

Amazing Science

A Closer Look at Physical Science and Plant Biology

Physical forces, light, and sound are central to our daily lives; electricity helps us meet our basic needs; and plants provide essential food and raw materials. Consequently, students are curious about how familiar areas of science function in our lives every day. The *Amazing Science* Teacher Guide serves to fuel further exploration of fundamental science concepts. By using this guide, you have an opportunity to tap into high student interest while exposing students to broader scientific issues.

Participation in these lessons will lead students to make global connections and understand higher-level concepts, such as states of matter and plant habitats. Students will become aware of some of the issues involved in energy conservation and the uses of natural resources. They will realize that they can make a positive difference through their actions.

The lesson plans in this guide are tailored for grades 2–4 and address various subjects, such as science, language arts, mathematics, and social studies. Each lesson plan is designed to stand alone. As such, they do not need to be presented in sequential order. Helpful reproducible worksheets and rubrics appear at the end of the guide. The book titles referenced in this guide include:

Amazing Electricity

Amazing Materials

Amazing Forces and Movement

Amazing Plants

Amazing Light

Amazing Sound

As students investigate the topics addressed in the guide and become more aware of science in everyday situations, they will sharpen their critical thinking skills to work toward creative solutions to worldwide problems. We invite you to jump in and ask questions with your class as you have fun learning more about physical science and biology.



National Standards Correlation

Lesson Plan Title	Correlation to National Standards
<p>Materials Matter</p>	<p>Language Arts Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.</p> <p>Science Students should develop an understanding of the properties of objects and materials. Students should develop an understanding of the properties of earth materials.</p>
<p>They're Everywhere! Products from Plants</p>	<p>Mathematics Students should count with understanding and recognize "how many" in sets of objects.</p> <p>Science Students should develop the abilities necessary to do scientific inquiry. Students should develop an understanding of the characteristics of organisms.</p>
<p>Lots of Watts</p>	<p>Mathematics Students should sort, classify, and order objects by size, number, and other properties.</p> <p>Science Students should develop an understanding of light, heat, electricity, and magnetism. Students should develop an understanding about science and technology.</p>
<p>Sound Ideas</p>	<p>Science Students should develop an understanding of the properties of objects and materials. Students should develop an understanding of the position and motion of objects.</p> <p>Social Studies The learner can work independently and cooperatively to accomplish goals.</p>

Lesson Plan Title	Correlation to National Standards
World of Light	<p>Science Students should develop an understanding of the properties of objects and materials. Students should develop an understanding of light, heat, electricity, and magnetism.</p> <p>Social Studies The learner can interpret, use, and distinguish various representations of the earth, such as maps, globes, and photographs.</p>
Forces in Action	<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 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 the properties of objects and materials. Students should develop an understanding of the position and motion of objects.</p>
Sum of the Parts	<p>Language Arts Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge. 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 the characteristics of organisms. Students should develop an understanding of organisms and environments.</p>
Paper, Plastic, or Cloth?	<p>Science Students should develop the abilities necessary to do scientific inquiry. Students should develop an understanding of the properties of objects and materials. Students should develop abilities of technological design.</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
Materials Matter	Art Science	<ul style="list-style-type: none"> • states of matter • identifying materials
They're Everywhere! Products from Plants	Math Science	<ul style="list-style-type: none"> • plant-based products • counting within sets
Lots of Watts	Art Math Science	<ul style="list-style-type: none"> • electricity • energy conservation • ordering numbers
Sound Ideas	Music Science Social Studies	<ul style="list-style-type: none"> • properties of sound • music composition and performance
World of Light	Science Social Studies	<ul style="list-style-type: none"> • properties of light • properties of color • interpreting satellite images and maps
Forces in Action	Language Arts Science	<ul style="list-style-type: none"> • force • gravity • friction • informative writing
Sum of the Parts	Art Language Arts Science	<ul style="list-style-type: none"> • plant parts • plant habitats • conducting research
Paper, Plastic, or Cloth?	Science	<ul style="list-style-type: none"> • properties of materials • collecting data • uses of materials

Pacing Chart and Vocabulary

One class period is approximately 40 minutes.

Lesson Plan Title	Pacing	Vocabulary	Assessment
Materials Matter	1–2 class periods	gas liquid materials solid	Evaluate students' <i>Materials Matter</i> reproducibles for understanding. Each should include pictures pasted in the appropriate columns.
They're Everywhere! Products from Plants	1 class period	plants wheat wood	Check reproducibles for accuracy. Student responses for the types and number of objects in each category may vary, but should be similar.
Lots of Watts	1–2 class periods	electricity watt	Check reproducibles for accuracy. Make sure student responses for saving electricity demonstrate an understanding of energy use.
Sound Ideas	1–2 class periods	instrument vibrate	Evaluate each student's reproducible for understanding of content.
World of Light	1–2 class periods	absorb ray reflect	Evaluate each student's reproducible for accuracy and understanding of content.
Forces in Action	1–2 class periods	force friction gravity	Distribute the <i>Forces in Action</i> reproducible. Have students exchange paragraphs and assess each other's work.
Sum of the Parts	1–2 class periods	fruit habitat leaf root seed stem	Assess students' posters for accuracy, completeness, and neatness.
Paper, Plastic, or Cloth?	1 class period	molded transparent waterproof	Check student responses on the reproducibles for accuracy and completeness.

Materials Matter

A Lesson on the Forms and Properties of Materials

Content

Students will gain a better understanding of the forms of materials in our world. They will investigate three forms: solids, liquids, and gases. They will learn about the properties of each form and identify the examples around them.

National Standards

The following standards will be addressed in the lesson:

Language Arts

Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

Science

Students should develop an understanding of the properties of objects and materials.

Students should develop an understanding of the properties of earth materials.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Interpersonal



Logical-Mathematical



Naturalistic



Linguistic



Visual-Spatial

Prerequisites

Have students read the book *Amazing Materials* before proceeding with the lesson. Review with students that *materials* are what things are made of. Point out some materials in the classroom, such as plastic, metal, or wood.

Materials

- *Amazing Materials* books
- chalkboard and chalk or whiteboard and markers
- small items for sorting (buttons, blocks, math manipulatives, etc.)
- assorted old magazines, scissors, and paste or glue
- student copies of the *Materials Matter* reproducible

Instructional Procedure

Anticipatory Set

Divide students into small groups and provide each group with an assortment of small objects to sort. Give students a few minutes to sort the objects in any way they see fit. When students finish, have each group explain how they sorted the objects (by size, color, shape, etc.). Tell students that scientists also sort things. They sort materials into the categories of solids, liquids, and gases.

Class Discussion

Draw a three-column chart on the board, and label the columns *solids*, *liquids*, and *gases*. Have students examine pages 8–9 of the book. Ask students to define *solids* (materials with shapes of their own), and write the definition on the board. Then have students give examples of solids from the book and the classroom, and write their examples in the *solids* column of the chart. Repeat the procedure with *liquids* (pages 10–11; materials that take on the shape of the containers they are in) and *gases* (pages 12–13; materials that move and change shape).

Objectives

The student will be able to...

- define *materials*, *solid*, *liquid*, and *gas*
- identify the properties of solids, liquids, and gases
- work in small groups to create a picture graph

Activity

Provide each student with a copy of the *Materials Matter* reproducible. Place students in small groups. Give each group magazines, scissors, and glue. Have groups work together to cut out pictures of solids, liquids, and gases, and paste them in the appropriate boxes on their charts. Encourage students to fill up all of the boxes on the chart. If students cannot find enough pictures in the magazines, they can make original drawings. Finally, have students label each picture.

Accommodations and Extensions

Cut out pictures of solids, liquids, and gases in advance. Then have students sort the pictures and glue them in the appropriate columns on the chart.

As an extension, ask students what happens to ice cream on a hot day. (The heat melts the ice cream. It changes from a solid to a liquid.) Have students list examples of other materials that change from one state to another.

Closure

Ask students to think of a solid, a liquid, and a gas found in their homes. Have them share the three materials with a partner and tell why each is a solid, liquid, or gas.

Assessment

Evaluate students' *Materials Matter* reproducibles for understanding. Each should include pictures pasted in the appropriate columns.

They're Everywhere! Products from Plants

A Lesson on the Ways People Use Plants

Content

Students will strengthen their understanding of how humans use plants every day. Students will then apply this knowledge to identify and count objects around them made from different plant-based materials.

National Standards

The following standards will be addressed in the lesson:

Mathematics

Students should count with understanding and recognize "how many" in sets of objects.

Science

Students should develop the abilities necessary to do scientific inquiry.

Students should develop an understanding of the characteristics of organisms.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Logical-Mathematical



Naturalistic



Visual-Spatial

Prerequisites

Students should read the book *Amazing Plants* to familiarize themselves with things that are made from plants. Particular attention should be paid to pages 20–23, which discuss some of the ways plants are useful to people. Students should also review the meaning of the term *plant*.

Materials

- *Amazing Plants* books
- chalkboard and chalk or whiteboard and markers
- small pieces of drawing paper
- markers or colored pencils
- clear tape
- student copies of the *They're Everywhere! Products from Plants* reproducible

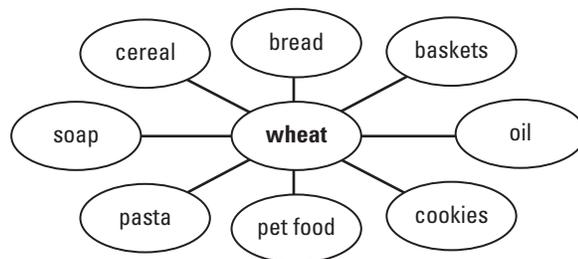
Instructional Procedure

Anticipatory Set

Ask students to name some of the plants described in *Amazing Plants*. Have volunteers write their answers on the board. (cactus plant, wheat, sunflower, sea kelp) Challenge students to name plants that are useful to people. (fruits, vegetables, wheat, trees, cotton plants)

Class Discussion

On the board, recreate the concept web below, which shows some of the products made from *wheat*.



Ask: *Why is wheat a useful plant?* (many things are made from wheat; we can eat some of the things that are made from wheat) Have students describe how their lives would be different without wheat. Then read pages 22–23 of *Amazing Plants* with students. Tell students that *wood* comes from the trunks and branches of trees. Ask: *What can people make from wood?* (furniture, paper) Point out that cardboard is also made from wood. Ask: *What can people make from other plants?* (clothes, tires, medicine)

Objectives

The student will be able to...

- identify plants that are useful to people
- identify objects made from plants
- count objects within sets

Activity

Distribute the drawing paper and markers or colored pencils. Have each student draw a leaf on a piece of paper; if the class is small, students may make two or more drawings. Have students take turns identifying objects in the classroom that are made from plants. When a student identifies an object, have him or her tape a leaf drawing to the item. Encourage students to look carefully for different objects that come from plant sources.

Distribute copies of the *They're Everywhere! Products from Plants* reproducible. Have students list two examples of classroom objects made from each material. Then have them count all the objects they can see that are made from that material.

Accommodations and Extensions

Ask students to identify objects made from specific materials, such as wood or paper. Explain that those materials come from plants. Have students work in pairs to complete the reproducible.

As an extension, have students work in groups to list products outside the classroom that come from plants.

Closure

Have students discuss the variety of objects made from plants. Ask: *How would the classroom be different without the objects made from plants?* (We would not have desks or cabinets made from wood. We would not have pencils to write with or paper to draw on. We would not have food to eat for lunch.) Remind students that materials such as paper and cardboard can be recycled so that fewer plants are needed to make new products.

Assessment

Check reproducibles for accuracy. Student responses for the types and number of objects in each category may vary, but they should be similar.

Lots of Watts

A Lesson on Using and Saving Electricity

Content

Students will gain a better understanding of electricity and its uses. They will identify ways to conserve electricity.

National Standards

The following standards will be addressed in the lesson:

Mathematics

Students should sort, classify, and order objects by size, number, and other properties.

Science

Students should develop an understanding of light, heat, electricity, and magnetism.

Students should develop an understanding about science and technology.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Bodily-Kinesthetic



Logical-Mathematical



Visual-Spatial

Prerequisites

Students should read the book *Amazing Electricity* to familiarize themselves with how electricity is made, used, and saved.

Particular attention should be paid to pages 10–13 and 26–27.

Students should also review how to order numbers from smallest to largest.

Materials

- *Amazing Electricity* books
- chalkboard and chalk or whiteboard and markers
- drawing paper
- markers or colored pencils
- student copies of the *Lots of Watts* reproducible

Instructional Procedure

Anticipatory Set

Remind students that most *electricity* is made by burning oil, gas, or coal. Point out that those fuels will one day run out. Ask students to think about how their lives would be different if they could not use electricity. Have students make a list of things that they do on a typical day. Then work with the students to cross off the activities that would be difficult to do without electricity.

Class Discussion

Ask students the following questions: *What is electricity?* (Electricity is a kind of energy.) *Where does the electricity we use come from?* (Electricity is made at power plants or by energy from the sun, wind, or moving water.) *What kinds of things need electricity to work?* (lights, machines, radios, trains) *What happens to electricity when you turn something on?* (The electricity flows along wires.) *What happens to electricity when you turn something off?* (The electricity stops flowing.)

Objectives

The student will be able to...

- define *electricity* and *watt*
- work in groups to order objects by the amount of electricity each one uses
- plan actions to conserve electricity

Activity

Part I: How Much Electricity?

On the board, recreate the chart below. Explain that the number of *watts* shows how much electricity something uses. Read aloud the name of each appliance, and have students read the number of watts it uses.

Appliance	Watts
CD player	50
computer	200
light bulb	60
refrigerator	750
telephone	3
television	80

Divide the class into groups of six. Distribute the drawing paper and markers or colored pencils. Assign one appliance to each group member. Each student should write the name of his or her appliance at the top of the page, draw a picture of the appliance, and write the number of watts the appliance uses at the bottom of the page. If the class cannot be divided evenly, more than one student may draw the same appliance.

Have each group arrange its drawings on a table or on the floor. Students should order the appliances from the one that uses the least electricity to the one that uses the most electricity. (telephone, CD player, light bulb, television, computer, refrigerator)

Part II: Saving Electricity

Have students discuss what they can do in their homes to save electricity. Encourage them to identify the actions that would save greater amounts of electricity. Then distribute the *Lots of Watts* reproducible and have students complete it.

Accommodations and Extensions

Have students work in mixed-ability pairs to complete the top part of the reproducible. When they're ready to complete the bottom, help them think of ways to save electricity. Give one example, such as turning off the lights when you leave a room.

As an extension, ask students to list several ways that businesses and towns could save electricity. Have students share their lists with the class.

Closure

Ask students to discuss the ways saving electricity could help their homes and communities.

Assessment

Check reproducibles for accuracy. Make sure student responses for saving electricity demonstrate an understanding of energy use.

Sound Ideas

A Lesson on Sound

Content

Students will strengthen their understanding of sound by producing, describing, and analyzing various sounds. They will also create musical compositions using instruments that they make.

National Standards

The following standards will be addressed in the lesson:

Science

Students should develop an understanding of the properties of objects and materials.

Students should develop an understanding of the position and motion of objects.

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



Musical

Prerequisites

Students should read the book *Amazing Sound* to familiarize themselves with the different types of sounds and how they are made. Particular attention should be paid to pages 8–9 and 12–15.

Materials

- *Amazing Sound* books
- chalkboard and chalk or whiteboard and markers
- materials for making musical instruments (see below)
- student copies of the *Sound Ideas* reproducible

Instructional Procedure

Anticipatory Set

Before class begins, gather materials that students can use to make simple instruments: metal and plastic containers with lids, dried beans, rice, pencils or pens, metal spoons, wood blocks, cardboard boxes, rubber bands, and so on. Write the word *instrument* on the board. Ask students to name some musical instruments. List their responses on the board. Tell students that they will make their own instruments and play them.

Then divide the class into two teams. Have the teams take turns using their voices to create high, low, loud, and soft sounds. Have the teams compete to see which can make the highest sound, the lowest sound, and so on.

Class Discussion

Write the word *vibrate* on the board. Tell students that *vibrate* means “to make tiny, very fast movements.” Ask: *What makes a sound?* (Air vibrating makes a sound.) Gently tap two pencils together. Ask: *What makes the air vibrate?* (The pencils hitting each other makes the air vibrate.) *Is the sound high or low?* (high) Explain that high sounds are produced by fast vibrations and low sounds are produced by slow vibrations. Ask: *Is the sound loud or soft?* (soft) Explain that soft sounds are produced by small vibrations and loud sounds are produced by large vibrations. Drop a heavy book or other object on the floor. Ask: *What makes the air vibrate?* (The book hitting the floor makes the air vibrate.) *Is the sound high or low?* (low) *Is the sound loud or soft?* (loud) Invite volunteers to describe the kinds of vibrations that produce those qualities. (Slow vibrations make low sounds and large vibrations make loud sounds.)

Objectives

The student will be able to...

- describe and analyze various sounds
- work in small groups to compose and perform a musical composition

Activity

Part I: Listening to Sounds

Ask each student to construct a musical instrument. Divide the class into groups of three or four students, making sure that each student has a different kind of instrument. Distribute the *Sound Ideas* reproducible. Each student in each group should make a sound with his or her instrument. Have group members work together to answer the questions on the reproducible about the first instrument. Tell students to follow the same steps for the remaining instruments.

Part II: Making Music

Have each group prepare a short musical composition that includes variations in pitch and volume. To help students get started, demonstrate a number of rhythms they might use, and show them how to vary pitch and volume with different instruments. Ask the groups to perform their compositions for the class.

Accommodations and Extensions

Have students refer to the *Amazing Sound* book as they complete the *Sound Ideas* reproducible.

As an extension, have students listen to a recording of music and discuss the changes in vibrations that cause variations in pitch and volume.

Closure

Write the word *vibrations* on the board along with the phrases *fast and large*, *slow and small*, *fast and small*, *slow and large*. Ask students to describe the sound each kind of vibration would make. (high and loud, low and soft, high and soft, low and loud) Have volunteers name objects outside the classroom that make those kinds of sounds. (car horn, heater, bird, truck)

Assessment

Evaluate each student's reproducible for understanding of content.

World of Light

A Lesson on Light and Color

Content

Students will strengthen their understanding of light, reflection, and color. They will interpret light and color in satellite images of Earth.

National Standards

The following standards will be addressed in the lesson:

Science

Students should develop an understanding of the properties of objects and materials.

Students should develop an understanding of light, heat, electricity, and magnetism.

Social Studies

The learner can interpret, use, and distinguish various representations of the earth, such as maps, globes, and photographs.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Naturalistic



Visual-Spatial

Prerequisites

Students should read the book *Amazing Light* to familiarize themselves with how we see light, color, and reflections.

Materials

- *Amazing Light* books
- chalkboard and chalk or whiteboard and markers
- a mirror
- a flashlight
- a computer with Internet access and a projector or printer, or several computers with Internet access
- atlases, globes, or wall maps of the world
- student copies of the *World of Light* reproducible

Instructional Procedure

Anticipatory Set

Have students identify the sources of light in the classroom. (sun, overhead lights, lamps) While students remain seated, have them close their eyes. Ask them what they would not know about the room if there were no light. (the colors of objects, the locations of objects that are out of reach, the size of the room, what people look like, where people are if they are quiet)

Class Discussion

Write the words *ray*, *reflect*, and *absorb* on the board. Tell students that light travels in *rays*, which are straight lines. Light is *reflected* when the rays bounce off of an object; reflected light can be seen. Point out that light is *absorbed* when the rays disappear into an object; absorbed light cannot be seen. List the following colors on the board: *red, orange, yellow, green, blue, indigo, violet*. Ask students to point out a red object. Explain that we see the object as red because it reflects red light and absorbs all the other colors. Ask: *What colors of light does the object absorb?* (orange, yellow, green, blue, indigo, violet) Have them point out a green object. Ask: *What color of light does the object reflect?* (green) *What colors of light does it absorb?* (red, orange, yellow, blue, indigo, violet) Tell students that white objects reflect all colors of light, and black objects absorb all colors of light.

Prop a mirror on a desk or table, dim the lights, and stand several feet away from the mirror. Point a flashlight at the mirror, and have students locate where the light is reflected. Ask: *Why is the light shining over there?* (The light is reflected by the mirror.) *What produces the light, the flashlight or the mirror?* (the flashlight) Remind students that light travels in straight lines. Have a volunteer follow the path of the light from the flashlight to the mirror and from the mirror to where the light is reflected. Repeat the process several times from different angles.

Objectives

The student will be able to...

- define *ray*, *absorb*, and *reflect*
- understand why objects appear to have certain colors
- work in small groups to interpret satellite images and maps

Activity

Show students a daytime satellite image of Earth by projecting or printing it, or supervise students as they view it on the computer. Make sure the image shows natural colors. Explain that the picture was taken from space. Divide the class into pairs, and have students discuss and answer the questions in Part 1 of the *World of Light* reproducible.

Then show students a nighttime satellite image of Earth. Again, make sure the image shows natural colors. Ask students to choose three bright areas and three dark areas in different parts of the world. For each area, have students use atlases, globes, or wall maps to identify the continents and countries. Have them work with their partners to complete Part 2 of the reproducible.

Accommodations and Extensions

Have students refer to the *Amazing Light* book as they answer the questions on the *World of Light* reproducible. Then help them identify one continent and country in a bright area and a dark area.

As an extension, ask students to review the nighttime satellite image of Earth. Have them research two countries they listed on the *World of Light* reproducible—one in a bright area and one in a dark area. Encourage them to look for major landforms, population figures, and other information about the countries. Then have them write a paragraph discussing why they think one country is brightly lit at night and the other is not.

Closure

Have students locate their own region on the daytime satellite image, and ask them to describe what they see using the terms *ray*, *absorb*, and *reflect*.

Assessment

Evaluate each student's reproducible for accuracy and understanding of content

Forces in Action

A Lesson on Force, Friction, and Gravity

Content

Students will practice informative writing while gaining a better understanding of force, friction, and gravity.

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 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 the properties of objects and materials.

Students should develop an understanding of the position and motion of objects.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Bodily-Kinesthetic



Linguistic



Logical-Mathematical

Prerequisites

Students should read the book *Amazing Forces and Movement* to familiarize themselves with force, friction, and gravity. Choose a location for the class to play a soccer game, such as the playground or gym.

Materials

- *Amazing Forces and Movement* books
- chalkboard and chalk or whiteboard and markers
- golf ball
- approximately one meter of carpet or textured fabric such as corduroy
- foam board
- soccer ball
- writing paper and pencils
- student copies of the *Forces in Action* reproducible

Instructional Procedure

Anticipatory Set

Have students jump in place several times. Explain that they have just demonstrated the three science ideas they will learn about in the lesson: they used the *force* of their muscles to jump, *gravity* brought them back to the ground, and *friction* kept their shoes from slipping when they landed.

Class Discussion

Write the words *force*, *friction*, and *gravity* on the board. Explain that a force is a push or pull that makes something move. Roll a golf ball along a smooth, level surface. Ask: *Where did the force to move the ball come from?* If students say “you,” ask them what gives you the strength to push the ball. (your muscles)

Explain that *friction* is a kind of force. Things make friction when they rub against each other. Roll the golf ball on the smooth surface and then on a piece of carpet or textured fabric. Tell students that both surfaces cause friction. Ask: *Did the ball roll as far on the rough surface as it did on the smooth surface?* (no) *Why not?* (The rough surface causes more friction than the smooth surface.) Point out that air and water also cause friction. Explain that *gravity* is a force that pulls things down to the ground. Prop a piece of foam board against several books to create an incline. Roll the golf ball up the incline and allow it to roll back down. Ask: *Why did the ball roll back down?* (Gravity pulled it down.)

Objectives

The student will be able to...

- define *force*, *friction*, and *gravity*
- describe effects of forces
- write an informative paragraph

Activity

Part I: Experiencing Forces

Review the basic rules of soccer. Take students to the playground or gym and have them play a short, informal game. Ask them to think about force, friction, and gravity as they play.

Part II: Describing Forces

Return to the classroom and have students write a paragraph that answers the following questions:

- What made the force that moved the soccer ball?
- Name one thing that caused friction in the game.
- How did friction affect the ball?
- How did gravity affect the ball?

(As we kicked the soccer ball, our muscles made the force that moved it. One thing that caused friction in the game was the grass on the playing field. Friction caused the soccer ball to slow down. Gravity caused the soccer ball to come back down to the ground after it was kicked into the air.)

Go over the expectations for the paragraph by presenting the information on the *Forces in Action* reproducible.

Accommodations and Extensions

If students have difficulty writing a whole paragraph, have them make a bulleted list to answer the questions instead.

As an extension, have students draw a car, motorboat, or airplane. Ask them to identify and label the part of the vehicle that pushes it forward, the direction of gravity, and one cause of friction

Closure

Ask students to discuss ways they experience force, friction, and gravity in their daily lives.

Assessment

Distribute the *Forces in Action* reproducible. Have students exchange paragraphs and assess each other's work.

Sum of the Parts

A Lesson on Plants and Their Habitats

Content

Students will strengthen their understanding of plant parts and habitats by conducting research and creating an informative poster.

National Standards

The following standards will be addressed in the lesson:

Language Arts

Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

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 the characteristics of organisms.

Students should develop an understanding of organisms and environments.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Linguistic



Naturalistic



Visual-Spatial

Prerequisites

Students should read the book *Amazing Plants* to familiarize themselves with the parts of a plant. Before class begins, purchase two different kinds of flowering potted plants. Remove the plants from their pots and clean the soil from the roots. Divide the plants so that each section includes roots, stems, leaves, and at least one flower.

Materials

- *Amazing Plants* books
- flowering potted plants removed from pots and divided into sections
- chalkboard and chalk or whiteboard and markers
- student copies of the *Sum of the Parts* reproducible
- encyclopedia set or computer(s) with Internet access
- poster board
- markers

Instructional Procedure

Anticipatory Set

Write the words *root*, *stem*, and *leaf* on the board. Ask: *Where do roots grow?* (Roots grow underground.) *What do roots do?* (Roots suck up water.) *What does a stem do?* (A stem supports the plant.) *What does a leaf do?* (A leaf makes food for the plant.) Distribute the flowering plants so that every student can see and touch each section of the plant. Have students describe the roots, stems, leaves, and flowers.

Class Discussion

Write the words *seed*, *fruit*, and *habitat* on the board. Ask: *What is a seed?* (A seed is the part of a plant that grows into a new plant.) *Where is a seed usually produced?* (in a flower) Point out that a fruit is not only something we eat but also the part of a flowering plant that protects the seeds. Show page 16 of *Amazing Plants*. Ask: *How does a watermelon protect its seeds?* (The watermelon has a thick skin, or rind, that protects the seeds. It also has flesh that surrounds the seeds.) Tell students that a plant's *habitat* is the place where the plant normally grows. Show page 9 of *Amazing Plants*. Ask: *What is the habitat of cactus plants?* (the desert) Show page 26. Ask: *What is the habitat of sea kelp?* (underwater)

Objectives

The student will be able to...

- understand the functions of various plant parts
- identify a plant's habitat
- work in pairs to conduct research and create an informative poster

Activity

Divide the class into pairs and distribute the *Sum of the Parts* reproducible. Have each pair use an encyclopedia or a student-friendly search engine to research one of the following plants: prickly pear cactus, aloe plant, goldenrod, juniper, sunflower, oak tree, maple tree, white pine tree, orange tree, pitcher plant, water lily, sea kelp. Ask students to study in particular the plant's roots, stems, leaves, flowers, fruit, and seeds. Explain that some of the plants do not have all of these parts. Have students research the plant's habitat. Have them record their findings on the *Sum of the Parts* reproducible.

Distribute the poster board and markers. Have each pair create a poster that illustrates the plant in its habitat and includes labels for the plant's parts. Have students present their posters to the class. Ask them to talk about why they think the plants in various habitats look different from each other. Display the posters in the classroom.

Accommodations and Extensions

Have students make note cards, to which they can refer during their presentation, and allow them to present their posters to a small group of students.

As an extension, ask students to research a second plant that is not on the list above. Have them write a paragraph to compare and contrast the two plants and their habitats.

Closure

Ask students to describe some of the plants that grow in or near their homes or school. Have them give as much detail as they can about the stems, leaves, flowers, seeds, and habitat. Encourage students to look closely in order to gain a better understanding of the plant's parts.

Assessment

Assess students' posters for accuracy, completeness, and neatness.

Paper, Plastic, or Cloth?

A Lesson on Materials and Their Uses

Content

Students will practice scientific inquiry while strengthening their understanding of the uses and properties of materials.

National Standards

The following standards will be addressed in the lesson:

Science

Students should develop the abilities necessary to do scientific inquiry.

Students should develop an understanding of the properties of objects and materials.

Students should develop abilities of technological design.

Multiple Intelligences

The following intelligences will be activated throughout the lesson:



Bodily-Kinesthetic



Logical-Mathematical



Visual-Spatial

Prerequisites

Students should read the book *Amazing Materials* to familiarize themselves with different types of materials and their uses.

Before class begins, prepare seven stations where students will investigate materials. At each station, place a container of water, an eyedropper, and several samples of one of the following materials: large metal beads, unfinished wood blocks, construction paper, cotton or another absorbent fabric, clear glass marbles, clear plastic wrap, unpolished stones.

Materials

- *Amazing Materials* books
- materials for stations (see above)
- drinking glass
- disposable plastic cup
- overhead transparency
- chalkboard and chalk or whiteboard and markers
- student copies of the *Paper, Plastic, or Cloth?* reproducible

Instructional Procedure

Anticipatory Set

Pass a drinking glass and a disposable plastic cup around the classroom for students to touch. Ask: *What materials are these objects made from?* (glass, plastic) Ask: *How are these objects the same? How are they different?* (The glass and the cup are the same because they are both cylinders that hold liquids. They are different because one is heavy and the other is flexible.) Ask: *Which one do you think is better?* (The glass is better because it is reusable. The plastic cup is better because it does not break.) Point out that objects made from different materials have different qualities, such as strength, flexibility, or weight.

Class Discussion

Write the words *transparent*, *waterproof*, and *molded* on the board. Tell students they can see through something that is *transparent*. Hold up an overhead transparency and a book, and ask students which is transparent and why. (The plastic is transparent because I can see through it. The book is not transparent because I cannot see through it.) Explain that a *waterproof* material keeps out water. Ask: *What is an example of something that is waterproof?* (a raincoat, an umbrella)

Show page 22 of *Amazing Materials*. Ask: *What is the truck made of?* (plastic) Show page 26. Ask: *What are the bottles made of?* (plastic) Point out that plastic can be *molded* into many different shapes. Read pages 16 and 17 with students. Explain that liquid plastic can be poured into a mold. When the plastic hardens and is released from the mold, it keeps the shape of the mold.

Objectives

The student will be able to...

- define *transparent*, *waterproof*, and *molded*
- determine properties of several materials
- recognize appropriate uses of materials

Activity

Distribute the *Paper, Plastic, or Cloth?* reproducible. Read the directions with students, and tell them they may visit the stations in any order. After they have completed the chart, have them answer the follow-up questions.

Accommodations and Extensions

Have students work in pairs to investigate the materials and complete the *Paper, Plastic, or Cloth?* reproducible.

As an extension, have students draw a building that includes at least four of the materials they examined. Invite students to be creative in their designs and encourage them to think about the qualities of each material as they plan the building. Students may design the outside of a building, the inside, or both. Have them present their drawings to the class and explain why they used different materials. (I used plastic for the roof because it is waterproof. I used wood for the outside walls because it is strong. I used cloth for the inside walls because it bends.)

Closure

Have students review the *Paper, Plastic, or Cloth?* reproducible. Ask: *Why do people use wood and stone to build houses?* (Wood and stone are hard and strong materials.) *Why do people make clothes out of cloth?* (Cloth bends and is strong.) *Why do people make food containers out of plastic?* (Plastic is waterproof and transparent.)

Assessment

Check student responses on the reproducibles for accuracy and completeness.

Materials Matter

Directions: Cut out pictures of solids, liquids, and gases. Paste them in the appropriate boxes below. If you cannot find enough pictures to cut out, make your own drawings in the boxes below. Then label each picture.

Solids	Liquids	Gases
Have their own shape	Take on the shape of the container	Move and change shape

They're Everywhere! Products from Plants

Directions: Find two things in the room that are made from wood. Write those two things in the first row of the chart. Next, count all the things you can see that are made from wood. Write the number at the end of the row. Then fill in the other rows with examples of things that are made from paper, cardboard, rubber, and cotton.

	Example 1	Example 2	Total Number of Things You Can See
Made from Wood			
Made from Paper			
Made from Cardboard			
Made from Rubber			
Made from Cotton			

Lots of Watts

Directions: List the objects below in order. Start with the one that uses the least electricity. End with the one that uses the most electricity. Then write two ways that you could save electricity

CD player computer light bulb refrigerator telephone television

Uses the least electricity



Uses the most electricity

1.
2.
3.
4.
5.
6.

7. I could save electricity by _____

8. I could also save electricity by _____

Sound Ideas

Directions: Listen to the sounds the instruments make. Work with your group to answer the questions about each instrument.

Instrument 1

What causes air to move and make the sound? _____

Is the sound high or low? _____

Are the vibrations fast or slow? _____

Is the sound loud or soft? _____

Are the vibrations large or small? _____

Instrument 2

What causes air to move and make the sound? _____

Is the sound high or low? _____

Are the vibrations fast or slow? _____

Is the sound loud or soft? _____

Are the vibrations large or small? _____

Instrument 3

What causes air to move and make the sound? _____

Is the sound high or low? _____

Are the vibrations fast or slow? _____

Is the sound loud or soft? _____

Are the vibrations large or small? _____

World of Light

Directions: Look at the pictures of Earth and discuss them with your partner. Then answer the questions. Use an atlas, map, or globe to help you complete the chart.

Part 1: Earth by Day

1. During the day, what is the main source of light on Earth? _____

2. Is that light produced on Earth or reflected by it? _____

3. Name a color you see in the oceans. _____

Use what you know about light to explain why the water is that color and not other colors. _____

4. Name two colors you see on land. _____

Use what you know about light to explain why the land is those colors and not other colors. _____

Part 2: Earth by Night

5. At night, what is the main source of light on Earth? _____

6. Is that light produced on Earth or reflected by it? _____

Bright and Dark Areas of Earth at Night

	Continent	Country
Bright Areas		
1.		
2.		
3.		
Dark Areas		
1.		
2.		
3.		

Name _____ Date _____

Forces in Action

Directions: Read your classmate's paragraph. After each question, write an *X* in the box for your answer.

Classmate's Name _____

	Yes	No
Does the paragraph explain the force that moved the soccer ball?		
Does the paragraph name something that caused friction in the game?		
Does the paragraph explain how friction affected the ball?		
Does the paragraph explain how gravity affected the ball?		
Is the paragraph clear and easy to understand?		
Are all of the words spelled correctly?		

Sum of the Parts

Directions: Answer the following questions to help plan your poster.

1. What is the name of the plant? _____

2. Describe the plant's habitat. _____

3. Describe the plant's roots. _____

4. Describe the plant's stems and leaves. _____

5. Does the plant have seeds? _____ If yes, describe them. _____

6. Does the plant have flowers? _____ If yes, describe them. _____

7. Does the plant have fruit? _____ If yes, describe it. _____

Paper, Plastic, or Cloth?

Directions: Write your answers to the questions about each material in the chart below. Then answer the follow-up questions.

1. Carefully try to bend the material. Is the material hard or flexible?
2. Carefully try to rip the material in two pieces. Is the material weak enough to tear or is it strong?
3. Hold the material up to your eyes. Is the material transparent or not transparent?
4. Place a few drops of water on the material. Is the material waterproof or not waterproof?

Material	Is it hard or flexible?	Is it weak or strong?	Is it transparent or not transparent?	Is it waterproof or not waterproof?
cloth				
glass				
metal				
paper				
plastic				
stone				
wood				

Follow-up Questions

5. Which materials could you use to make something waterproof? _____

6. Which material could you use to make something that you can bend and see through? _____

7. Which materials could you use to make something that is hard, strong, and not transparent? _____

8. Name one material that can be molded. _____
