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Title: Minerals and the Products of Mining

Level: Middle/Secondary

Day/Time: Four Activities, 45-60 min./Activity

KERA Goals: 1.2, 1.7, 1.13, 1.16, 2.2, 2.5, 2.16, 2.18, 2.19, 6.1, 6.3

Objectives:

1. Students explain any perceived relationship between mineral resources and political/economic power.
2. Students test knowledge through puzzles and classroom activities.
3. Students research different minerals and educate one another about their formation, uses, and location of deposits.
4. The extension experiment further investigates the formation of mineral deposits. Students crush pigments to make their own mineral-based paints.

Each activity is designed to be completed in 1 classroom period, unless noted otherwise.

Background Information:

1. We mine many different minerals from Earth, which provide us with almost any product or technology imaginable.
2. All of these products exist in limited supply on and under the Earth's surface, so it's important that we realize what they are and where they came from.

Everything we use on Earth that is not made of plants or animals is made of minerals. These minerals are our natural resources. They are mined so that we can have all of the products we're used to using. Even though over 99 percent of the Earth's surface has never been mined, it's important to remember that minerals exist in limited supply. We should be aware of what products they provide us with and use our mineral resources wisely.

Activity 1: Where Are the Minerals?

Materials:

Where Are the Minerals? student list

World map

Non-permanent dot stickers

1. Assign specific minerals from the list to pairs or groups of students and have them locate major mineral-producing countries by placing dots on the world map.
2. Discuss or write about topics in light of current events. Notice some economically

powerful countries have many dots on them. Is there a connection between economic power and mineral wealth? What would happen if industrial countries that are poor in mineral resources (Japan for example) were cut off from mineral resources? Is this likely to happen?

Activity 2: What's Mined Is Yours

Materials:

Whats Mined Is Yours student worksheet

1. Talk about the mineral products in the classroom. Chalk is a mineral, so is the metal in desks and glass in windows. Pencil "lead" is actually graphite. What other mineral products are there in the classroom?
2. Hand out the student worksheet What's Mined Is Yours. Ask students to log their activities from the day before and try to come up with the mineral products that they used in each activity.
3. Use the end of this class, or the beginning of the next to choose one of the common activities, such as eating breakfast, and write a master list on the board of mineral products used by everyone during this activity. See the attached What's It Made of? list for some ideas on the minerals that make up basic items.

Activity 3: Research Assignment (2 class periods)

Materials:

Common Ground Video

This research activity can be assigned right after students view the Common Ground video.

1. List the minerals below on the board.
2. As an assignment, each student should choose a mineral from the list and research it. What is the mineral used for? What are the properties that suit it for these particular use? How was it formed? Where are major deposits located and how is it mined? Most of this information can be found in encyclopedias or geology and minerals books. In the second class, each student gives an oral presentation about their mineral and its uses.

Aluminum
Antimony
Barite
Bentonite
Beryllium
Boron
Cadmium
Calcium Carbonate
Chromium

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Clay
Coal
Copper
Feldspar
Fluorspar
Gold
Graphite
Gypsum
Iron
Kaolin
Lanthanides
Lead
Lithium
Manganese
Mercury
Mica
Molybdenum
Nickel
Platinum
Quartz
Silica
Silver
Talc
Tin
Titanium
Trona
Tungsten
Wollastonite
Zinc
Zirconium

Lesson Evaluation:

Copy and distribute the Mining and Minerals Crossword. Have students complete as a classroom assignment.

Activity 4: Painting With Minerals

Our ancestors used mineral paints to record history with cave paintings and later used mineral-based face paints for ceremonial and ritual makeup. The pigments in paints we use today are also provided by different minerals. This activity allows students to grind their own pigments and use them to make paints.

Materials:

Aluminum foil muffin cups

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Mortar and pestle for grinding

Charcoal

Terra cotta flowerpot or brick

Colored chalk

Optional Binders:

1. egg yolk beaten with water

2. linseed oil to make oil paints (this will require turpentine to clean brushes), or

3. 1 tablespoon low-fat cottage cheese mixed with one tablespoon warm water and one teaspoon baking soda.

1. Grind the charcoal, terra cotta and colored chalk until it is finely crushed.

2. In the muffin cups, mix pigments with water, or experiment with the different binders listed.

3. Have the students make their own art by painting pictures with their homemade paints.

Aluminum (Bauxite)	Australia, Guinea
Andalusite	South Africa, India
Barite	China, India
Beryllium	U.S., Russia
Borates	Turkey, U.S.
Cadmium	Japan, Belgium
Chromite	South Africa, Russia
Clays	U.S.
Copper	Chile, U.S.
Diatomite	U.S., France, Romania
Feldspar	Italy, U.S.
Fluorspar	China, Mongolia
Graphite	Korea, India
Gravel	U.S.
Gypsum	U.S., Canada
Industrial Diamonds	Australia, Zaire
Iron	Russia, China
Kyanite	South Africa, India, France
Lead	Australia, U.S.

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Lime	Russia, China
Limestone	U.S
Micas	U.S., Russia
Nickel	Russia, Canada
Perlite	U.S., Greece
Platinum	South Africa, Russia
Potash	Russia, Canada
Pumice	Italy, Greece
Selenium	Japan, Canada
Silica Sand	U.S., Netherlands
Sillimanite	South Africa
Sodium Sulfate	Mexico, Spain
Sulfur	U.S., Russia
Talc	Japan, U.S
Tin	China, Brazil
Titanium	Russia, Japan
Trona (Soda Ash)	U.S., Kenya
Tungsten	China, Russia
Vermiculite	South Africa, U.S.
Wollastonite	Germany, Great Britain
Zeolites	U.S., Tanzania
Zinc	Canada, Australia
Zircon	Australia, South Africa

Student Handout: What's it Made of?

Batteries: Antimony, Cadmium, Lead, Zinc

Bicycle: Aluminum, Clay, Diatomite, Mica, Sulfur, Selenium, Wollastonite, Zinc

Books: Clay, Limestone, Sodium Sulfate, Feldspar

Bricks: Bauxite, Chromite, Zircon, Silica, Graphite, Kyanite, Andalusite, Sillimanite, Clays

Car: Platinum, Iron, Aluminum, Lead, Coal, Barite, Boron, Calcium Carbonate, Bentonite, Silica, Chromium, Perlite, Wollastonite, Mica, Industrial Diamonds, Zeolite, Clays

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Carpet: Limestone, Selenium, Lime, Soda Ash, Zeolite, Bentonite, Titanium, Sulfur, Diatomite, Petroleum Products

Cement: Limestone, Gypsum, Iron, Clays, Diatomite, Feldspar

Chalk: Limestone

Clothing: Boron, Halite, Molybdenum, Sulfur

Computer: Aluminum, Antimony, Barite, Beryllium, Cobalt, Columbium, Copper, Gallium, Germanium, Gold, Indium, Iron, Lanthanides, Lithium, Manganese, Mercury, Mica, Molybdenum, Nickel, Platinum, Quartz, Rhenium, Selenium, Silver, Strontium, Tantalum, Tellurium, Tin, Tungsten, Vanadium, Yttrium, Zinc, Zirconium

Cosmetics: Iron, Silica, Limestone, Talc

Desk: Copper, Iron, Zinc, Nickel

Digital Alarm Clock: Boron, Copper, Gold, Quartz

Doorknob: Iron

Drinking Glass: Boron, Silica

Electrical Cords, Outlet (electricity): Coal, Copper

Glass: Silica Sand, Feldspar, Trona

Lights: Aluminum, Copper, Beryllium (florescent), Tungsten (incandescent), Tin, Nickel

Linoleum: Limestone, Clay, Wollastonite, Petroleum Products

Magazine: Clay, Kaolin, Sodium Sulfate, Titanium

Paint: Titanium Oxide, Clays, Limestone, Mica, Talc, Silica, Copper, Fluorspar, Iron Tungsten, Zinc, Cadmium

Paper: Boron, Clay, Kaolin, Sulfur, Talc, Titanium, Trona

Pencils: Graphite, Clays

Pencil Sharpener: Iron, Copper, Zinc

Pens: Limestone, Wollastonite, Mica, Talc, Clay, Silica, Petroleum Products, Sulfur

Photograph: Chromium, Silver, Sulfur

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Plaster Wall: Gypsum, Perlite

Plastic: Limestone, Wollastonite, Coal, Talc, Silica, Petroleum Products

Rubber: Sulfur

Sidewalk: Sand, Gravel, Gypsum, Iron, Dolomite, Diatomite, Limestone

Skateboard: Aluminum, Calcium Carbonate, Clay, Coal, Iron, Mica, Sulfur, Silica, Talc, Wollastonite

Soda Can: Aluminum

Telephone: Aluminum, Beryllium, Coal, Copper, Gold, Iron, Limestone, Silica, Silver, Talc, Wollastonite

Television Set: Aluminum, Antimony, Barite, Beryllium, Cobalt, Columbium, Copper, Europium, Gallium, Germanium, Gold, Indium, Iron, Kaolin, Lanthanides, Limestone, Lithium, Manganese, Mercury, Mica, Molybdenum, Platinum, Rhenium, Selenium, Silica, Strontium, Tantalum, Tellurium, Terbium, Tin, Titanium, Vanadium, Yttrium, Zinc, Zirconium

Tennis Racket: Graphite

Wallpaper: Mica, Trona

Window: Feldspar, Irona, Silica, Trona

Mineral Products: What's Mined Is Yours Worksheet

Earth bears many minerals which play a major role in our daily lives. Look around the room and you'll see many objects that are metal. We mine Earth's ore deposits to make iron, copper, aluminum and other metals. Mineral fuels, such as coal, give us energy to heat, air condition, light up and electrify our homes, offices and factories. Minerals are also mined for stone products to make concrete, brick and glass for our buildings, roads and playgrounds. And a broad assortment of Earth's minerals go into paper, paint, plastics, chemicals, filters, films, fertilizers, and many other products.

Make a log of what you did yesterday and how many mineral products you actually used.

Activity	Mineral Products Used (Metal, Energy, Stone, Industrial Minerals)		

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Example:

Activity	Mineral Products Used (Metal, Energy, Stone, Industrial Minerals)		
Woke Up	Alarm Clock	Room-Walls	
	Light	Carpet	
Ate Breakfast	refrigerator	spoon, knife	microwave
	toaster	plate, bowl	

Crossword Puzzle: Minerals and Mining

Clues

Across

1. In 1849, this brought fortune hunters to California. (2 words)
6. Killer shark.
10. Period of time.
11. What is left of an ancient city.
12. Nuisance, Dennis was one.
13. Two of these make a ballerina's skirt.

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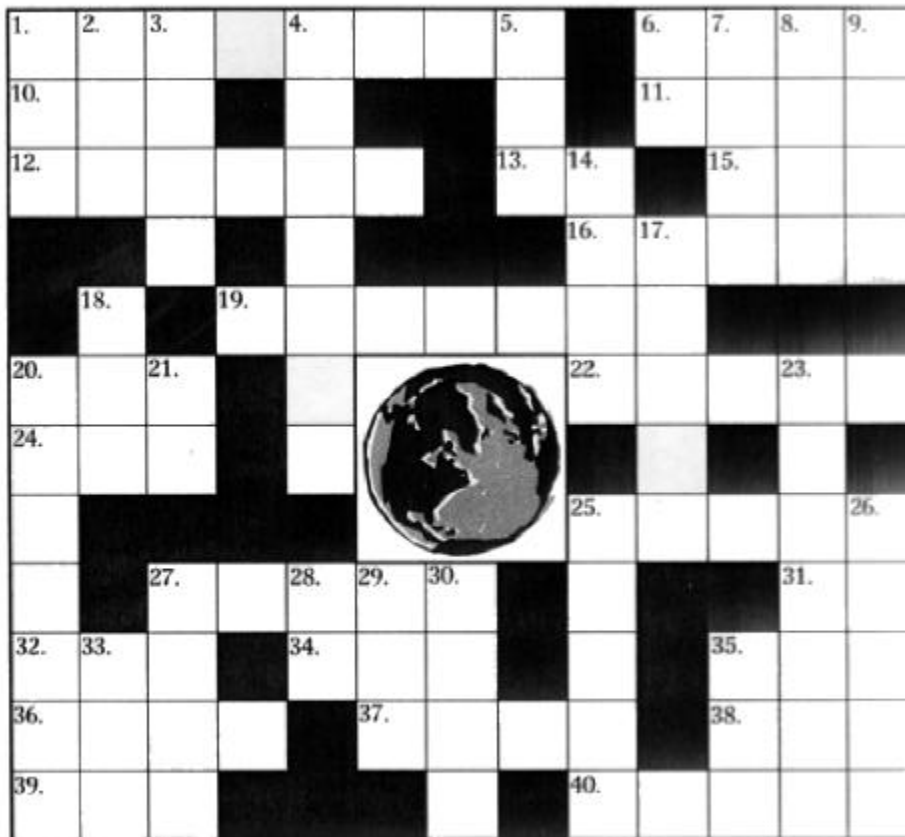
15. Tender loving care. (Abbr.)
16. Rock.
19. This person brushes mineral colors onto houses.
20. Color of cinnabar.
22. Landfills.
24. What you do to get the minerals your body needs.
25. To move with wheels or blades on your feet.
27. Snapshot.
31. Chemical symbol for radium.
32. Certified public accountant. (Abbr.)
34. Tear.
35. We breathe it.
36. Volcano's melted rock.
37. Pointed metal with a flat head, driven with a hammer.
38. Cooking container.
39. You see with it.
40. You brush them with toothpaste.

Down

1. Any polished stone used in jewelry, prized for its beauty.
2. Minerals as they exist in a deposit.
3. Earth is made up of air, water, and _____.
4. What modern miners do with land after it is mined.
5. Metal in a liquid state is this.
6. Used with the name of a man.
7. You couldn't drive this without steel, aluminum, zinc and lead.
8. Oven for baking ceramics, brick or pottery.
9. One time only.
14. When you are done with something, it is this.
17. A mine-working vehicle that weighs as much as 6 jet airplanes.
18. It once covered Earth, leaving deposits of limestone and shale.
20. To use something over and over again.
21. Defensive tackle. (Abbr.)
23. Defense missile used in the Gulf War; the SCUD was its target.
25. A way to refine ore, "melt" it and separate impurities.
26. Planet (pictured).
27. To cover a road with asphalt, concrete or brick.
28. This _____ that.
29. Food cans are made of this metal.
30. A shiny polished stone that reflects light in a rainbow effect.
33. When you buy something with money.
35. Monkey.

Crossword Puzzle: Minerals and Mining

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Answers:

Across

- 1. Gold Rush
- 6. Mako
- 10. Era
- 11. Ruin
- 12. Menace
- 13. Tu
- 15. TLC
- 16. Stone
- 19. Painter
- 20. Red
- 22. Dumps
- 24. Eat
- 25. Skate
- 27. Photo

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- 31. Ra
- 32. CPA
- 34. Rip
- 35. Air
- 36. Lava
- 37. Nail
- 38. Pot
- 39. Eye
- 40. Teeth

Down

- 1. Gem
- 2. Ore
- 3. Land
- 4. Reclaim
- 5. Hot
- 6. Mr.
- 7. Auto
- 8. Kiln
- 9. Once
- 14. Used
- 17. Truck
- 18. Sea
- 20. Recycle
- 21. DT
- 23. Patriot
- 25. Smelt
- 26. Earth
- 27. Pave
- 28. Or
- 29. Tin
- 30. Opal
- 33. Pay
- 35. Ape

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