

Hazard Literacy Center

Hazard Literacy Education Program

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Where Would Be at Risk if Volcano Erupts?



1. Program Overview

This disaster safety education program helps students understand the distribution of volcanoes and the major hazards caused by volcanic eruptions and explore how volcanic hazards can affect different areas and people's lives through real-world volcanic cases. Centered on the question, "Where would be at risk if a volcano erupts?", students examine the locations and distribution of major active volcanoes around the world and compare the characteristics and impacts of volcanic ash, lava flows, and pyroclastic flows. Through these activities, students learn that the areas and spatial extent affected by volcanic hazards can vary depending on the type of hazard.

The program consists of four stages: exploring the distribution of active volcanoes around the world, comparing major hazards caused by volcanic eruptions, examining the extent and impacts of volcanic ash using Mount Fuji as a case study, and reviewing safety guidelines for volcanic eruptions. Students locate major active volcanoes on a world map and compare how volcanic ash, lava flows, and pyroclastic flows move and the types of damage they can cause. They then use a volcanic ashfall potential map of Mount Fuji and related materials to examine the areas that could be affected by volcanic ash and its possible impacts on people's lives. Students also use evidence to assess the potential impacts of a Mount Fuji eruption on Korea. Finally, they review appropriate safety actions during a volcanic eruption and reflect on what they have learned.

The program is designed to help students move beyond simply understanding volcanic hazards and develop the ability to use maps and other information to identify and assess the extent and impacts of these hazards. Through the program, students develop their understanding and judgment of volcanic hazards, learn appropriate safety actions during volcanic eruptions, and build the skills needed to prepare for actual disaster situations.

Grade Level	Upper Elementary or Middle School Students	Instructional Methods	Inquiry-based activities
Learning Environment	Classroom with Access to Internet	Duration	Inquiry-based activities
Required Materials	Worksheets, an internet-enabled digital device, world map		

2. Learning Objectives (Hazard Literacy Framework)

① Understand the distribution of volcanoes and the major hazards caused by volcanic eruptions, and recognize that the areas and spatial extent affected can vary depending on the type of hazard.
② Use maps and other information to identify the extent of the impacts of volcanic eruptions and their effects on people's lives, and assess volcanic hazards based on evidence.
③ Understand appropriate safety actions during a volcanic eruption and use safety information to prepare for and respond appropriately to actual disaster situations.

Learning Objectives	Knowledge & Understanding		Reasoning & Skills					Values & Attitudes			Psychology & Emotion			Behavioral & Practical Engagement		
	A1	A2	B1	B2	B3	B4	B5	C1	C2	C3	D1	D2	D3	E1	E2	E3
Objective ①	O		O													
Objective ②			O	O			O							O		
Objective ③								O		O		O				

3. Key Concepts

- Volcanic distribution and activity
- Major volcanic hazards and their impacts
- Spatial characteristics of volcanic hazards
- Decision-making in volcanic hazard situations
- Volcanic evacuation and safety guidelines

4. Program Sequence

	Activity Sequence
Introduction	-Introduction• Share images or scenes that come to mind when thinking of volcanoes. -Learn about the concept of a volcano and the meaning of an active volcano.
Inquiry 1	-Use online maps to explore the locations of major active volcanoes around the world. -Mark the locations of major active volcanoes on a world map. -Identify spatial patterns in the distribution of active volcanoes around the world.

	Activity Sequence
Inquiry 2	-Identify hazards that may occur during a volcanic eruption. -Compare how volcanic ash, lava flows, and pyroclastic flows move and the damage they can cause. -Identify how the impacts of volcanic hazards may vary with distance from a volcano.
Inquiry 3	-Use a volcanic ashfall potential map of Mount Fuji to identify the potential extent of volcanic ash. -Analyze how volcanic ash can affect people's lives, including transportation, electricity, water supply, communications, and buildings. -Use evidence to assess the potential impacts of a Mount Fuji eruption on Korea.
Conclusion	-Review and summarize appropriate safety actions during a volcanic eruption. -Reflect on what students learned through the activities. -Reflect on how their ideas about volcanoes have changed since the beginning of the lesson.

5. Theoretical Background and Activity Design for Disaster Education

Volcanoes are landforms created when magma from inside the Earth erupts onto the surface. Volcanic eruptions can produce a variety of hazards, including volcanic ash, lava flows, and pyroclastic flows. These hazards differ in how they move and in the areas they can affect. Volcanic ash, for example, can be carried by the wind and affect areas far from the volcano. Understanding volcanic hazards therefore requires students to consider not only the characteristics of the phenomena produced by eruptions but also the spatial extent of their potential impacts.

This program is designed to help students understand the concept of volcanoes and the meaning of active volcanoes and explore the distribution of major active volcanoes by locating them on a world map. Students then compare the characteristics, movement, and potential damage caused by volcanic ash, lava flows, and pyroclastic flows. Through this comparison, they learn that different types of volcanic hazards can affect different areas and spatial extents. By comparing possible impacts in areas near and farther away from a volcano, students also develop an understanding of the spatial characteristics of volcanic hazards.

The program also uses Mount Fuji as a case study. Students analyze a volcanic ashfall potential map and explore how volcanic ash could affect transportation, electricity, water supply, communications, buildings and residential environments, and the supply of essential goods. The activities use the Japanese Cabinet Office's Report of the Committee for the Review of the Mount Fuji Hazard Map and Guidelines for Wide-Area Volcanic Ashfall Countermeasures in the Tokyo Metropolitan Area to examine both the spatial extent and social impacts of volcanic ash (Cabinet Office, Government of Japan, 2004, 2025). Students then use information about the distance between Mount Fuji and Korea and wind direction to assess the potential impacts of a Mount Fuji eruption on Korea (Yonhap News Agency, 2025).

Finally, students use volcanic eruption safety guidelines provided by KMA Weather Nuri to review appropriate actions during a volcanic eruption and reflect on the overall learning experience (Korea Meteorological Administration [KMA], n.d.). Through these activities, students develop hazard literacy by understanding volcanic hazards, using maps and other information to identify their spatial extent and impacts, making evidence-based judgments, and applying appropriate safety actions in actual disaster situations.

6. Instructional Considerations

When teaching this program, guide students to identify the spatial patterns in the distribution of active volcanoes without assuming that all volcanoes have the same characteristics or pose the same level of risk. Explain that a volcano may still be classified as active even if it is not currently erupting because it may erupt again. Encourage students to identify patterns in volcanic distribution themselves based on the locations of major volcanoes they mark on the world map.
When comparing volcanic ash, lava flows, and pyroclastic flows, help students understand that these hazards differ in how they move and in the areas they can affect. Volcanic ash can travel long distances with the wind, while lava flows and pyroclastic flows are affected by factors such as the surrounding terrain and slope. Students should therefore avoid assessing the level of risk based solely on distance from a volcano. When using the Mount Fuji volcanic ashfall potential map, explain that the areas shown on the map do not indicate locations where volcanic ash will necessarily accumulate during an actual eruption. Rather, the map shows areas where ashfall could occur under a specific set of assumed conditions.
When assessing the potential impacts of a Mount Fuji eruption on Korea, encourage students to base their conclusions on the information provided, such as the distance from the volcano and wind direction, rather than on vague concerns or assumptions. Safety actions during a volcanic eruption should also be checked against official information provided by public agencies such as the Korea Meteorological Administration rather than relying on students' own guesses. At the end of the program, encourage students to reflect on what they have learned and how their ideas have changed since the beginning of the lesson. This helps connect their understanding of volcanic hazards with judgment and safe actions in actual disaster situations.

7. References

- Cabinet Office, Government of Japan. (2004). Report of the Committee for the Review of the Mount Fuji Hazard Map [富士山ハザードマップ検討委員会報告書]. Disaster Management in Japan. https://www.bousai.go.jp/kazan/fuji_map/index.html
- Cabinet Office, Government of Japan. (2025). Guidelines for wide-area volcanic ashfall countermeasures in the Tokyo metropolitan area [首都圏における広域降灰対策ガイドライン]. Disaster Management in Japan. https://www.bousai.go.jp/kazan/shiryo/index.html
- Yonhap News Agency. (2025, May 28). Would an eruption of Mount Fuji affect Korea? Experts say the impact would be "quite limited." https://www.yna.co.kr/view/AKR20250528041000530
- Korea Meteorological Administration. (n.d.). Earthquake and volcano evacuation guidelines. KMA Weather Nuri. https://www.weather.go.kr/w/earthquake-volcano/evacuation.do

Session 1: Where Are Volcanoes Found?

Topic	Understanding Volcanoes and the Distribution of Active Volcanoes Around the World
What Will We Learn?	① Explain what a volcano is and how it forms. ② Locate major active volcanoes on a world map and identify patterns in their distribution.

1 Think About It

- What images or scenes come to mind when you think of a volcano?

- Are there any volcanoes in Korea? If so, which ones?

2 Understanding Volcanoes

- **Volcano**
  : A landform created when magma from inside the Earth erupts onto the surface
- **Active Volcano**
  : A volcano that is currently erupting, has a recorded history of past eruptions, or may erupt again in the future

1) Can a volcano still be considered active even if it is not currently erupting? Why?

2) Write the names of any volcanoes you know.

3 Where Are Active Volcanoes Found Around the World?

- Use the internet to find the locations of the major active volcanoes listed below.
- Write the country for each volcano and mark its location on the world map.



Volcano	Country
Mount Fuji	Japan
Mayon Volcano	Philippines
Mount Etna	Italy
Mount Merapi	Indonesia
Mount Ruapehu	New Zealand
Kīlauea	United States
Popocatépetl	Mexico

1) Are active volcanoes evenly distributed around the world, or are they concentrated in certain areas?

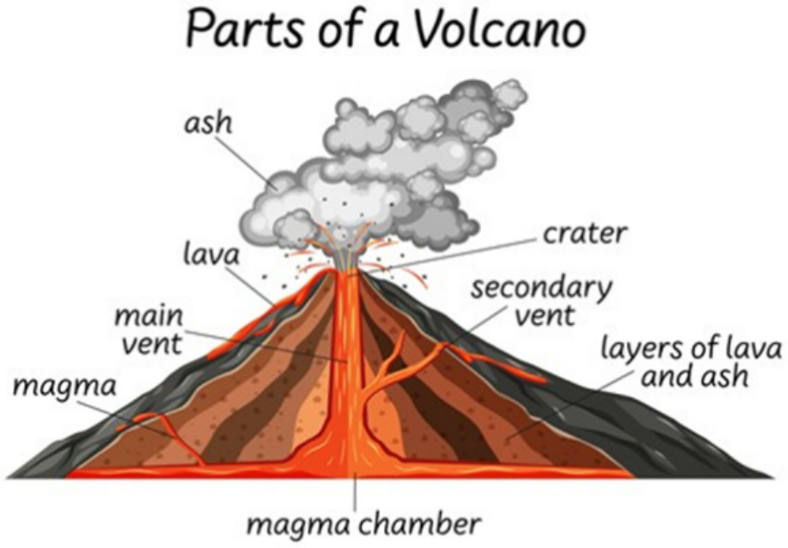
2) What patterns do you notice in the distribution of the active volcanoes you marked on the world map?

Session 2: What Hazards Can a Volcanic Eruption Cause?

Topic	Understanding Major Volcanic Hazards and Their Characteristics
What Will We Learn?	① Explain the characteristics of volcanic ash, lava flows, and pyroclastic flows. ② Understand that different volcanic hazards can affect different areas and distances.

1 What Comes Out When a Volcano Erupts?

- Look at the image below and identify the materials that come out of a volcano during an eruption.



*Key Terms in the image
magma / lava / ash / crate

1) Identify and write down the materials shown in the diagram that come out of the volcano during an eruption.

2) How might these materials affect areas around the volcano?

2 What Hazards Can a Volcanic Eruption Cause?

- When a volcano erupts, it can produce various hazards, including volcanic ash, lava flows, and pyroclastic flows.
- These hazards move in different ways and can affect different areas. Read the information below and identify the characteristics of each hazard.

(1) Volcanic Ash
Small pieces of rock and volcanic material ejected into the air during an eruption. Volcanic ash can be carried by the wind and affect areas far from the volcano.

(2) Lava Flows
Lava erupted from a volcano flows across the ground and can damage buildings, roads, farmland, and other areas in its path.

(3) Pyroclastic Flows
Hot volcanic ash, rock fragments, and volcanic gases move rapidly down the slopes of a volcano.

Hazard	How Does It Move?	What Damage Can It Cause?
Volcanic Ash		
Lava Flows		
Pyroclastic Flows		

1) Which of these hazards can affect areas far from the volcano? Why?

2) How might areas close to the volcano and areas farther away be affected differently?

Session 3: Which Areas Would Be at Risk if Mount Fuji Erupted?

Topic	Exploring How an Eruption of Mount Fuji Could Affect Local Areas and People's Daily Lives
What Will We Learn?	① Identify the areas that could be affected by volcanic ash using a Mount Fuji volcanic ash hazard map. ② Explain how an eruption of Mount Fuji could affect people's daily lives in Japan. ③ Use evidence to assess the possible effects of a Mount Fuji eruption on Korea.

1 Exploring the Potential Impact of Volcanic Ash from Mount Fuji

- If Mount Fuji erupts, volcanic ash can be carried by the wind and affect areas far from the volcano.
- The map below shows the potential depth of volcanic ash deposits if Mount Fuji were to erupt on a scale similar to the 1707 Hōei eruption.



Source: Cabinet Office, Government of Japan, *Map of Potential Volcanic Ashfall from Mount Fuji*

図　降灰可能性マップ

※ 2 cm, 10 cm, 30 cm, and 50 cm indicate the potential depth of volcanic ash deposits in different areas.

1) As the distance from Mount Fuji increases, how does the potential depth of volcanic ash deposits change?

2) Are only areas near Mount Fuji likely to be affected by volcanic ash? Could Tokyo also be affected?

2 Exploring How a Mount Fuji Eruption Could Affect People's Daily Lives

- Read the passage below and organize the possible effects of volcanic ash on people's daily lives in the table.

[Source 1] Effects of Volcanic Ash on Daily Life

If Mount Fuji experiences a large-scale eruption, large amounts of volcanic ash could accumulate over a wide area. Ashfall could disrupt rail services and road travel and cause problems with the transportation of supplies. It could also cause power outages, water supply disruptions, and communication failures. If large amounts of volcanic ash accumulate on buildings, they could also affect the safety of the buildings. In these ways, volcanic ash can affect people's daily lives and many functions of society.

Source: Adapted from the Cabinet Office, Government of Japan, *Guidelines for Large-Scale Volcanic Ashfall Measures in the Tokyo Metropolitan Area.*

Area of Daily Life	Possible Effects
Roads/Transportation	
Electricity/Water	
Buildings/Housing	
Supply of Goods	

3 Exploring the Possible Effects of a Mount Fuji Eruption on Korea

- Read the passage below and explore how an eruption of Mount Fuji could affect Korea.

[Source 2] Possible Effects of Volcanic Ash on Korea

In 2025, the Ministry of the Interior and Safety and volcano experts examined the possible effects of a Mount Fuji eruption on Korea. Mount Fuji is more than 800 km from Korea, and westerly winds generally prevail over Japan. For these reasons, experts expected the direct effects of volcanic ash on Korea to be quite limited. The Cabinet Office of Japan also estimates that the area affected by volcanic ash deposits following a Mount Fuji eruption would extend to approximately 200 km from the volcano.

Source: Adapted from Yonhap News Agency (May 28, 2025), *"Would a Mount Fuji Eruption Affect Korea? Experts Say the Impact Would Be 'Quite Limited.'"*

1) Find two pieces of evidence that experts used to conclude that the effects on Korea would likely be limited.

2) What kinds of effects do you think an eruption of Mount Fuji could have on Korea?

Session 4: What Should We Do During a Volcanic Eruption?

Topic	Learning Evacuation and Safety Actions During a Volcanic Eruption
What Will We Learn?	① Explain the safety actions needed during a volcanic eruption. ② Organize evacuation and safety guidelines for different situations.

1 Learning Safety Guidelines for a Volcanic Eruption

- Use the KMA Weather Nuri website to review safety guidelines for volcanic eruptions and fill in the blanks.

Safety Guidelines
· Prepare ( ), including dust masks, eye protection, drinking water, and flashlights, in case of a volcanic eruption. · Continue to check ( ), including weather conditions and hazards in the surrounding area. · Seal gaps around doors and ventilation openings with ( ), and seal windows with tape. · When volcanic ash is falling, stay ( ) whenever possible. · Listen to ( ) on TV or radio and follow the instructions. · When volcanic ash is in the air, cover your ( ) with a mask, handkerchief, or clothing to protect your respiratory system. I· f you are outdoors, quickly evacuate to ( ).

2 Reflection

- Think about what you have learned about volcanoes throughout the activities.

1) What is something new you learned through these activities?

2) What do you think is the most important safety action to take during a volcanic eruption? Why?

3) How has your understanding of volcanoes changed compared with before the lesson?