

Physical Science Lesson Plan: Illuminating the World Beneath in Hungary, Romania, and Russia



Bolshaya Udina Volcano on the Kamchatka Peninsula, Russia



Salina Turda Salt Mine, Romania



János Molnár Underwater Cave in Budapest, Hungary

For children and adults alike, the world beneath our feet is a fascinating place of discovery which invites minds to wander down complex and diverse paths. The exploration of caves, caverns, and old abandoned mines consistently enhances our understanding of the world not just beneath us, but of the one we see and live in every day. For example, geothermal energy not only produces healing waters in natural springs which we bathe in on the surface, but also produces life-taking lava. That thermal energy has been used by humans in an array of different ways and has changed the way people interact with their physical environment. The more the activity of earth's lithosphere is illuminated, the more we can successfully interact with and understand the world we are a part of. This illumination requires not only the exploration of new places, but of new cultures.

Did you know that there are volcanoes in Russia? That in Romania there is an old salt mine with an entire amusement park inside? That under Hungary's capital, Budapest, there is an entire city's worth of caves filled with thermal water that you can scuba dive in? Some have yet to be explored! Bringing Russia, Romania, and Hungary into the US classroom can help teach children not only about the basics of physical and earth sciences, but can provide them the opportunity to

learn about what and who lives on the surface of that place and how those people interact physically and socially with their environment.

The following lesson plan is intended for early elementary school students, but can be easily adapted for higher grades as well with lesson extensions and the use of different materials.

Guiding questions:

What is illumination?

What can the light from a flashlight show you in a lit room, in a dark one?

How do you adapt when you see something new?

What happens when you shine a light in a place that is usually dark?

What can people in caves see or encounter and what do they do with what they see?

Have you ever been in a cave or by a volcano? If so, what types of tools did you use to illuminate your path?

Example guiding questions for older or more advanced students:

What types of life can you find in dark places like caves?

What types of special adaptations do creatures make in the dark?

How do people living on the surface use and interact with the caves and mines beneath them?

What is the difference between a cave, a mine, and a cavern?

Learning Objectives:

This lesson plan can be altered to shift focus on life sciences, physical science, and/or earth science.

1. Make observations to collect evidence and explain that objects can be seen only when illuminated.
2. Develop a model mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. Explore how those external parts could solve a human problem.
3. Make observations of plants and animals to compare the diversity of life in different habitats.

Lesson Preparation:

Review the lesson plan. Familiarize yourself with google earth, watch the linked YouTube videos, and print out the linked coloring sheets. Collect the rest of the materials. If you have time, further explore Hungarian, Romanian, and Russian sites below to better familiarize yourself with the sites in the lesson.

Split the students into three groups, a Russia, Hungary, and Romania group, respectively. The night before the lesson, send children home with the coloring sheet which corresponds to their country. Ask them to color it and have them tell you one fun fact about the physical geography of their region the next day in class, which they should mark on their coloring sheet as accurately as they can. (A simple google search at home accompanied by a guardian, should do.)

Lesson Presentation:

Have the students pull out their homework and quickly review their own findings. Use Google Earth and show the students the three sites: the underwater caves in Hungary, the mine amusement park in Romania, and the volcanoes in Russia via the program. Ask students if anyone found these places online. Show all students the three short videos, highlighting the different ways the underground can be illuminated, and the three different modes of exploration.

Lesson Practice:

Put the students in their three groups and have them talk to one another about the places they found using the maps they colored. How can the places they found be illuminated and explored? Which place do they find most interesting and why? Walk around to each group and help facilitate productive conversation.

Provide each group with materials to make a diorama of their place of choice. They can choose the place shown in the video or choose from one of the group member's discoveries the previous night. Have the group work together to create a diorama of their favorite place.

Lesson Production:

Have each group "present" their findings. Ask each student to say a sentence or two about the dioramas. Then ask the students to shine a flashlight on the diorama. Does that change its appearance? Does it change the colors of the paper they used? Can they see the glue holding things together?

Close by talking a bit more about the idea of illumination. Why is an erupting volcano more interesting than a dormant volcano? Is it because erupting volcanoes shed light on usually dark places? What else can we illuminate besides places beneath the earth's crust?

Extend this lesson:

To incorporate curriculum in the life sciences, have students research or discuss life in the underwater caves using the "Life in Total Darkness" article and "Cryptic Underwater Maze" video listed below.

Materials and media:

Shoe boxes, cardboard for cave, mine, and volcano dioramas
Glue
Markers
Scissors
Construction Paper
Flashlights
Internet access and large screen to show short videos and present maps

Google Earth (for maps of all places mentioned):

<https://www.google.com/earth/>

Underwater caves beneath Budapest, Hungary:

1. Video: The Hungarian City Built Over 80 Underwater Caves

<https://www.youtube.com/watch?v=DFFDKZ0JyQ>

2. Article: “The Labyrinthine ‘Underground Flower Garden’ Caves Beneath Budapest”
<https://www.atlasobscura.com/articles/the-labyrinthine-underground-flower-garden-caves-underneath-budapest>
3. Picture/Video Story: “A Hidden World 30 Meters Below Budapest”
<http://www.bbc.com/travel/gallery/20180514-a-hidden-world-30m-below-budapest>
4. Coloring sheet: Hungary
<https://www.coloring.ws/t.asp?t=https://www.coloring.ws/countries/hungary/map2.gif>

Romanian Salt Mines:

1. Video: This Transylvanian Salt Mine is Now an Amusement Park, National Geographic
<https://www.youtube.com/watch?v=BnvetBBa5zE>
2. Video: SALINA TURDA- Flying in one of the best Underground location in the world! [4K]
<https://www.youtube.com/watch?v=vgXnEFJc4ec>
3. Article: “Salina Turda”
<https://www.atlasobscura.com/places/salina-turda>
4. Coloring sheet: Romania
<http://www.supercoloring.com/coloring-pages/romania-map>

Russian Siberian Volcanoes:

1. Video: 360 degrees Kamchatka Volcano Eruption, National Geographic
<https://www.youtube.com/watch?v=o3a1fkLsNS4>
2. Map and FAQ site: Volcano Discovery
<https://www.volcanodiscovery.com/russia.html>
3. Article: “Twelve Active Russian Volcanoes”
https://www.rbth.com/articles/2012/08/15/twelve_active_russian_volcanoes_17407.html
4. Coloring sheet: Russia Map
<https://coloringhome.com/coloring-page/1827486?album=russia-coloring-pages>

Life in Underwater Cave Systems

1. Informative Article: “Life in Total Darkness—Investigating Underwater Cave Systems
https://www.usgs.gov/center-news/life-total-darkness-investigating-underwater-cave-ecosystems?qt-news_science_products=3#qt-news_science_products
2. Video: “This Cryptic Underwater Maze Holds Life That Survives on Methane”
<https://www.youtube.com/watch?v=NHxKqsGShDc&fbclid=IwAR3X1FWbHHBpyBfVHZSHBbXgklkyhb5EW2ujY313quiIjJ99RQvc-r8s6j8>