Sustainability and Mining

Level: Grades K-2
Facilitator Guide

LESSON DETAILS

Objective: Students will investigate how sustainability concerns can be addressed by mining companies.

Standards

NVACSS and NGSS

- **K-ESS3-3:** Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
- **DCI:** Natural Resources; Defining and Delimiting Engineering Problems; Biodiversity and Humans
- **SEP:** Asking Questions and Defining Problems; Engaging in Argument from Evidence; Systems and System Models
- **CCC:** Influence of Engineering, Technology, and Science on Society and the Natural World

Career Readiness

- **1.2.5:** Demonstrate lifelong-learning skills by continually acquiring new industry-related information and improving professional skills.

Materials

- computer with internet access and a projector
- 3-5 mineral samples (preferably from Nevada and with a range of appearances)
- products made from one mineral (chalk, graphite, copper wire)
- art supplies for student drawings
- samples of common rocks/minerals found in products (optional)

Lesson Summary

Students begin by making observations of areas where mining has taken place as an introduction to mining. Students then describe mineral samples to understand how each mineral has unique properties that relate to their function. A discussion of minerals in products can help students see how minerals are part of items that people use. Students then return to the mine images to consider the balance of the effects of mining (positive versus negative). The lesson concludes with students drawing pictures of how they would restore land after mining has been completed and how this helps achieve a more sustainable world.

Preparation

Carefully consider the rock and mineral samples you want students to observe in **Explore** so that they relate to the products that you show in **Explain**.

Engage

1. Choose an image of one or more mines from **this site** to show students.

2. Ask students to describe what they observed and hypothesize why certain materials eroded or dissolved faster than others.

    a. Only show the left half of the images so they see the mine, but do not yet see the site after it has been reclaimed/restored.

    b. Harmony Latke and the two Magmont Mine images are recommended, as they contain evidence of human influence, but also because parts of the "before" image are recognizable in the “after” image, which will help students later in the lesson.

3. Tell students that the images show old mines, which is where people remove rocks and minerals from the ground to use in making products.

Explore Minerals

1. Provide student groups with 3-5 samples of minerals common in Nevada. Be sure to use samples with a wide range of properties (e.g., shiny versus dull, regular versus irregular shape).

2. Give students time to make observations of the minerals.

3. Ask students to group the minerals in different ways. Have students share why they chose the groups they did. Examples of groupings include:

    a. Color

    b. Shine (known as luster)

    c. Shape

4. Ask students if they have seen any of these minerals before or if they remind them of something they have seen or used (e.g., they may relate a metallic mineral to something made of metal).

5. Provide examples of rocks and have students describe how these differ from the mineral samples.

    a. Discuss that rocks contain multiple minerals.

    b. Ask students if they know of materials made of rocks (e.g., roads and construction materials).

Explain

1. Show students examples of products made from one rock or mineral, such as chalk, graphite, and copper wire.

    a. Have students describe the uses of these products.

    b. Discuss and show how the properties of these minerals make them ideal for their use (i.e., chalk and graphite "break" easily and so can be used for writing, demonstrate how **copper is good at conducting electricity** or how the copper wire bends to be able to be run through a building).

2. Show students **images and graphics** of how rocks and minerals are also used in other objects and materials that might not be as obvious.

    a. If possible, have examples of some of the more common rocks and minerals shown in these images, like limestone, mica, gypsum, and salt.

    b. Discuss how minerals in more complex objects are also chosen for specific properties that make them ideal for certain jobs.

Elaborate

1. Show students the same images as in the **Engage.** Remind them that most minerals are mined like shown in these pictures.

2. Ask students:

    - *Now that you know some examples of minerals and what they do, do you think it's worth it to mine minerals even if it affects if environment?*
    - *Do you think a mine can run forever?*
    - *Why might a mine shut down?*

3. Show an example of a rock that has a small quantity of a specific mineral (i.e., like **this ore that contains gold**).

    a. Discuss how it might be difficult to get the gold out of the rock and how it might not be worth the effort to get so little gold.

    b. Describe sustainability as: "taking care of our Earth so it stays nice for a long time."

Evaluate

1. Show students the same images as from the **Engage** one more time. Ask students:

   ▸ *Now that these mines are closed, what might you do to fix these areas?*

2. Have students draw pictures to show what they would do to restore the environment of one of the mines.

3. Have some students share their pictures with the class, or have a gallery walk so students can see others' ideas.

4. Show the mine images again, but this time, also show their "after" images.

   a. Have students describe what was changed about the areas to restore them. This is called "rehabilitation."

   b. Discuss what parts of the photos help students identify that the before and after are the same area (e.g., tree lines, bodies of water, or hills often help identify the areas).

HANDOUT

Explore

			Mineral Name
			Color
			Shine
			Shape
			Other Observations