

LESSON 2: DESIGNING SAFETY

GRADE LEVEL K-2



VOLCANOES EDUCATOR GUIDE

An
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DIGITAL CROSSING
FILMS



Volcanoes Educator Guide

LESSON 2: DESIGNING SAFETY

GRADE LEVEL K-2
(1) 15 MINUTE PREP LESSON
(3) 45 MINUTE LESSONS

LESSON OVERVIEW:

In this lesson, students engineer protective equipment for scientists working near volcanoes. To begin, students learn about the different needs of volcanologists when studying volcanoes. Afterwards, students examine different materials and identify those whose properties would help volcanologists. Finally, students put the information together to create safety goggles for volcanologists.

SCIENCE STANDARDS:

- 2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- 2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

SCIENCE AND ENGINEERING PRACTICES:

- K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

FROM THE FILM:

In the film *Volcanoes*, we see all the different dangers that volcanologists face when working around active volcanoes. In this activity, students learn about the properties of materials to create a piece of protective gear for volcanologists.

MATERIALS:

- Goggles
- Spray bottles
- Clear plastic bottles (cut in half)
- Aluminum foil
- Wax paper
- String
- Pipe cleaners
- Tape
- Plastic wrap
- Popsicle sticks
- Construction paper
- Crayons

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TEACHER PREP:

DAY 1:

You will need to find a pair of science goggles for each group of students. These are often found in the science lab of a school.

DAY 2:

Assemble the materials bags for students. This bag will have smaller pieces of the materials students can use later in the design challenge. They will examine these materials, record their properties, then return the bag to you.

Because these are just a “sample” of what they can use later, fill each bag with a small piece (such as a 3 inch piece of string or a square cut of alumni foil) of the following materials:

- Clear plastic bottles (cut in half)
- Aluminum foil
- Wax paper
- String
- Pipe cleaners
- Tape
- Plastic Wrap
- Popsicle sticks

It is also optional to add to the materials bag with other materials that you feel would be appropriate and useful.

TO DO:

BEFORE VIEWING THE FILM:

1. Using a sentence strip or projector, show students the word “volcanologist”. If appropriate, practice sounding out the word with students. Ask students if they can make a prediction about what a volcanologist does. If they do not already guess the answer, show them the word “volcano” inside of volcanologist and tell them that a volcanologist is someone who studies volcanoes. Without giving more detail about a volcanologist’s job, challenge students to draw what they think a volcanologist would look like at their work place. Inform students that they are going to watch a film called **Volcanoes**. **Volcanoes** shows the life of people who study and photograph active volcanoes on our planet. Isn’t that neat? Challenge students to pay special attention to the people exploring volcanoes when they work. Ask them to remember one way that their job might be dangerous and one way that they keep themselves safe.

DAY 1:

1. Gather students around and ask them to share what they remember about the film.

How is a volcanologist’s job dangerous?

What are some ways that they saw volcanologists keeping themselves safe?

2. Tell students that today, they are going to learn more about a day in the life of a volcanologist. To do this, you can show them a short video from National Geographic:

<https://www.youtube.com/watch?v=ADnh2FcZwLg>

or read *Science Works: Be a Volcanologist* with the students. As you read or watch the video, ask students to circle words from the “Job Duties” activity page(s) that they observe the volcanologists doing on the job.

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DAY 1 CONTINUED:

3. At the end, ask the students to turn and talk. Brainstorm equipment that they believe would be helpful for a volcanologist to have on the job. *What would keep them safe and allow them to do their job duties?* At the end of the turn and talk, students should share out what they brainstormed. Record student ideas on the board. (Examples should be: walking sticks, gloves for touching hot objects, helmets to protect from falling rocks, etc.)

4. Note that they saw volcanologists had walking sticks to help them walk, helmets to keep their head safe, and technology to write and gather data. What they did not have, however, is something to protect their eyes. As a class, students will design goggles to help keep smoke and debris out of volcanologists' eyes. Group students in groups of 3 or 4.

5. Afterwards, present materials properties vocabulary to students. Opaque, translucent, transparent, flexible, rigid, smooth, rough, and any vocabulary you feel are appropriate for your students.

6. To begin, students should analyze a pair of science lab goggles (Goggles can usually be found in the science lab in the school. If your school has multiple kinds of goggles, you can mix up the type each group gets and do a compare and contrast activity). Give each group one pair of goggles and have them examine it. Students should mark their observations in the "Goggles Examination" activity page(s). When students are finished, lead a whole-class debrief.

DAY 2:

1. Review the parts of goggles with students as a warm up. Ask students,

What were the properties of the materials for the strap/ear piece?

What were the properties for the eyepiece?

2. Remind students that they will want materials that are smooth so they are comfortable for the scientists, transparent for the eye piece so they can see, not easily breakable and not porous so smoke and liquids can't get to their eyes.

3. Give each group a sample materials bag (please see teacher prep for contents) and the "Material Properties" activity page(s). Have students examine each material and record its properties. In order to test if the material is porous, you or the students can place the material in front of a piece of paper towel and spray it with a water bottle. If the paper towel beneath is still dry, the material is not porous.

4. Finally, have students draw their ideas for how they plan to make to goggles and list the materials they will need.

The Volcanoes film crew prepares to descend into Marum Crater, Vanuatu



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DAY 3:

1. As a warm up, have some groups present their goggle design plans to the class.
2. Tell students that they will have 5 minutes to gather their materials and 20 minutes to build their goggles. At the end, students will test the goggles by first putting them on themselves, seeing if the goggles stay on their face, if they can properly see while wearing them, and if they are comfortable. Afterwards, to test if the goggles will protect the eyes of the scientists, they will take the goggles off, put them in front of a piece of construction paper, and spray them with water to see how much area is protected.
3. Allow students to gather the materials they listed on the “My Plan” activity page(s).
4. Give students 20 minutes to build, circulating to assist groups as they need it.
5. At the end of the time, remind students that it is okay if they are not completely finished. Sometimes engineers have to do a lot of work in a short amount of time and don't fully finish their project. They still test their design regardless because it will help them make improvements.
6. Prompt students to start by trying to put the goggles on one of their teammates. Have the student rank the comfort and visibility of the goggles with the five stars on the “Testing” activity page(s).
7. Have students take off the goggles and place them on a piece of construction paper. You or the students can spray the goggles with water. Students should lift the goggles off and outline the space that remained dry with a crayon. This would be the area of the face that is protected by their design.
8. To conclude, you can have students look at each other's designs and construction paper outline. Afterwards, lead a short class debrief on the lessons they learned throughout the process of engineering safety devices.



Photographer Carsten Peter setting up camp on Marum Crater, Vanuatu.

What Does A Volcanologist Do?

Directions: Watch a video or read a book. What is the scientist doing?
Circle words the scientist does.

Reading

Sitting at a desk

Walking

Writing

Talking to others

Using technology

Taking measurements

Answering the phone

Grabbing rocks

What other activities did you see? _____

Goggle Examination

Directions: Your teacher will give you goggles. Look at the goggles. Feel the texture of the goggles. Record your observations in the box.

Word Bank:

Opaque

Transparent

Smooth

Rigid

Translucent

Clear

Rough

Flexible

Ear piece:



Materials Properties

Directions: Your teacher will give you a bag. The bag contains different materials. These are the materials you can use to make goggles. Examine each material. Record its properties.

Word Bank:

Opaque
Smooth

Translucent
Rough

Transparent
Rigid

Clear
Flexible

Material Name:	Properties:
Plastic Water Bottle	
Aluminum Foil	
Wax Paper	
String	
Pipe Cleaners	
Tape	
Plastic Wrap	
Popsicle Sticks	
Other:	

My Plan

Directions: Get in your project groups.
Decide together: How will you build the goggles?
Draw your idea.
List the materials you need.

Drawing:

Materials:

I will need (number) of (material).

I will need _____ of _____ .

I will need _____ of _____ .

I will need _____ of _____ .

I will need _____ of _____ .

I will need _____ of _____ .

Testing the Goggles

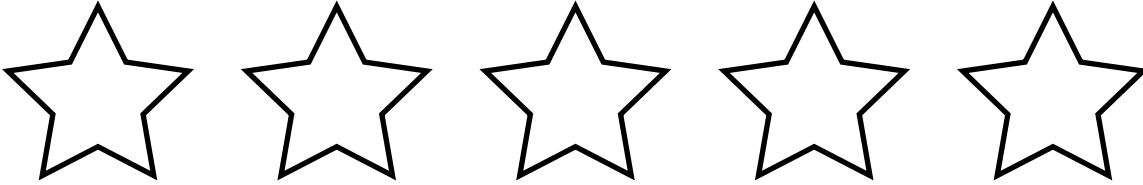
Directions: Put the goggles on your face.

Can you see well?

Is it comfortable?

Fill in the amount of stars you would give the goggles.

Vision:



Comfort:

