

Rocks, Minerals, and Resources

A Closer Look at Earth's Vital Materials

Where do we get power and light? Why is water so precious? What makes gold and diamonds sparkle? The *Rocks, Minerals, and Resources* series answers these and many other questions while teaching students about the natural world. These interesting books provide students with important facts about nature and the historic demand for earth's precious materials. The *Rocks, Minerals, and Resources* Teacher Guide fuels further exploration of our planet's natural resources with exciting, hands-on lessons. By using this guide, you have an opportunity to tap into high student interest while exposing students to broad social, scientific, and environmental issues.

Participation in these lessons will lead students to make personal connections to global issues, such as the need for conservation of natural resources and solutions to pollution problems worldwide. Students will become aware of some of the issues involved in burning fossil fuels and learn about minerals that are vital to the human body. They will recognize the need to make attaining natural resources safer and cleaner for the future.

The lesson plans in this guide are tailored for grade 4 and address various subjects including art, language and performing arts, science, and social studies. Each lesson plan is designed to stand alone. As such, the lessons do not need to be presented in sequential order. Helpful reproducible worksheets appear at the end of the guide. The titles in the series include:

Coal

Oil and Gas

Gold

Fossils

Salt

Metals

Minerals

Sand and Soil

Diamonds and Gemstones

World of Water

All lesson plans included in this guide may be used in combination with one or more of the *Rocks, Minerals, and Resources* books.

As students investigate the topics addressed in the guide and become more aware of the need for earth's materials, they will sharpen their critical thinking and problem-solving skills. So get ready to pose problems and brainstorm solutions with your class as you have fun learning about natural resources!



National Standards Correlation

Lesson Plan Title	Correlation to National Standards
<p>The Most Important Thing</p>	<p>Language Arts Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes. Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).</p> <p>Science Students should develop an understanding of properties of earth materials. Students should develop an understanding of types of resources.</p>
<p>A Day Without Power</p>	<p>Language Arts Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).</p> <p>Science Students should develop an understanding of types of resources. Students should develop an understanding of properties of earth materials.</p> <p>Social Studies The learner can examine the interaction of human beings and their physical environment, the use of land, building of cities, and ecosystem changes in selected locales and regions. The learner can explore causes, consequences, and possible solutions to persistent, contemporary, and emerging global issues, such as pollution and endangered species. The learner can examine the relationships and tensions between personal wants and needs and various global concerns, such as the use of imported oil, land use, and environmental protection.</p>
<p>Fossil Finds</p>	<p>Science The student should develop abilities necessary to do scientific inquiry. The student should develop an understanding of properties of earth materials. The student should develop an understanding of changes in earth and sky.</p> <p>Social Studies The learner can work independently and cooperatively to accomplish goals.</p>
<p>Rain, Rain, Go Away!</p>	<p>Language Arts Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.</p> <p>Science Students should develop an understanding of changes in earth and sky. Students should develop an understanding of changes in environments.</p> <p>Social Studies The learner can examine the effects of changing technologies on the global community. The learner can explore causes, consequences, and possible solutions to persistent, contemporary, and emerging global issues, such as pollution and endangered species.</p>

Lesson Plan Title	Correlation to National Standards
<p>Water, Water, Everywhere</p>	<p>Language Arts Students apply knowledge of language structure, language conventions (e.g. spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and non-print texts.</p> <p>Science Students should develop an understanding of changes in earth and sky. Students should develop an understanding of types of resources. Students should develop an understanding of properties of earth materials.</p> <p>Social Studies The learner can work independently and cooperatively to accomplish goals. The learner can examine the effects of changing technologies on the global community. The learner can explore causes, consequences, and possible solutions to persistent, contemporary, and emerging global issues, such as pollution and endangered species.</p>
<p>What's in That Dirt?</p>	<p>Science Students should develop an understanding of properties of earth materials.</p> <p>Social Studies The learner can work independently and cooperatively to accomplish goals.</p>
<p>Sticking Together</p>	<p>Science The student should develop an understanding of properties of earth materials. The student should develop an understanding of changes in environment.</p> <p>Social Studies The learner can work independently and cooperatively to accomplish goals.</p>
<p>Salt of the Earth</p>	<p>Science Students should develop an understanding of types of resources. The student should develop an understanding of properties of earth materials.</p> <p>Social Studies The learner can examine the interaction of human beings and their physical environment, the use of land, building of cities, and ecosystem changes in selected locales and regions.</p>

For state specific educational standards, please visit <http://www.crabtreebooks.com/>.

Overview and Scope of Lesson Plan Activities

Lesson Plan Title	Subject Areas	Major Concepts
The Most Important Thing	Language Arts Science	<ul style="list-style-type: none"> • discussing important resources • designing an informative Web site • speaking persuasively
A Day Without Power	Science Social Studies	<ul style="list-style-type: none"> • origins of fossil fuels and renewable and non-renewable energy sources • uses of power in daily life • everyday activities to conserve power use
Fossil Finds	Science	<ul style="list-style-type: none"> • imprint fossils and the work of paleontologists • creating imprint fossils • identifying plants from fossil leaf rubbings
Rain, Rain, Go Away!	Art Language Arts Science Social Studies	<ul style="list-style-type: none"> • causes and effects of acid rain and global warming • generating possible solutions for acid rain and global warming • creating an informative poster about one such issue
Water, Water, Everywhere	Performing Arts Science Social Studies	<ul style="list-style-type: none"> • understanding the water cycle, the importance of water to life and the uses of water • creating and presenting a newscast about an important water-related issue
What's in That Dirt?	Science	<ul style="list-style-type: none"> • different types of soil • making and recording observations • basing a conclusion on recorded observations
Sticking Together	Science	<ul style="list-style-type: none"> • the relationship between root systems and topsoil • observing the effects of growing grass on soil • recording observations
Salt of the Earth	Science Social Studies	<ul style="list-style-type: none"> • understanding the importance of salt in history • identifying uses of salt • creating a model salt pan

Pacing Chart and Vocabulary

One class period is approximately 40 minutes.

Lesson Plan Title	Pacing	Vocabulary	Assessment
The Most Important Thing	2 class periods	minerals natural resource persuade	Assess student Web site designs for accuracy, relevance of illustrations and vocabulary terms, thoughtful summarization of facts, and creativity.
A Day Without Power	1–2 class period(s)	fossil fuels non-renewable energy sources renewable energy sources	Assess participation and behavior during discussion and activity. Evaluate reproducibles for completion.
Fossil Finds	2 class periods	imprint fossil paleontologist	Evaluate reproducibles for completion, neatness, and correct identification of plant type.
Rain, Rain, Go Away!	1–2 class period(s)	acid rain global warming greenhouse effect	Assess posters for accuracy, neatness, and completion. Monitor students' cooperation and participation.
Water, Water, Everywhere	2–3 class periods	water cycle water preservation	Use the reproducible as a rubric to evaluate student groups' newscasts.
What's in That Dirt?	1 class period	minerals nutrients silt	Evaluate students' reproducibles for completion and correct observation.
Sticking Together	3 partial class periods over a week	topsoil root system	Evaluate students' reproducibles for completion and comprehension of main ideas.
Salt of the Earth	1 class period	mineral salt pan solar evaporation	Assess students' participation during class discussion. Evaluate students' reproducibles.

The Most Important Thing

A Lesson on Sharing the Importance of Rocks, Minerals, and Resources

Content

Students will work in small groups to summarize and then design persuasive Web sites about one of the *Rocks, Minerals, and Resources* books.

National Standards

The following standards will be addressed in the lesson:

Language Arts

Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).

Science

Students should develop an understanding of properties of earth materials.

Students should develop an understanding of types of resources.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Interpersonal



Verbal-Linguistic



Visual-Spatial

Prerequisites

Students should read the books in the *Rocks, Minerals, and Resources* series and become acquainted with the rocks, minerals, and resources featured in the series.

Materials

- chalkboard and chalk or whiteboard and markers
- books from the *Rocks, Minerals, and Resources* series
- student copies of *The Most Important Thing* reproducible
- poster board, one per small group
- markers

Instructional Procedure

Anticipatory Set

Write the following list on the board: *drinking water, firewood, boat, shelter, TV*. Ask students to vote on which of the following items would be most important to them if they were stranded on a deserted island. Tally their votes and write them on the board.

Class Discussion

Lead the students in a discussion about their responses. Invite students to explain their thought processes while deciding upon what they think would be the most important item. Emphasize that different people consider different items to be more valuable than others. After some students have explained their reasoning, take another vote and see if some students have changed their minds about what item is the most important item on the list. If the number has changed, explain that some of the students have *persuaded* (convinced by argument) their peers to change their minds.

Objectives

The student will be able to...

- define *minerals, natural resource, and persuade*
- identify important facts in a small group
- design a Web site about his or her assigned resource in a small group
- attempt to persuade the class that his or her resource is the most important one

Activity

Have students define *mineral* (non-living, naturally occurring substance) and *natural resource* (something found in nature that is useful to people, such as water, forests, metals, and fossil fuels). Explain that, just as in the desert island exercise, different people consider different minerals and resources to be more important than others.

Part I: Become Experts

Divide students into small groups. Assign each group a book in the *Rocks, Minerals, and Resources* series to read and discuss. Distribute the books and reproducibles. Instruct students to read Part I of the reproducible and begin reading and taking notes in their small groups.

Part II: Persuade Others

Distribute the poster board and markers. Have students read the directions to Part II and design the homepage of a Web site about their mineral or resource on their poster board. Each homepage should include two graphics (drawings), three vocabulary terms, four important facts, an e-mail contact for more information (such as “metalsgroup@4thgraderoom101.com”) and a link to a real or imaginary organization that can teach people more about the resource (such as “www.healthysaltuses.org”). Once each group has designed its Web site, have each group present its design to the class. While presenting, each group should try to persuade the rest of the class that their specific mineral or resource is the most important one. Encourage audience members to take notes while the groups present.

Accommodations and Extensions

Students may read their assigned *Rocks, Minerals, and Resources* book for homework.

Time permitting, advanced learners can prepare a persuasive paragraph to post on their Web sites and read while presenting their mineral or resource to the class.

Closure

After each group has presented, write each mineral and resource on the board and have the students take a vote on which is “the most important thing.” Review important concepts with the students and answer questions they may have about the minerals and resources.

Assessment

Assess student Web site designs for accuracy of information, relevance of illustrations and vocabulary terms, evidence of thoughtful summarization of facts, and creativity.

A Day Without Power

A Lesson on Fossil Fuels and Everyday Uses of Power

Content

Students will review the formation and uses of fossil fuels as they brainstorm all the things for which they need power to do every day. Then, in a “powerless hour,” students will generate ideas for alternative activities that do not require using power from non-renewable energy sources.

National Standards

The following standards will be addressed in the lesson:

Language Arts

Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).

Science

Students should develop an understanding of types of resources.

Students should develop an understanding of properties of earth materials.

Social Studies

The learner can examine the interaction of human beings and their physical environment, the use of land, building of cities, and ecosystem changes in selected locales and regions.

The learner can explore causes, consequences, and possible solutions to persistent, contemporary, and emerging global issues, such as pollution and endangered species.

The learner can examine the relationships and tensions between personal wants and needs and various global concerns, such as the use of imported oil, land use, and environmental protection.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Bodily-Kinesthetic



Interpersonal



Logical-Mathematical



Verbal-Linguistic

Objectives

The student will be able to...

- define *fossil fuels*, *non-renewable energy sources*, and *renewable energy sources*
- understand modern society's dependence upon constant, reliable power
- understand the importance of power conservation
- think of simple ways to conserve power and save energy in his or her own life

Prerequisites

Students should read books in the *Rocks, Minerals, and Resources* series, especially *Coal, Fossils, Oil and Gas* and *World of Water* before beginning this lesson.

Materials

- chalkboard and chalk or whiteboard and markers
- student copies of *A Day Without Power* reproducible
- pencils

Instructional Procedure

Anticipatory Set

Flick the classroom lights on and off a few times. Ask students what they would think if the power were to go off suddenly. Write the words *fossil fuels*, *non-renewable energy sources* and *renewable energy sources* on the board. Ask students: *What do these words have to do with our classroom's power?* (power comes from either non-renewable energy sources like fossil fuels, or from renewable energy sources)

Class Discussion

Ask students to remind you what they learned about fossil fuels in the *Rocks, Minerals, and Resources* books. Ask them: *How are fossil fuels formed?* (by the compression of dead and broken down plant and animal matter over a long time) *Where are they found?* (all over the planet under the Earth's crust) Next, discuss with them what they know fossil fuels are used for (to generate power and electricity). Ask them to list some fossil fuels and tell you what kind of energy sources (renewable or non-renewable) they are. (coal, natural gas, oil, peat; all non-renewable) Discuss with students why the use of fossil fuels is a concern to scientists. (it creates pollution and global warming) Stress that the less power people use, the less pollution they create. Lastly, ask students to brainstorm all the things that they need power to do every day. Allow them to call out things as you write their responses on the board. (watch TV, listen to the radio, use the computer, play with battery-operated toys, ride in a car, turn on the lights, cook, operate the garage door, use the phone, etc.)

Activity

Part I: Find the Power!

Get students on their feet and moving. Give them four minutes to find as many things as they can in the classroom that require power to operate. Reassemble as a class with students seated in a circle on the floor. Make another short list on the board of things at school for which power is needed. Now, have the class close their eyes. Tell them you are all going to participate in an experimental “powerless hour.”

Part II: A Powerless Hour

When students have their eyes closed, turn off any TVs or computer monitors and all the classroom lights that you can. (Open the curtains for natural light, or if it is simply too dark for you to see safely, leave on a few lights in a far part of the classroom. If your school allows and if it is a nice day, you may consider performing the “powerless hour” outside in natural light.) Have students open their eyes again and give them a moment to adjust to the dimmer lighting. Ask students what they notice or feel about the natural light instead of the classroom lights. Tell them that now, you will brainstorm as a class about all the things you can do on a daily basis without power, or with very little power. Explain that since you can’t write on the board in the dark, you will play a game out loud as a group. The game is called, “On a Day Without Power.” You will start the game by asking the student to your left to say, “On a day without power we can. . .” and finish the sentence. Then you will repeat what the student said, adding “and” with your own example. Then the student on your right repeats the whole thing and adds another example. As a class you will try to remember and repeat everything as you go around the circle. (For example, if the student to your left says, “On a day without power we can play soccer outside,” you can say “On a day without power we can play soccer outside and tell ghost stories,” and the student to the right could say “On a day without power we can play soccer outside and tell ghost stories and sing songs,” etc.)

Accommodations and Extensions

As an accommodation, allow students each to give an example to finish the sentence “On a day without power we can” without repeating everything that is said before.

As an extension, have students try to write a list of all the things they mentioned in the game after the game is over and the lights are back on. Encourage them to take their lists home and try to spend at least one “powerless hour” every day, doing things that don’t use up precious non-renewable energy.

Closure

After the powerless hour, have students copy the lists on the board onto their reproducibles. Ask them what activities they most enjoy: activities that need power, or those that don’t. Encourage all student responses and stress the need for maintaining balance every day by not using up more power than we really need.

Assessment

Assess class participation and behavior during the discussion and activity. Evaluate students’ reproducibles for completion.

Fossil Finds

A Lesson on Imprint Fossils

Content

Students will learn about imprint fossils and the work of paleontologists as they create and exchange their own imprint leaf fossils in class. Then students will work in pairs to determine which leaf their fossil records by comparing their fossil rubbings to others, and document their findings.

National Standards

The following standards will be addressed in the lesson:

Science

The student should develop abilities necessary to do scientific inquiry.

The student should develop an understanding of properties of earth materials.

The student should develop an understanding of changes in earth and sky.

Social Studies

The learner can work independently and cooperatively to accomplish goals.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Interpersonal



Logical-Mathematical



Naturalist



Visual-Spatial

Prerequisites

Students should read *Fossils: Clues to ancient life* before proceeding with this lesson. Make sure leaves and grasses are clean and dry. Make a labeled leaf rubbing of each type of leaf or grass for student reference later. Use a permanent marker to number each item according to its type, 1–6 or 1–7, depending on the number of types you have. Keep a record for yourself of the plant names that correspond to the numbers, so you can assess how well students have identified their fossils.

Materials

- chalkboard and chalk or whiteboard and markers
- fast-drying, non-toxic modeling clay for each student
- six or seven varieties of clean leaves and grasses for imprinting (enough for one item per student)
- rubbings of the varieties of plants used above, clearly labeled with plant names
- student copies of the *Fossil Finds* reproducible
- pencils
- colored pencils or crayons

Instructional Procedure

Anticipatory Set

Ask the class: *Where do fossils come from?* and *Where are they made?* Ask students what they find interesting about fossils. Explain that they will get to make their own fossils together and study them, like real scientists.

Class Discussion

Write the words *imprint fossil* and *paleontologist* on the board. Review their meanings with the class. Ask students what they remember that scientists can learn from fossils (the types of plants and animals and climate existing when the fossil was made). Write student responses on the board. Ask them: *If scientists find a fossil of a fish in the mountains, what does this probably mean?* (the mountain was once under water) Ask, *What if scientists find fossils of desert plants in a snowy place?* (the place was probably a desert a long time ago; the climate of the place has changed over time) Explain that paleontologists can make all these educated guesses about what life on Earth was like long ago because they record all the information they can about fossils they find, so they can look back at the information and study it later even if they don't understand it right away. Explain to the class that they will make their own imprint fossils, and then study other students' fossils to discover and record what they can about the fossils.

Objectives

The student will be able to...

- define *imprint fossil* and *paleontologist*
- create an imprint fossil
- work cooperatively with a partner to study and identify the imprint fossils of classmates
- correctly identify and record leaves from different plant species

Activity

Part I

Place the leaves and grasses where students can each pick one. Give each student a ball of modeling clay and have him or her pat it flat until it is big enough for the surface area of the imprint item he or she has chosen. Show students how to imprint their items in the clay carefully, by placing the most textured side into the clay and pressing it down evenly and smoothly by hand. Then have students remove their leaves carefully without damaging the imprint. Have students use a sharpened pencil to carve their initials and the number on their leaf in a part of the clay outside of the imprint. Set fossils aside and allow the clay to dry.

Part II

When the fossils are dry, have each student pick a fossil (not the one he or she made). Arrange students in pairs. Students should not pair up with others who have the same number fossil that they have. (Each pair should have two fossils that are new to both students.) Distribute copies of the reproducible and place the labeled leaf rubbings you made where students can readily access them. Explain that students will work with their partners to make colored pencil or crayon rubbings of both fossils on their reproducibles. They should fill out the number carved into the fossil as well. Then, each pair should find another pair to trade fossils with so that they have two new fossils to make colored pencil or crayon rubbings. Once each student has created and labeled pencil rubbings of four different fossils, pairs should work together to consult the labeled rubbings and try to determine which plants their fossils came from.

Accommodations and Extensions

As an accommodation, limit the plant varieties to three or four so it is easier for students to identify their fossil rubbings, or reduce the number of fossil rubbings students are required to do.

As an extension, have students write a paragraph about their fossil findings answering the question, “What can I learn about the climate of the area where I found my fossil?” Students should identify the plants that created their fossils, then study what conditions such plants require. (For example, if a study includes only tropical plants, students should conclude that the area is or was at one time tropical. If there are many different kinds of plants, students may conclude that the area had a seasonal climate or a climate that changed throughout history.)

Closure

Reveal to students what number each plant variety was, so they can check to see if they correctly identified their fossils. Ask them what the most challenging and most interesting parts of the activity were. Finally, collect reproducibles and have students return their fossils to the maker, so each can take his or her own fossil home.

Assessment

Evaluate reproducibles for completion, neatness, and correct identification of plant type.

Rain, Rain, Go Away!

A Lesson on Acid Rain and Global Warming

Content

Students will review the causes of acid rain and global warming, have a class discussion about how they can prevent these environmental catastrophes, and create posters to put up around school to educate their peers about what they have learned.

National Standards

The following standards will be addressed in the lesson:

Language Arts

Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

Science

Students should develop an understanding of changes in earth and sky.

Students should develop an understanding of changes in environments.

Social Studies

The learner can examine the effects of changing technologies on the global community.

The learner can explore causes, consequences, and possible solutions to persistent, contemporary, and emerging global issues, such as pollution and endangered species.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:

-  Interpersonal
-  Naturalist
-  Verbal-Linguistic
-  Visual-Spatial

Prerequisites

Students should read books in the *Rocks, Minerals, and Resources* series, particularly *Coal, Fossils, World of Water*, and *Oil and Gas* before proceeding with the lesson.

Materials

- chalkboard and chalk or whiteboard and markers
- *Coal* and *World of Water* books
- student copies of the *Rain, Rain, Go Away* poster guide
- poster board for small groups
- pencils, crayons, and markers

Instructional Procedure

Anticipatory Set

Write the terms *acid rain*, *global warming*, and *greenhouse effect* on the board. Ask students to tell you where they have heard these terms lately. Explain that as a class they will discuss these issues and create posters to inform their peers about what can be done to help stop them.

Class Discussion

Review the definitions of these terms with students. Ask them what causes acid rain, and what acid rain does. (poisonous gases and chemicals created from burning fossil fuels mix with water vapor and form rain that is harmful to plants and animal life; over time, acid rain can corrode stones, and kill life in lakes) Discuss with students how the greenhouse effect causes global warming (heat from the sun becomes trapped by waste gases in the atmosphere and is unable to leave Earth) and why global warming is dangerous. (warmer ocean water causes storms, hurricanes and floods that destroy cities and homes along coastlines; global warming leads to faster evaporation of fresh water, and droughts, which causes crops to fail) Ask them what they think can be done to prevent these events from happening. Explain that much of the damage caused by burning fossil fuels can be slowed down if we need less fossil fuels or switch to other, alternative sources of energy. Have them review the section “Alternatives to Coal” in *Coal* and “Water Power” in *World of Water*. Ask them, *What do you think we ought to tell people about acid rain and global warming? How can we help spread the word about these global problems?* Write student responses on the board.

Objectives

The student will be able to...

- identify the main causes of acid rain and global warming
- understand how he or she can make a difference in environmental change by recycling and conserving water and power
- create an informative poster to teach others about acid rain and global warming

Activity

Divide students into small groups. Give each group a poster board, crayons, pencils and markers, and copy of the *Rain, Rain, Go Away* poster guide. Explain that groups will be designing a poster to educate their schoolmates about either acid rain or global warming. Groups should pick only one topic so that they can give details about what causes it, what it does, and how people can help to stop it in everyday life. They should use the poster guide to help them make sure their poster has everything it needs on it. Groups should look at the notes on the board from the class discussion to help them think of ways that people can make a difference in these problems in everyday life.

Accommodations and Extensions

Focus the lesson only on acid rain or global warming, not both, if students will need more time to absorb and relay the causes, problems and possible solutions to one of the issues.

As an extension, ask students to give group presentations to the class, using their posters as visual aids. Presentations should provide more information than what is on the poster already, so students are not just reading from the poster.

Closure

Arrange to have posters displayed in a place in the school, such as the cafeteria, where they will be seen by many students. Ask the class what new or important things they have learned about acid rain and global warming. Ask them if they feel any differently about the issues after the discussion and poster assignment.

Assessment

Assess posters for accuracy of information, neatness, and completion. Circulate during group time and monitor students' cooperation and participation.

Water, Water, Everywhere

A Lesson on Water Pollution, Power, and Conservation

Content

Students will use what they have learned about the water cycle, water pollution, water power and water conservation to create a newscast about the importance of clean, fresh water to life on earth.

National Standards

The following standards will be addressed in the lesson:

Language Arts

Students apply knowledge of language structure, language conventions (e.g. spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and non-print texts.

Science

Students should develop an understanding of changes in earth and sky.

Students should develop an understanding of types of resources.

Students should develop an understanding of properties of earth materials.

Social Studies

The learner can work independently and cooperatively to accomplish goals.

The learner can examine the effects of changing technologies on the global community.

The learner can explore causes, consequences, and possible solutions to persistent, contemporary, and emerging global issues, such as pollution and endangered species.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Bodily-Kinesthetic



Logical-Mathematical



Verbal-Linguistic



Visual-Spatial

Objectives

The student will be able to...

- understand and discuss the water cycle and the importance of clean water to life
- work collaboratively in small groups to create an informative newscast about an important water-related topic

Prerequisites

Students should read *World of Water* before proceeding with the lesson. If you like, show students a video of an age-appropriate newscast (perhaps one done by students for a child-centered television network) to help inspire them for the activity.

Materials

- *World of Water* book
- clear glass of water
- chalkboard and chalk or whiteboard and markers
- paper and pencils
- video of age-appropriate newscasts (optional)
- any props students bring in
- copies of the *Water, Water, Everywhere* rubric for each student group

Instructional Procedure

Anticipatory Set

Hold up the clear glass of water. Ask students if they know that the liquid in your glass is one of the most powerful forces on earth. Tell students that today they will review what they know about water and work together to create newscasts about the many properties and purposes of water.

Class Discussion

Tell students to take detailed notes during the class discussion. Write the words *water cycle* and *water preservation* on the board. Discuss with students everything that they know about why water is important. Encourage them to think about water in the body, water as a means of travel, water needed for food to grow, even water needed to put out fires. Review what the class knows about the water cycle. (Allow them to review that section in *World of Water*.) Ask them: *Is water a renewable resource? How?* (yes, through the water cycle and water treatment) Next, ask them why water preservation is important. (it saves fresh water for more people to use and drink) Ask the class to review the section in *World of Water* about water being a commodity—something people want and need to earn—or something everyone should get to share. Ask students to discuss their opinions about this. Explain that everything they have discussed they will think about now in small groups, and that each group will create a newscast to inform the class even more about an important water-related issue.

Activity

Divide the class into six groups. Write the following topics on the board: *the water cycle; ways to save water; the importance of water to the body; the use of water for electric power; uses of water for farming and other jobs; and how water shapes the Earth*. Assign topics or allow each group to pick a topic. Together, groups should draft a five-minute newscast about their topic, using their class discussion notes. Groups can take turns checking facts in *World of Water* or in a class dictionary or encyclopedia. Explain to students that everyone needs a speaking role in the newscast. Some students will be anchors, who sit at a desk and report the news; others will be reporters, who interview experts; and some will be experts who are interviewed for opinions or information. The water cycle group can also have a group member be a weatherperson who explains part of the water cycle.

Accommodations and Extensions

As an accommodation, allow students extra time to practice their speaking roles, and allow them to make cue cards for their newscasts.

As an extension, have students do extra research in the school library or computer lab about their topic. Extend the newscast time from five to seven minutes. Encourage them to bring in visuals for their newscasts as well.

Closure

Have students perform their newscasts for the class. As each group performs, use the *Water, Water, Everywhere* reproducible as a rubric to grade them. After all newscasts are complete, discuss with students if anything new they learned during this lesson surprised them or motivated them to use less water.

Assessment

Use the *Water, Water, Everywhere* reproducible as a rubric to evaluate students' newscasts.

What's in That Dirt?

A Lesson on Soil Composition

Content

Students will conduct a simple test to study the composition of different types of soil and conclude which kind would be better for plants.

National Standards

The following standards will be addressed in the lesson:

Science

Students should develop an understanding of properties of earth materials.

Social Studies

The learner can work independently and cooperatively to accomplish goals.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Logical-Mathematical



Naturalist



Verbal-Linguistic



Visual-Spatial

Prerequisites

Students should read *Sand and Soil* and *Minerals* before proceeding with this lesson.

Materials

- chalkboard and chalk or whiteboard and markers
 - three large science beakers or empty glass jars with no labels
 - about a cup each of potting soil and local earth from two different locations* in plastic sandwich bags, numbered 1, 2, and 3
 - a water pitcher
 - student copies of the *What's in That Dirt?* reproducible
 - pencils
- * you will want the local soil samples to be from locations some miles apart if possible; you might take an earth sample near the school and one from around your home or somewhere else easily accessible

Instructional Procedure

Anticipatory Set

Ask students what they usually think of when they hear the word *dirt*. Do they think dirt is the same all over the world? Why or why not? Explain that today they will conduct a simple experiment to see how dirt from different places can be made of different things.

Class Discussion

Write the words *minerals*, *nutrients*, and *silt* on the board. Review the definitions with students. Elicit from them the relationship between these words, and what they have to do with soil and plants. (Minerals are part of the nutrients that plants need which are found in soil; silt is a type of soil that is high in minerals and nutrients and is often left behind in fields after floods.) Discuss with the class what they think good soil has to have for plants to grow well in it. (the right minerals and nutrients) Explain that, along with climate requirements, some plants only grow in places with the right kind of soil.

Objectives

The student will be able to...

- define *minerals*, *nutrients*, and *silt*
- observe a simple science test and record observations
- make a conclusion based on recorded evidence

Activity

Enlist students to help you set up the experiment and pass out copies of the reproducible to the class. Three students can each place a soil sample in a beaker or jar; another three students should write the sample number on a piece of paper and place it in front of the correct jar; another two students can use the pitcher to fetch water and gently fill the beakers or jars almost to the top. Explain to students that they will need to wait for the soil to settle into different levels, so they can record what they observe on their reproducibles. In the meantime, call on volunteers to read pages 6–11 of *Sand and Soil* aloud to the class as a review.

When the soil has settled, allow students to approach the jars to observe the layers. Students should take this time to fill out their reproducibles, recording what they see. Then they should guess, based on what they've learned in the reviewed pages, which of the three soils would be the best soil for growing plants.

Accommodations and Extensions

As an accommodation, allow students to work with a partner to fill out the reproducible.

As an extension, follow up the lesson with an actual planting experiment. Pour off the excess water from each of the jars outside or in the sink and stir the soil. Then, have students plant wheatgrass seeds in each jar, (keeping track of which type of soil is in each) cover the jars with foil, and place them in a warm, dark place for a day or two until the seeds have sprouted. Then students should remove the foil and place the jars in a sunny spot to record in which soil the grass grows best. They can keep science notebooks to measure the growth of the grass every day.

Closure

Ask students what the most interesting thing they learned from this observation was. Review the vocabulary terms as a class and ask students to describe the relationship between the terms.

Assessment

Evaluate students' reproducibles for completion and correct observation.

Sticking Together

A Lesson on the Importance of Plant Roots for the Earth

Content

Students will plant and sprout wheatgrass seeds and study the seeds' effect on the potting soil over the course of about a week.

National Standards

The following standards will be addressed in the lesson:

Science

The student should develop an understanding of properties of earth materials.

The student should develop an understanding of changes in environment.

Social Studies

The learner can work independently and cooperatively to accomplish goals.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Bodily-Kinesthetic



Logical-Mathematical



Naturalist



Visual-Spatial

Prerequisites

Students should read the book *Sand and Soil* before proceeding with this lesson.

Materials

- chalkboard and chalk or whiteboard and markers
- two wheatgrass planting kits (sometimes sold in pet stores) or wheatgrass seeds, potting soil, and two shallow planting containers, about 2 1/2" deep
- old newspapers
- student copies of the *Sticking Together* reproducible

Instructional Procedure

Anticipatory Set

Ask students to recall the opening of the *Sand and Soil* book. What event is described? (the dust bowl) Ask students if they have heard of this event before. Explain that they are going to begin an experiment that will help them understand how winds can blow soil away, and what we can do to prevent it.

Class Discussion

Pre-Activity

Write the words *topsoil* and *root system* on the board. Ask students what these terms mean. Review with them how these terms are related. (topsoil is needed to plant things, and plants' root systems hold topsoil in place)

Post-Activity Part I

Discuss the results of the test with students. Did they expect what happened? Why? (probably, because there was nothing to keep the topsoil in the container)

Objectives

The student will be able to...

- understand how topsoil is vital to farming and planting
- understand and discuss how plant root systems keep soil in place
- understand that clear cutting forests can result in a damaging loss of topsoil

Activity

Part I

Distribute the reproducible. Instruct students to keep their reproducibles handy since they will use them through the course of the experiment. Show students the containers of topsoil. Ask them to predict what will happen when you flip a container over (on to old newspaper). Dump one container of dirt over. Have students record what happens on their reproducibles. Next, return the potting soil to the container and follow the directions on the seed packet to plant the wheatgrass seeds with students helping. (Instructions will probably indicate that seed containers should be covered and put in a warm spot for a day or so until they sprout.) Proceed to *Post-Activity Part I Discussion*. After the seeds sprout, allow students to take turns watering the containers daily.

Part II

When seeds have sprouted and grass is under an inch high, perform the same experiment with one of the containers. (Sprouts' roots should not be strong enough to hold the soil yet.) Have students record their observations on their reproducibles. Have another brief discussion about what happened and why. Explain that this can happen after farmers plant seeds in loose soil; even though the seeds sprout, the wind can still carry them away. (Discard the contents of the flipped container.)

Part III

When wheat grass is about four inches high, perform the same experiment. This time, the grass may not come out of the container unless you pull it, and it will bring all of the soil with it. Have students record their observations now and complete their reproducibles.

Accommodations and Extensions

You could perform this lesson all at once by buying a pot of already sprouted wheatgrass at a pet store, and skipping part II of the activity.

As an extension, have students “chop down” the fully sprouted wheatgrass with scissors, then use a non-toxic grass killer (such as very salty water mixed with white vinegar) to kill the roots. Over time, show them that with the wheatgrass “clear cut” like a forest, the topsoil becomes loose again, and can be blown away.

Closure

Discuss with the class how topsoil, which is vital to growing plants for food, also depends on those plants to remain fertile. Remind them that the loose soil had nothing holding it in place, and even the sprouted seeds were not strong enough to keep the soil down. Stress the importance of protecting and replanting plants and trees in order to maintain fertile soil.

Assessment

Evaluate students' reproducibles for completion and comprehension of main ideas.

Salt of the Earth

A Lesson on Solar Evaporation

Content

Students will review the importance of salt to society and the reasons for it. They will understand the basic method of salt gathering by building models of salt pans for solar evaporation.

National Standards

The following standards will be addressed in the lesson:

Science

Students should develop an understanding of properties of earth materials.

Social Studies

The learner can work independently and cooperatively to accomplish goals.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Interpersonal



Naturalist



Verbal-Linguistic



Visual-Spatial

Prerequisites

Students should read the books *Salt* and *Minerals* before proceeding with the lesson.

Materials

- chalkboard and chalk or whiteboard and markers
- student copies of the *Salt of the Earth* reproducible
- disposable foil muffin pans
- modeling clay for each student
- water pitcher
- wooden spoon
- large container of table salt

Instructional Procedure

Anticipatory Set

Ask students to tell you what they use salt for every day. Write student responses on the board. Ask them to tell you what they remember from the books *Salt* and *Minerals* about the important uses of salt. Where is the most salt in the world located? (in the ocean)

Classroom Discussion

Lead a class discussion about the importance of salt today and in history. Elicit mentions of salt in the body, salt for cooking, melting ice, preserving food, even softening bath water. Jot down student mentions on the board in a two-column chart with heads *Salt Today* and *Salt in History*. Next, ask students to recall what they read about how people access salt today. Ask them to explain the two ways of getting salt. (mining or solar evaporation) Explain to them that because salt is such an important natural resource, it is a major part of the economy all over the world.

Objectives

The student will be able to...

- identify the main uses of salt throughout human history
- understand the importance of salt to the body and to society
- work with a partner to create a model salt pan for solar evaporation

Activity

Divide students into pairs. Explain that now that they know how important salt is to society, they are going to build a model of one of the oldest methods of getting salt—using salt pans for solar evaporation.

Have a student fill the water picture with warm or luke-warm tap water. Pour a heavy amount of salt into the water while another student stirs it with the wooden spoon. (The more salt is in the water, the faster students will see results from their salt pans. For a gallon of water, use several cups of salt.) Give students modeling clay to spread over the tops (not in the cups) of the muffin pans, imitating the look of the natural solar pans pictured in *Salt*. (For example, by building clay ridges or short walls around and between their muffin cups.) Place the decorated muffin pans in a warm, sunny spot or a spot under a bright light in the classroom. Allow students to carefully pour or ladle the salt water from the pitcher into their muffin cups until the cups are each about half-full. After the activity, test students' knowledge by having them complete the *Salt of the Earth* reproducible.

Accommodations and Extensions

As an accommodation, allow students to complete the reproducible with a partner.

As an extension, have students write a paragraph about the importance and uses of salt after the class discussion.

Closure

Let students check on their salt pans daily to see how their water is evaporating. When it has evaporated, ask the class what they think about this method of getting salt. Did they find it surprising at all?

Assessment

Assess students' participation during class discussion time. Collect and grade students' reproducibles.

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The Most Important Thing

Part I: Become Experts

Directions: While you read about your *mineral* (non-living, naturally occurring substance) or *natural resource*, (something found in nature that is useful to people, such as water, forests, metals, and fossil fuels) take notes on this sheet of paper. Take a break every few pages to write a sentence about what you've read. It'll help you review later!

Part II: Persuade Others

Directions: Take what you have learned and design a Web site to teach others about your mineral or resource. Make sure your homepage includes. . .

- 2 graphics—Draw two pictures that will help visitors learn about your resource!
- 3 vocabulary terms from your book's glossary—What three terms should everyone know? Add them to your page design and define them for visitors.
- 4 facts—List four important things your group has learned, like how your resource is formed, where it's found, or how it has played a role in history.
- A contact e-mail—try the name of your mineral or resource @ your grade and room number.com! Visitors to your site will probably have questions, so a good design will include a contact link.
- A link to some other helpful Web site—if you know of a real organization that can provide reliable facts about your mineral or resource, add that link. Or, make up your own realistic-sounding link.

A Day Without Power

Directions: Copy the lists from the board to remind you what sort of things use up power at home and around school. What things can you use less often in order to help you save power?

Non-renewable fossil fuels

- 1.
- 2.
- 3.
- 4.

Activities and things that use power every day at home

Activities and things that use power at school

Three things that you can do without using power

- 1.
- 2.
- 3.

Fossil Finds

Directions: Use the spaces below to make pencil rubbings of your fossils. Be sure to record the number on the fossils you are rubbing. When you're done, try to identify the names of the plants that made your imprint fossils. When your teacher reveals the names of each number, record them to see how close you were!

Number carved on fossil: _____

Plant I think it is: _____

Actual plant: _____

Number carved on fossil: _____

Plant I think it is: _____

Actual plant: _____

Number carved on fossil: _____

Plant I think it is: _____

Actual plant: _____

Number carved on fossil: _____

Plant I think it is: _____

Actual plant: _____

Rain, Rain, Go Away!

Poster Guide

Directions: Use the checklist to make sure that your poster has everything it needs to inform people about this important issue!

Our issue is clearly stated

Our poster is neat and easy to read

Our poster is interesting to look at and colorful

Our poster lists

at least two clear causes of the issue

at least two problems the issue creates

at least two ways people can help solve this issue

Everything on our poster is spelled correctly

All of our names are on the back of our poster

Group Members _____

Date _____

Water, Water, Everywhere Newscast Rubric

Score Key

3= Great

2= Good

1= Okay

0= Did not do

Category	Score
Participation <ul style="list-style-type: none">• every group member had a part in the newscast	
Report details <ul style="list-style-type: none">• group reported true information• group gave information from class discussion and <i>World of Water</i> book• report met almost or all of the full five minutes	
Creativity <ul style="list-style-type: none">• newscast was creative and enjoyable	

Total: _____ /15

Other comments

What's in That Dirt?

Directions: In the space below, sketch each of the soil samples, and then write your observations of it. Pay attention to how thick any layers are, or how the colors of the samples compare to each other. Finally, answer the question at the bottom.

Sample 1

Sample 2

Sample 3

Which soil sample do you think would be best for plants? Why?

Name _____

Sticking Together Data Log

Part I: Date _____

My observations:

Part II: Date _____

My observations:

Part III: Date _____

My observations:

Based on what you saw, what do you think we could do to keep topsoil in place?

Salt of the Earth

Directions: Answer the questions below to prove what you've learned about this important resource.

1. Salt is a _____.

2. What is salt made of? _____

3. Where is the most salt in the world located? _____

4. When water _____ in the warm sun, salt is left behind.

5. List four things salt is used for.

-
-
-
-

6. List two ways people get salt from nature.

-
-

7. Solar salt is made in salt _____.

Bonus!

List three things that can be made from salt (different from your answers to questions 5).

-
-
-