NO

If so, what are they and how did you address them?

\_\_\_\_\_  
\_\_\_\_\_

4. Have you changed the original project plan? YES NO

If so, explain how. If not, explain why not.

\_\_\_\_\_  
\_\_\_\_\_

What other information about the project do you want to share with your teacher?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Team Members \_\_\_\_\_

Date \_\_\_\_\_

**Driving Question:** How can you protect people from a volcanic eruption?

**Directions:** Use this table as a guide as your team prepares its presentation. Also, use this table to provide helpful feedback during peer review of another team’s presentation.

The Team...	Great Work!	Almost There	Needs Work
<b>Organizes Ideas</b>	<ul style="list-style-type: none"> <li>Tells many facts and details about the topic</li> <li>Ideas are in complete sentences</li> </ul>	<ul style="list-style-type: none"> <li>Tells facts, but with no details</li> <li>Most ideas are in complete sentences</li> </ul>	<ul style="list-style-type: none"> <li>Tells facts about another topic</li> <li>Ideas are not in complete sentences</li> </ul>
<b>Uses Visual Devices</b>	<ul style="list-style-type: none"> <li>Uses a lot of photos, diagrams, or graphs in helpful ways</li> </ul>	<ul style="list-style-type: none"> <li>Uses some photos, diagrams, or graphs</li> </ul>	<ul style="list-style-type: none"> <li>Does not use photos, diagrams, or graphs</li> </ul>
<b>Speaks Clearly</b>	<ul style="list-style-type: none"> <li>Speaks very clearly</li> </ul>	<ul style="list-style-type: none"> <li>Speaks clearly, but too slowly or quickly</li> </ul>	<ul style="list-style-type: none"> <li>Speaks too quietly or mumbles</li> </ul>
<b>Answers Audience</b>	<ul style="list-style-type: none"> <li>Answers questions in complete sentences</li> </ul>	<ul style="list-style-type: none"> <li>Answers questions, but not completely</li> </ul>	<ul style="list-style-type: none"> <li>Does not answer questions</li> </ul>
<b>Presents as a Team</b>	<ul style="list-style-type: none"> <li>Everyone on team participates</li> <li>Team members know when to listen or speak</li> </ul>	<ul style="list-style-type: none"> <li>Whole team participates but not equally</li> <li>Some team members know when to listen or speak</li> </ul>	<ul style="list-style-type: none"> <li>Some team members do not participate</li> <li>Team members do not know when to listen or speak</li> </ul>

PBL Sheet 12: Practice Presentation and Peer Review

Team Members \_\_\_\_\_

Date \_\_\_\_\_

**Driving Question:** How can you protect people from a volcanic eruption?

**Directions:** Your team will present your project to an audience. The presentation should include the Driving Question, project title, and a summary of the project. Also plan to explain the materials you used, the methods you followed, challenges you faced, and how you dealt with those challenges. Finally, present your conclusion based on the results of your project.

Your presentation can take many forms. Try to use some form of **art** to share the project with the audience. If possible, use **technology** to design the presentation. Your teacher can offer ideas for using art and technology. Review *PBL Sheet 11: Presentation Rubric* as you plan your presentation so you know how to deliver a good presentation.

**Practice Presentation**

Before your team presents to the whole class, you will practice presenting to one other team. They will also practice presenting to your team. Students on the other team will look at the *Presentation Rubric* and suggest how to make your presentation better. Write all their suggestions in the table. Then write how you will use these ideas to make your final presentation better.

Peer Review Suggestion	How We Will Apply This Suggestion to Our Presentation

Team Members \_\_\_\_\_

Date \_\_\_\_\_

Project Title \_\_\_\_\_

**Directions:** Use this rubric to judge how well your team completed the PBL project. Write the score that best describes your team’s performance in each subcategory and category. At the end of the rubric, give your team an overall score.

**Research, Planning, and Organization**

**Category Score:** \_\_\_\_\_

<b>Building Knowledge and Evaluating Information</b>		<b>Subcategory Score:</b> _____
4	Our team gathered information from many sources. Our research allowed us to answer the Driving Question, and we came up with new research questions during the project.	
3	Our team gathered information from many sources. Our research allowed us to answer the Driving Question.	
2	Our team gathered information from only a few sources. Our research was related to the topic but did not help us answer the Driving Question.	
1	Our team gathered information from only one or two sources. Our research was not related to the topic and did not help us answer the Driving Question.	

<b>Sticking to the Schedule</b>		<b>Subcategory Score:</b> _____
4	We finished all parts of the project on time or early. Our team did not need any reminders to stick to the schedule.	
3	We finished all parts of the project on time. Our team needed very few reminders to stick to the schedule.	
2	We finished most of the project tasks on time. Our team needed some reminders to stick to the schedule.	
1	We did not finish most of the project tasks on time. Our team needed a lot of reminders to stick to the schedule.	

<b>PBL Project Organizer</b>		<b>Subcategory Score:</b> _____
4	We completed our Project Organizer and included a lot of details.	
3	We completed our Project Organizer.	
2	We completed most of our Project Organizer.	
1	We did not complete most of our Project Organizer.	

**Project Design**

**Category Score:** \_\_\_\_\_

<b>Topic Knowledge</b>		<b>Subcategory Score:</b> _____
4	Our team developed a complete understanding of the topic.	
3	Our team developed a fairly complete understanding of the topic.	
2	Our team developed a partial understanding of the topic.	
1	Our team did not develop a good understanding of the topic.	

<b>Solving the Problem</b>		<b>Subcategory Score:</b> _____
4	We answered the Driving Question, solved the Problem, and researched answers to new questions about the project.	
3	We answered the Driving Question and solved the Problem.	
2	We answered part of the Driving Question and tried to solve the Problem but did not find a successful solution.	
1	We did not answer the Driving Question and did not create a plan to address the Problem.	

<b>Creativity</b>		<b>Subcategory Score:</b> _____
4	We showed outstanding creativity by coming up with a unique design. We used our knowledge to create something completely original.	
3	We showed creativity by coming up with a unique design. We used our knowledge to improve an existing idea or model.	
2	We showed some creativity in our design. We used our knowledge to make small changes to an existing idea or model.	
1	We did not show creativity in our design. Instead, we copied an existing idea or model.	

<b>Peer Review</b>		<b>Subcategory Score:</b> _____
4	We fully explained our project design using many details. Then we considered all the peer feedback and decided which ideas to use to improve our final project.	
3	We explained our project design using some details. Then we considered some of the peer feedback to use in our final project.	
2	We partially explained our project design using very few details. Then we considered a little of the peer feedback to use in our final project.	
1	We did not clearly explain our project design and did not consider the peer feedback to use in our final project.	

**Presentation**

**Category Score:** \_\_\_\_\_

<b>Organizes Information</b>		<b>Subcategory Score:</b> _____
4	We presented ideas and information very clearly and in a logical order. We explained all the important parts of the project in a way that was easy to understand.	
3	We presented ideas and information clearly and in a logical order. We explained most of the important parts of the project.	
2	We presented most ideas and information clearly but should have presented them in a different order. We explained some of the important parts of the project.	
1	We did not present ideas and information clearly. We left out some important parts of the project.	

<b>Technology and the Arts</b>		<b>Subcategory Score:</b> _____
4	We used technology and the arts in a creative way to make our presentation better.	
3	We used technology or the arts in our presentation.	
2	We made limited use of technology and the arts in our presentation.	
1	We did not use technology or the arts in our presentation.	

<b>Responds to Audience</b>		<b>Subcategory Score:</b> _____
4	We answered all questions using facts and details. We showed a good understanding of the topic.	
3	We answered most or all questions using facts and details.	
2	We answered some questions and used some facts or details.	
1	We did not answer questions and did not use very many facts or details.	

<b>Presents as a Team</b>		<b>Subcategory Score:</b> _____
4	Everyone on the team participated equally. Each person always knew when to speak or listen. Our presentation had no pauses or mistakes.	
3	Everyone on the team participated equally. Each person usually knew when to speak or listen.	
2	Everyone on the team participated but not equally. Some of us had trouble knowing when to speak or listen.	
1	Some members of the team did not participate, and we did not know when to speak or listen.	

**OVERALL SCORE: 4 3 2 1**

**Comments:** \_\_\_\_\_

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Team Members \_\_\_\_\_

Date \_\_\_\_\_

Project Title \_\_\_\_\_

**Directions:** As a team, think about the entire project and answer the questions below.

What is the most important thing you learned by doing this project?

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Which part of the project was most challenging for your team, and why?

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What do you wish you had spent *more* time on?

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What do you wish you had spent *less* time on?

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What would you do differently if you could start over?

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Look at the questions you wrote in the *W* and *S* portions of the *KWLS* chart. Which question would you be most interested in pursuing in a new project, and why?

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**PBL Sheet 15: Student Rubric-Individual** (page 1 of 2)

My Name \_\_\_\_\_ Date \_\_\_\_\_

Project Title \_\_\_\_\_

**Directions:** Use this rubric to judge how well you contributed to your team throughout the project. Write the score that best describes your performance in each subcategory and category. At the end of the rubric, give yourself an overall score.

**Research, Planning, and Organization**

**Category Score:** \_\_\_\_\_

<b>Building Knowledge and Evaluating Information</b>		<b>Subcategory Score:</b> _____
4	I always helped gather information and did research to share with my team.	
3	I usually helped gather information and often did research to share with my team.	
2	I sometimes helped gather information and did research to share with my team.	
1	I did not gather enough information or do research to share with my team.	

<b>Sticking to the Schedule</b>		<b>Subcategory Score:</b> _____
4	I always focused on the activity and showed leadership by making sure the team did not fall behind.	
3	I usually focused on the activity, and I did not cause the team to fall behind.	
2	I often focused on the activity, but I sometimes disrupted others or caused the team to fall behind.	
1	I needed to focus more on the activity and not disrupt the team.	

<b>SAZ Journal</b>		<b>Subcategory Score:</b> _____
4	I organized my SAZ Journal very well and used it effectively to record notes, data, and sketches.	
3	I organized my SAZ Journal well and used it to record notes, data, and sketches.	
2	I organized some parts of my SAZ Journal well but included only a few notes, data, or sketches.	
1	I did not organize my SAZ Journal well and did not include useful notes, data, or sketches.	

<b>Listening and Communication Skills</b>		<b>Subcategory Score:</b> _____
4	I helped my team communicate by always listening to team members. I offered comments and questions without interrupting others.	
3	I usually listened to team members and offered comments and questions. I rarely interrupted others.	
2	I sometimes listened to team members and offered comments and questions. I sometimes interrupted others.	
1	I did not listen to team members enough. I almost never offered comments or questions.	

**Project Design**

**Category Score:** \_\_\_\_\_

<b>Contribution to Project Selection</b>		<b>Subcategory Score:</b> _____
4	I always suggested valuable ideas, and I played an important role in selecting the project.	
3	I usually suggested valuable ideas, and I played a role in selecting the project.	
2	I sometimes suggested ideas, and I played a small role in selecting the project.	
1	I did not suggest ideas to the team, and I did not play a role in selecting the project.	

PBL Sheet 15: Student Rubric-Individual (page 2 of 2)

(Project Design continued)

Contribution to Project Development		Subcategory Score: _____
4	I always did my fair share of the work. I led the team and helped make sure all team members contributed.	
3	I did my fair share of the work.	
2	I sometimes did my fair share of the work, but I sometimes waited for others to do the work for me.	
1	I did not do enough work to help my team develop the project.	

Safety and Ethics		Subcategory Score: _____
4	I showed an understanding of and respect for safety and ethics during the project. I set an example for other team members.	
3	I showed an understanding of and respect for safety and ethics during the project.	
2	I showed a partial understanding of and respect for safety and ethics during the project.	
1	I did not show an understanding of or respect for safety and ethics throughout the project.	

**Presentation**

**Category Score:** \_\_\_\_\_

Speaking		Subcategory Score: _____
4	I spoke loudly and clearly. I was enthusiastic about the project. I faced the audience and presented with confidence. I made eye contact and did not rely on my notes.	
3	I spoke loudly and clearly, and I faced the audience. I made eye contact most of the time and used notes only when needed.	
2	I did not speak loudly or clearly and often faced away from the audience. I rarely made eye contact, and I often read from my notes.	
1	I did not speak at all during the presentation.	

Contribution to Presentation		Subcategory Score: _____
4	I contributed equally with fellow team members. I knew when to speak or listen and helped the presentation flow naturally without any pauses or mistakes.	
3	I contributed well but sometimes too much or too little. I knew when to speak or listen, and I helped the presentation flow smoothly.	
2	I contributed but not enough or way too much. My team members had some trouble knowing when to listen or speak because of me.	
1	I did not contribute to the presentation at all.	

**OVERALL SCORE: 4 3 2 1**

**Comments:** \_\_\_\_\_  
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