Science
K through 6

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Science and the visual arts are both deeply rooted in curiosity, imagination, and the quest for exploration and discovery. Albert Einstein said, “To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science.” It is our vision that the lessons in this guide will stimulate your students’ creative imaginations, broaden their understandings, and enhance their abilities to apply new learnings in science through visual arts explorations.

Nancy A. De Bellis
Director, Education Marketing
Crayola

Crayola Dream-Makers is a series of standards-based supplemental curriculum resources that contain lesson plans for educators teaching kindergarten through 6th grade. Each guide uses visual art lessons to stimulate critical thinking and problem-solving for individual subject areas such as Math, Language Arts, Science, and Social Studies. Students demonstrate and strengthen their knowledge while engaging in creative, fun, hands-on learning processes.

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Each Crayola Dream-Makers guide provides elementary classroom and art teachers with 24 arts-focused lessons that extend children’s learning and enhance academic skills. Align these lessons with your school district and state curriculum standards. Stay flexible in your teaching approaches with adaptations like these.

- **Be prepared.** Read through the lesson first. Create an art sample so you understand the process.
- **Discover new resources.** Each lesson contains background information, fine art and craft examples, representative student artwork, vocabulary builders, and discussion ideas. Use these suggestions as a springboard to find resources that address your students’ interests and are pertinent to your community. Search Web sites such as Google Image to locate fine art. Stretch student imaginations and their awareness of the world around them.
- **Seek creative craft materials.** Ask children’s families and local businesses to recycle clean, safe items for project use—and take better care of the environment, too. Recycle, Reuse, Renew!
- **Showcase student achievements.** Create banners to accompany curriculum project displays in your class, school, or community. Post the lesson’s standards-based objectives with displays to demonstrate broad-based student learning. Demonstrate how children’s accomplishments have personal meaning and promote life-long learning through portfolio documentation.
- **Make this book your own.** Jot down your own ideas as you plan and reflect on students’ learning experiences. Combine art techniques and lesson content to fit goals for your students and classroom. Substitute other transformative craft materials. With students, make content webs of possibilities for extending learning opportunities.
- **Build connections.** Collaborate with your students, other teachers, administrators, artists in residence, and community groups to plan lessons that are unique. Work together to promote creative thinking!
- **Write DREAM statements.** As part of the assessment process, students are asked to reflect on their work in a dream journal. Before the lesson, DREAM statements are expected to capture children’s prior knowledge about each topic. After each lesson, students state in writing how they will use what they have learned and dream about possibilities for future exploration.
- **Funding resources.** Crayola Dream-Makers lesson plans have been used in school programs funded by a variety of federal, state, local, and private grants. For more information about grants and grant writing visit The Foundation Center at www.fdncenter.org.

The lessons in this book are intended to address content benchmarks and grade-level expectations in science along with a heavy concentration of key art concepts. All lessons are teacher- and student-tested and follow a consistent format to support you in planning creative, fun learning opportunities for your students.

**Benefits of Arts Integration**

The 2006 report *Critical Evidence—How the ARTS Benefit Student Achievement*, published by the National Assembly of State Arts Agencies in collaboration with the Arts Education Partnership, identifies a number of ways that arts learning experiences benefit students. Teachers who consciously integrate arts-based practice into their teaching bring these benefits to their students.

“Certain arts activities promote growth in positive social skills, including self-confidence, self-control, conflict resolution, collaboration, empathy, and social tolerance. Research evidence demonstrates these benefits apply to all students, not just the gifted and talented. The arts can play a key role in developing social competencies among educationally or economically disadvantaged youth who are at greatest risk of not successfully completing their education.” (p. 14)

According to Diane Watanabe and Richard Sjolseth, co-directors of the Institute of Learning, Teaching, and the Human Brain, when there is joy in learning, student achievement soars.

“When students find joy in their creative outlets, there is a positive carryover to school in general. Emotion, interest, and motivation promote learning and memory. Brain research shows the brain produces as least three pleasure chemicals when joy is present: endorphins, dopamine, and serotonin. These chemicals account for the emotional states produced by self-satisfaction, positive self-image, passion for one’s art, and joy in learning.” (2006, p. 20)
Children learn in many different ways

Howard Gardner has identified eight types of intelligences and may add others. Arts-integrated learning experiences enable children to more fully develop a wide range of skills and understandings.

- **Linguistic intelligence** involves sensitivity to spoken and written language, the ability to learn languages, and the capacity to use language to accomplish certain goals.
- **Logical-mathematical intelligence** consists of the capacity to analyze problems logically, carry out mathematical operations, and investigate issues scientifically.
- **Musical intelligence** involves skill in the performance, composition, and appreciation of musical patterns.
- **Bodily-kinesthetic intelligence** entails the potential of using one’s whole body or parts of the body to solve problems.
- **Spatial intelligence** involves recognizing and using the patterns of wide space and more confined areas.
- **Interpersonal intelligence** is concerned with the capacity to understand the intentions, motivations, and desires of other people. It allows people to work effectively with others.
- **Intrapersonal intelligence** entails the capacity to understand oneself, to appreciate one’s feelings, fears, and motivations.
- **Naturalist intelligence** enables human beings to recognize, categorize, and draw upon certain features of the environment. (Gardner, 1999: pp. 41-43, 52)

Find More Resources at www.crayola.com/educators

Supplementary materials for Dream-Makers guides include:

- Printable certificates for recognizing children’s participation and adults’ support
- Thousands of images of children’s art
- Demonstration videos for teaching arts-integrated lessons
- Lesson-by-lesson correlations to California, New York, Texas, Illinois, and Florida standards
- Printable resource guides for educators and administrators
- More than 1,000 free, cross-curricular lesson plan ideas on wide-ranging topics, all developed by experienced educators. Sign up for free monthly newsletters to keep you abreast of the newest Crayola products, events, and projects.

Bibliography


Objectives

Students identify relationships between structure and function by studying fossil remnants of organisms that once lived on Earth.

Students (3-4) explain how fossils are formed.

Students (5-6) draw conclusions about the unique characteristics of extinct organisms based on fossilized remains.

Students sculpt fossil-like skeleton forms and draw animal illustrations to match the skeleton models.

Multiple Intelligences

<table>
<thead>
<tr>
<th>Logical-mathematical</th>
<th>Naturalist</th>
<th>Spatial</th>
</tr>
</thead>
</table>

What Does It Mean?

**Lagerstatte**: sedimentary deposits in which extraordinarily complete fossils are found

**Paleontology**: the science of forms of life existing in former geologic periods, as represented by their fossils

**Skeletal forms**: forms made of modeling materials that resemble bone-like features

Background Information

Dinosaurs once roamed the Earth and later became mysteriously extinct. We know about these creatures because of the fossilized bones that they left behind. Scientists called paleontologists use chisels, diamond saws, and dental drills to remove these fossils and the remains of other prehistoric plants and animals from rocks. They spend great amounts of time fitting dinosaur fossil bones together like a giant puzzle to determine what dinosaurs might have looked like. These fossils are the records of ancient life on our planet. They help us understand living things today, providing clues to their adaptations and behaviors.

Dinosaurs came in all sizes. Some walked on two feet, some on four. Some were carnivores and some were herbivores. Some of the many dinosaur species include: Allosaurus, Iguanodon, Triceratops, and Tyrannosaurus Rex.

Resources

*A Dinosaur Named Sue: The Story of the Colossal Fossil* by Pat Reif
Nonfiction account of the 1990 discovery of a nearly complete Tyrannosaurus Rex skeleton. Describes its removal and transport to Chicago’s Field Museum. Illustrated with detailed color photos, diagrams, and paintings. Will appeal to 9- to 12-year-olds.

*Dinosaur Bones* by Bob Barner
Bouncy rhymes and brightly colored paper collage illustrations. Introduces young children to fossils. Dinosaurs are depicted in both skeletal and living form. Additional fossil and dinosaur information is included on each page.

*Encyclopedia Preistorica Dinosaurs: The Definitive Pop-Up* by Robert Sabuda and Matthew Reinhart
Fascinating pop-ups in a deftly designed book bring extinct dinosaurs to life. Various species depicted with identifying characteristics. Brief text offers additional information. Appeals to all ages.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

- **Earth**
  - Desert
  - Grand Canyon

- **Paleontology**
  - Allosaurus
  - Brachiosaurus
  - Carnivores
  - Dig site
  - Dinosaurs

- **Skeletal structures**
  - Legs
  - Necks

- **Visual arts**
  - Cylinder
  - Form
  - Impression

- **Tools**
  - Excavate
  - Formation
  - Fossils
  - Herbivores
  - Lizards
  - Triceratops

- **Replica**
  - Model
  - Proportion
  - Replica

- **Texture**
  - Sphere
  - Texture

- **Sediment**
  - Grassland
  - Habitat
  - Wetlands

- **Prehistoric**
  - Stegosaurus
  - Tools

- **Vertebral**
  - Skull
  - Teeth

*www.dsc.discovery.com/guides/dinosaur/dinosaur.html*
Dinosaur site includes ZIP Code Dino Finder, Fossil Help, and a guide to dinosaur programs on the Discovery Channel. All ages.
### Suggested Preparation and Discussion

<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make and display a sample paleontologist dig box containing aquarium gravel and several bone-like structures. Include drawings of prehistoric animal body parts that the skeletal forms represent. Discuss the relationship between the fossil remains and the function of the living organism. Display reference materials about paleontology. Include drawings of various types of dinosaurs as well as photographs of prehistoric dig sites and a world map pinpointing their locations. Display examples of real fossils if possible. Ask: What does the word <em>dinosaur</em> mean? When and where did dinosaurs live? How do we know? What is a fossil? What is a paleontologist? What do bones look like and how are they formed? How do bones help us identify animal body parts? Tailor children’s research and class discussion to match the depth and breadth appropriate for students’ ages and interests.</td>
<td>Discuss the kinds of bones found. What are they called? What was their purpose? How do we know? Tell students they are going to recreate a dinosaur skeleton using the various bone shapes to create a unique creature.</td>
<td>Discuss where fossils have been found around the world. Identify them on a map. Tell students they are going to create a dinosaur environment based on their research of what a specific dinosaur skeleton can tell about what it may have looked like, where the bones were found, and what it may have eaten.</td>
</tr>
</tbody>
</table>

Tell students they will create imaginary fossils, drawings, and paleontologist dig boxes.
# Fossils: Structure and Function

<table>
<thead>
<tr>
<th></th>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crayola® Supplies</strong></td>
<td>• Crayons • Paint Brushes • Scissors • Tempera Paints • Watercolors • Model Magic® • School Glue</td>
<td>• Colored Pencils • Scissors • Tempera Paints • Watercolors</td>
<td>• Crayons • Paint Brushes • Scissors • Tempera Paints • Watercolors</td>
</tr>
<tr>
<td><strong>Other Materials</strong></td>
<td>• Aquarium gravel • Paper towels • Recycled newspaper • Recycled shoe boxes with lids • Water containers • White paper • Construction paper</td>
<td>• Natural found objects such as twigs and stones • Paper towels • Recycled newspaper • Recycled shoe boxes with lids • Water containers • White paper</td>
<td>• Model Magic® • School Glue</td>
</tr>
<tr>
<td><strong>Set-up/Tips</strong></td>
<td>• Ask families to donate recycled shoe boxes with lids. • Cover painting surface with newspaper.</td>
<td>• Ask families to donate recycled shoe boxes with lids. • Cover painting surface with newspaper.</td>
<td>• Crayola Air-Dry Clay also works well for this project. • To make impressions, knead modeling compound and flatten. Press textured item, such as the back of a sea shell, into modeling compound and carefully lift to reveal the impression, or use a modeling tool, such as a wooden toothpick, to etch designs into compound.</td>
</tr>
</tbody>
</table>

## Process:
**Session 1**
30-45 min.

### Sculpt fossil models
1. Students shape Ping-Pong ball sized Model Magic® spheres into skulls, hipbones, legs, and other dinosaur-like skeletal forms.
2. Roll a ball of modeling compound into a long cylinder. Cut it into one-inch lengths. Shape these small cylinders into vertebrae forms. Connect vertebrae with toothpicks.
3. Texture fossil models with modeling tools. Air-dry at least 24 hours.

### Draw a dinosaur
1. Research bone structures of dinosaurs. What bone types have been found to create dinosaur skeletons?
2. Create a simple outline of one type of imagined dinosaur.
3. What type of bone structure would it need to be able to stand? Draw the bone structure within the outline. Show all the bones it would take to make the creature move and function.

### Create a dinosaur environment
1. Using information collected, students select one dinosaur for further study. Plan an environment the dinosaur may have inhabited.
2. Students create that environment inside a shoe box.

## Process:
**Session 2**
30-40 min.

### Paint models and boxes
4. Paint fossil models with watercolors or tempera. Air-dry the paint.
5. In three or four small groups, paint the outside of boxes with tempera. Air-dry the paint.

### Sculpt the dinosaur
4. Students shape small Model Magic spheres into skulls, vertebra, fibula, tibia, and all other bone types associated with dinosaur bone structures in the drawings.
5. Arrange Model Magic bones on a sheet of dark paper and glue.

### Paint the environment
3. Add details to environment with paint and natural objects. Air-dry the paint.

---

**Quiet Walk–Protoceratops**  
*Artist: Nelson Maniscalco*  
*2004*  
*Bronze, marble, and wood*  
*4” x 9”*  
*Private Collection.*
<table>
<thead>
<tr>
<th>Process: Session 3 30-45 min.</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assemble paleontologist dig box</td>
<td>Describe dinosaur</td>
<td>Sculpt dinosaurs</td>
</tr>
<tr>
<td>7. Cut paper to fit the box lid. Draw dinosaurs that match the bone replicas found in the box in form and proportion. Consider color and texture. Add a background of plants most likely common to the organism’s native environment.</td>
<td>8. Label the drawing with the name of the dinosaur species.</td>
<td></td>
</tr>
<tr>
<td>8. Label the drawing with the name of the dinosaur species.</td>
<td><strong>Assessment</strong></td>
<td><strong>Extensions</strong></td>
</tr>
<tr>
<td>• Are “fossils” bone-like in appearance? • Do children’s drawings match their fossils in form and function? • Can children verbally identify the species of their dinosaurs and their skeletal parts?</td>
<td>• Can students accurately describe one way a fossil is formed and explain how their drawings complete the image of the fossil pieces they created? • Ask students to explain the unique characteristics of the dinosaurs they created, including details about food, size, movements, and habitat.</td>
<td>Extend understanding of fossil formation by pressing Model Magic into molds (such as fish molds available from school supply stores). If possible, examine skeletal remains or replicas of familiar organisms such as chickens. Compare them to the living creatures. This may be especially important for very young children and those with some types of disabilities. Challenge children to match partial impressions, made by pressing parts of plastic animals (or other objects) into damp sand, with a selection of whole objects or animals. Assemble 3-D dinosaur puzzles. Ask students to choose a favorite dinosaur fossil. Research and write a story from the fossil’s point of view. Describe its appearance, habitat, and food when alive. Imagine how it died. Post stories on a map of the world with string pointing to locations where these dinosaurs lived. Invite academically talented students to research the German term lagerstatte, which means “resting place.” Ask them to share their findings with the class about places where fossils have been found perfectly preserved in complete detail. Locate and discuss lagerstatte such as: The Tar Pits of Rancho La Brea in Los Angeles, Burgess Shale in the Canadian Rockies, Ediacara Hills in Australia, and others. Explore how various ecosystems may have contributed to the preservation of fossils.</td>
</tr>
<tr>
<td></td>
<td>* Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.</td>
<td>Invite paleontologists from local colleges or universities to visit the classroom. Ask them to share their favorite fossil stories, photos, and samples. Provide kinesthetic learning opportunities for students with special needs by allowing them to handle actual fossils and create imprints with them in wet sand or with modeling compound. Explore a dinosaur or fossil exhibit at a local museum.</td>
</tr>
</tbody>
</table>
Objectives

Students observe and record similarities and differences in leaf structures and classify them by species.

Grades 3-6

Students observe and record similarities and differences in functions of leaf parts and research how the process of photosynthesis benefits trees as well as animals and humans.

Students observe the life cycle of leaves and the effects of changes in light and temperature on their color.

Grades 5-6

Students observe patterns in leaf structures and compare them to other patterns in nature.

Students make leaf rubbings and use them to design collages, informative posters, or patterned works of art similar to pieces by Andy Goldsworthy.

Multiple Intelligences

| Interpersonal (grades 3 and 4) | Naturalist | Spatial |

What Does It Mean?

Assemblage: unified sculpture that combines unrelated objects

Crayon rubbings: an unwrapped crayon is pressed and moved over paper to reveal impressions of objects below

Glycerin: an odorless, colorless, viscous liquid, can be used to help keep leaves supple and soft for use in rubbings

National Standards

Visual Arts Standard #3
Choosing and evaluating a range of subject matter, symbols, and ideas

Science Standards

Unifying Concept & Process
Systems, order, and organization
Change, constancy, and measurement

Science As Inquiry
Understanding scientific inquiry

Physical Science
Properties and changes of properties in matter
Transfer of energy

Life Science
Characteristics of organisms
Life cycles of organisms
Organisms and environments
Structure and function of living systems

Background Information

Leaves come in many sizes, shapes, and textures. There are many species of leaves. All leaves have two things in common: They have stems and veins. They are also filled with chlorophyll. Through a process called photosynthesis, chlorophyll turns light into energy, which provides food for the plants.

Leaves also help keep humans and animals alive. They absorb carbon dioxide from the air and combine it with water (that comes up through the veins from the roots of the plant) to release oxygen into the air. This exchange provides fresh air for people to breathe.

Like other living things, a leaf has a life cycle. For trees in temperate zones, a leaf typically begins as a bud in the spring, grows into a leaf that remains green throughout the summer, and then changes color and falls from the tree in the autumn. Changes in light and temperature in the autumn, combined with the carotene and anthrocyanin in the leaf, cause the color change.

Andy Goldsworthy, a British artist and photographer born in 1956, has spent much of his life observing and arranging elements of nature into new patterns and designs to create mood and meaning. His photographs show how nature changes with the passage of time. Rowan Leaves and Hole is a beautiful pattern of red and gold leaves arranged in a circle around a black hole. Other works include Oak Leaves and Holes, Iris Leaves With Rowan Berries, and Autumn Cherry Leaves.

Resources

Andy Goldsworthy: A Collaboration With Nature by Andy Goldsworthy
Beautiful photographs of leaves, twigs, rocks, branches, and icicles reorganized into simple sculptures and forms. Photos help children discover and appreciate the miracles of nature.

Autumn Leaves by Ken Robbins
An album of life-size autumn leaves with simple text for children through 3rd grade. Includes photographs of trees from which the leaves came and a brief explanation of photosynthesis.

Oak Tree by Gordon Morrison
Description of a year in the life of an oak tree. Photosynthesis, transpiration, dormancy, passage of seasons, and an explanation of autumnal colors carefully explained and illustrated. Grades 2 to 5.

Why Do Leaves Change Color? by Betsy Maestro
An elementary explanation of cause and effect in the autumnal leaf cycle. Includes detailed, labeled pictures of different sizes, shapes, and colors of leaves. Ages 5 to 9.
Concept List

*Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.*

- **Science**
  - Carbon dioxide
  - Cells
  - Deciduous
  - Dormant
  - Environment
  - Evergreen
  - Light
  - Oxygen
  - Photosynthesis

- **Visual arts**
  - Assemblage
  - Balance
  - Color
  - Contrast
  - Design
  - Form
  - Geometric

- **Pigments**
  - Anthocyanin
  - Carotene
  - Chlorophyll
  - Season
  - Shape
  - Broadleaf
  - Slender
  - Size
  - Species
  - Stem

- **Temperature**
  - Texture
  - Bumpy
  - Dull
  - Hairy
  - Prickly
  - Shiny
  - Smooth
  - Soft
  - Veins

- **Mood**
  - Movement
  - Outline
  - Patterns
  - Pigment
  - Rubbing

- **Shape**
  - Symmetry
  - Texture
  - Theme
  - Unity
  - Variety

Artwork by students from Cabot Elementary School, Newton, Massachusetts.
Teacher: Erin Straight

Artwork by students from St. Theresa School, Hellertown, Pennsylvania.
**What Clues Do Leaves Leave Behind?**

<table>
<thead>
<tr>
<th>Suggested Preparation and Discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have children select leaves to study and discuss. How are leaves similar? How are they different? Examine the stems and veins. What is the function of the stem? How do the veins work? What lines, shapes, colors, and textures do the leaves have? List similarities and differences. Different leaves come from different kinds of trees. What are the names of some tree species? Label and display samples of leaves. Tailor the discussion to the needs and abilities of the students.</td>
</tr>
<tr>
<td>Display drawings, photographs, and paintings such as the examples shown here that illustrate properties of leaves. Collect a wide variety of soft leaves outdoors or ask children to bring leaves from home. Put them in a class leaf box. Demonstrate how to create a leaf rubbing.</td>
</tr>
<tr>
<td>Discuss how and why leaves change colors and fall off trees in autumn in temperate climates. Research and discuss the process of photosynthesis.</td>
</tr>
<tr>
<td>Examine the patterns formed by veins in leaves. What other patterns can be found in leaves and other parts of a tree? What are other examples of patterns found in nature? Examine photographs made by Andy Goldsworthy. How does he use patterns in nature to create art?</td>
</tr>
</tbody>
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<tr>
<th>Crayola® Supplies</th>
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<tbody>
<tr>
<td>• Crayons • School Glue • Scissors</td>
</tr>
<tr>
<td>• Markers</td>
</tr>
<tr>
<td>Other Materials</td>
</tr>
<tr>
<td>• Construction paper • Glycerin • Leaves • Magnifying glass • Paper towels • Recycled box</td>
</tr>
<tr>
<td>• Recycled newspaper • Water container</td>
</tr>
<tr>
<td>• Posterboard</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process: Session 1 20-30 min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create leaf rubbings</td>
</tr>
<tr>
<td>1. Remove wrappers from several crayons. Lay several soft leaves on recycled newspaper. Place colored construction paper on top of the leaves.</td>
</tr>
<tr>
<td>2. Press the unwrapped side of the crayon on the construction paper. Firmly pull the crayon barrel across the surface to reveal the leaf designs. Move the leaf or paper if desired to create a ghosting effect.</td>
</tr>
<tr>
<td>3. Make additional rubbings with various leaves, crayon hues, and paper colors to extend the design possibilities.</td>
</tr>
<tr>
<td>4. Cut out the leaf shapes.</td>
</tr>
</tbody>
</table>

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Leaf Design Mola
1995
Artist Unknown
Colored cotton fabric, thread
12" x 14"
Cuna Indians
San Blas Islands
Private Collection.
### Process: Session 2 20-50 min.

<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Create collages</strong>&lt;br&gt;5. Arrange leaf shapes in various designs. Encourage students to consider color, shape, texture, contrast, and size.&lt;br&gt;6. Glue shapes on a contrasting color of paper to create a leaf collage. Air-dry the glue.</td>
<td><strong>Create informative posters</strong>&lt;br&gt;5. Students form small groups and select a theme for a leaf poster.&lt;br&gt;6. Design a poster using leaf rubbings to illustrate the chosen concept. Consider balance and contrast to create visual appeal. Glue leaf rubbings to poster board. Air-dry the glue.&lt;br&gt;7. Compose and neatly letter an informative poster title and labels. Add a short explanatory paragraph.</td>
<td><strong>Create Goldsworthy-like assemblages</strong>&lt;br&gt;5. Arrange leaf rubbings in new and different patterns to create works of art that reflect a mood or theme.&lt;br&gt;6. Select the most meaningful design. (Tip: Consider using a collage of nature photographs as a backdrop to reflect the way Goldsworthy superimposes one element of nature over another.) Glue leaf rubbings to background paper. Air-dry the glue.</td>
</tr>
</tbody>
</table>

### Assessment

- Observe whether children’s rubbings display leaf structures and include several different leaf shapes.
- Can students identify similarities and differences in the leaves chosen for their designs?
- Were students able to work cooperatively to create a poster using leaves and ideas contributed by all group members?
- Is the information included on the poster informative and correct?
- Is the poster design visually appealing?
- Students compare the patterns observed on leaves to other patterns in nature.
- Students describe the natural process involved in leaves changing color and falling from trees in autumn.
- Students observe and interpret their classmates’ assemblages, explaining what meaning they derive from them.
- Students give reasons for the choice and arrangement of leaves in their own leaf creations.

### Extensions

- Sorting leaves by color, shape, or size is an excellent kinesthetic learning opportunity for young children and those with specific learning disabilities.

Create a “field guide” to local leaves by placing a rubbing of one of each species native to your area in a class scrapbook. Label the leaves. Create an attractive cover. Display the book in your classroom or school library.

Use reflective surfaces, such as mirrors, to explore symmetry in leaves and other natural objects.

- Observe and record on a chart the effects of light/no light, water/no water, soil/no soil on plant leaves. Compare and discuss findings regarding what is needed for leaves to survive.

- Explore current research on the positive health effects of indoor plants and the environmental advantages of plantings strategically placed outside. Write letters, citing the benefits, as proposals to parent groups or other decision makers, requesting the addition of plants to classrooms and plantings for the school’s exterior.

Encourage students in advanced math classes to research and explain the relationship between patterns in nature and mathematics. What is a Fibonacci number and what does it have to do with patterns in nature?

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**Leaf**<br>Artist: Cara Farley Skrips<br>Felted wool<br>22” x 17”<br>Collection of Bill and Cara Skrips.
Objectives

Students name the sequence of rainbow colors.

Students in grades 3-4 demonstrate an understanding of the effects of light on water in their explanations of how refraction and reflection cause the formation of rainbows.

Students in grades 5-6 name the major components of the atmosphere and explain the causes of phenomena such as coronas, sunsets, and lightening.

Students paint accurate representations of rainbows or other atmospheric phenomena.

Multiple Intelligences

<table>
<thead>
<tr>
<th>Naturalist</th>
<th>Spatial</th>
</tr>
</thead>
</table>

What Does It Mean?

**Phenomena:** events

**Reflection of light:** light waves bounce back when they strike a surface

**Refraction of light:** light waves bend as they pass through a medium

Background Information

Rainbows have existed as long as light and rain. Some people believe that rainbows are a symbol of hope or peace. Legends tell about a pot of gold at the rainbow’s end. But rainbows do not have ends. A rainbow is a circle partly obliterated by the Earth’s horizon. The full circle can only be seen from high above, as when flying in an airplane.

Rainbows appear when sunlight, or white light, is bent and thus broken into its component parts by a prism or water droplet. This is called *refraction*. Refraction occurs because each color of light travels at a different speed and therefore exits the prism at a different angle. This is why the colors of a rainbow always appear in the same sequence: red, orange, yellow, green, blue, indigo, violet. There are even some colors that are not visible to the human eye. In order to see a rainbow, three conditions must exist: the sun must be shining, there must be water droplets in the atmosphere, and observers must be facing the water droplets with their backs to the sun.

Other atmospheric phenomena observed by humans are halos, coronas, sunsets, and the Aurora Borealis or Northern Lights. Some occur frequently, while others may occur only once in a lifetime.

Vocabulary List

*Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.*

- **Atmosphere**
  - Clouds
  - Coronas
  - Dust particles

- **Color spectrum in rainbow order**
  - Red
  - Orange
  - Yellow
  - Green
  - Blue
  - Indigo
  - Violet

- **Light**
  - Bent light
  - Optics
  - Prism
  - Reflection
  - Refraction
  - Visible light

- **Other vocabulary**
  - Acronym
  - Bleed
  - Blend
  - Dry paper
  - Fantasy
  - Hue
  - Pneumonic device
  - Simile
  - Symbol
  - Spectrum
  - Watercolors
  - Wet paper

Resources

A *Rainbow of My Own* by Don Freeman

Unable to find a rainbow after a storm, a boy returns home and finds one with the fishbowl in his bedroom. Kindergarteners to second graders enjoy the story and soft watercolor illustrations.

*Exploring the Sky by Day: The Equinox Guide to Weather and the Atmosphere* by Terence Dickinson

Written for ages 9 to 12. Offers insight into atmospheric phenomena such as lightning, 10 types of clouds, storms, solar haloes, sundogs, sunsets, and rainbows. Photographs and color illustrations.

*Planting a Rainbow* by Lois Ehlert

Excellent introduction to color, shape, and design for young children. Examples of plants and flowers for every color of the rainbow.


For children ages 5 to 8. Ms. Frizzle’s class struggles to split white laser light into various light colors. Covers reflection, refraction, prisms, and wavelengths.
Artwork by students from St. Theresa School, Hellertown, Pennsylvania.

Artwork by students from Oakhurst Elementary School, Fort Worth, Texas. Teacher: Rebecca Martin

Artwork by students from St. Theresa School, Hellertown, Pennsylvania.
What Is in a Rainbow?

<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
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</thead>
<tbody>
<tr>
<td><strong>Suggested Preparation and Discussion</strong></td>
<td><strong>Observe rainbows.</strong> Collect and display photographs and paintings that depict rainbows such as those shown here.</td>
<td><strong>Discuss and share rainbow sightings with students.</strong> Read to find out about sunlight. What color is light? What colors are in the visible light spectrum? How can you make your own rainbow? Explain how when light travels, it changes direction (bends) when it strikes a different medium such as glass (prism) or water (raindrop). Prisms and raindrops split or refract white light into the colors of the rainbow. Experiment with prisms. Ask students to draw and color predictions of what they might see when they look through a prism. After the experiment, ask them to draw what they actually saw. Share recorded predictions and results. Review the correct order of the rainbow colors by using the acronym, Roy G. Biv. <strong>Review and discuss the definitions of light refraction and reflection.</strong> Investigate to see what happens when light plays on water drops, dust, or ice crystals in the atmosphere. Discuss how and where rainbows, halos, coronas, sunsets, and other atmospheric optics are produced. Ask students to think about ways of representing atmospheric optics using watercolors, crayons, and markers. Discuss the lines, shapes, colors, and forms students will use. Demonstrate wet-paper and dry-paper watercolor techniques. How might movement of atmospheric phenomena be depicted on paper?</td>
</tr>
<tr>
<td><strong>Crayola® Supplies</strong></td>
<td>• Crayons • Markers • Watercolors</td>
<td>• Glitter Glue • School Glue • Scissors</td>
</tr>
<tr>
<td><strong>Other Materials</strong></td>
<td>• Paint Brushes • Paper towels • Recycled newspaper • Water containers</td>
<td>• Black construction paper • Rulers</td>
</tr>
<tr>
<td><strong>Set-up/Tips</strong></td>
<td>• Cover painting surface with recycled newspaper. • To keep colors bright, rinse the paint brush after each color use and blot on a paper towel. Change water frequently. • Limit brushing on wet painted areas. Wet colors bleed and blend at edges for fantasy-like effects.</td>
<td></td>
</tr>
<tr>
<td><strong>Process:</strong> Session 1 20-30 min.</td>
<td><strong>Imagine a rainbow picture</strong> 1. Students visualize a picture of a rainbow and the imaginary things they would like to find at its end. Share ideas for fantasy illustrations.</td>
<td><strong>Draw a favorite scene</strong> 1. Children imagine a scene viewed through a giant prism and enveloped in rainbows. Make a crayon drawing of the imagined scene. Which of the larger elements in the scene will students surround with watercolor rainbows?</td>
</tr>
<tr>
<td><strong>Process:</strong> Session 2 20-30 min.</td>
<td><strong>Paint a rainbow</strong> 2. Remind children to paint their rainbows in the proper color sequence. 3. Brush clean water over white paper. Load the brush with the first color that appears in a rainbow sequence and paint. Continue until the rainbow color sequence is complete. Air-dry the paintings.</td>
<td><strong>Paint a sky phenomenon</strong> 2. Cut paper into 9-inch squares. Using the sketches as guides, create paintings using the media and techniques best suited to the purposes. Air-dry the paintings.</td>
</tr>
</tbody>
</table>
**Process:**

**Session 3**

20-30 min.

**Add details and display work**

4. Add scene details with markers and crayons.
5. Display paintings in a prominent location.

**3-4**

4. Use crayons, markers, and glitter glue to emphasize shapes, lines, and movement in the atmospheric creations. Neatly label creations.
3. Glue each quilt square to a 10-inch square of black paper. Air-dry the glue.
5. Display paintings in a quilt-like array with a title such as *Sky Quilt*.

**5-6**

**Assessment**

- Do student paintings accurately depict the sequence of rainbow colors?
- Ask students to describe orally or in writing the objects they illustrated at the end of their rainbows.
- Students accurately define white light as a combination of the colors in the rainbow.
- Students give a scientific explanation for how raindrops refract light to create rainbows.
- Students sequentially name the colors in the rainbow.
- Students’ paintings create the illusion of a scene viewed through a prism, with rainbow colors depicted in the correct order.
- Students accurately define refraction and reflection of light.
- Students describe and explain five atmospheric phenomena.
- Students give logical reasons for their choices of line, color, shape, and form in the depiction of their sky phenomena.

- Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned about rainbows.

**Extensions**

Young children and those with special needs may find it especially helpful to have an acronym or pneumonic device to help them remember the order of the colors in the rainbow. Give them one example and invite them to think of some of their own.

Share Lois Ehlert’s *Planting a Rainbow*. Brainstorm a list of other objects that have the same colors as the flowers in the book. Invite children to draw pictures to illustrate their ideas. Display illustrations as a huge rainbow in the classroom.

Use a Venn diagram to compare and contrast what students see when looking through a prism, into a mirror, and into a kaleidoscope. Discuss diagram.

Provide children with only red, blue, and yellow watercolors. Challenge them to create their own versions of purple, green, and orange by combining the primary colors. Discuss the results. What color do they get when they mix all the colors together? How is that different from what happens when all the colors of light are combined?

Read to learn more about atmospheric optics. Develop a visual organizer to show which appear on a recurrent basis and which occur only once in a lifetime.

Challenge students interested in further research to find out more about rainbow sightings, such as: Do two or more people standing apart in different places see the same rainbow? How would a rainbow look if viewed from high above in an airplane? Why do we sometimes see two rainbows?
Objectives

Students name four types of teeth and their functions (older students), and describe exactly how to maintain good personal oral hygiene.

Students (K-4) sculpt models of teeth and create matching containers corresponding to a tooth fairy or tooth personality theme and use them as storytelling devices.

Students (5-6) construct a timeline of dental innovations with 3-D models and predictions, and present their findings to the class.

Background Information

Children have 20 primary teeth, which are replaced by permanent teeth by about age 13. An adult has 32 permanent teeth. Everyone has four different kinds of teeth. Incisors are the flat front teeth. There are four on top and four on the bottom. The incisors work like scissors to help us cut through our foods. The two pointy teeth next to the incisors on the top and bottom work like knives and are called cuspid. Bicuspids are also pointy but are bigger than cuspid. There are four on top and four on the bottom and they help to tear our food. The flat teeth at the back of the mouth are called molars. There are six on top and six on the bottom and they help us chew and grind our food.

Many legends surround the loss of a child’s primary teeth. In the United States, many children put their lost teeth under their pillows and receive money or a treat from the tooth fairy. Children in other cultures may leave the tooth for a bird, a rabbit, a lizard, or a mouse to take in exchange for a new tooth.

Folklore is filled with fairy stories. The Golden Age of fairy painting occurred in 19th-century England during the reign of Queen Victoria. Artists continue to create magical, enchanting paintings of fairies in their environments. Many artists use British folklore as inspiration to create fairy art.

Resources

Dear Tooth Fairy by Alan Durant & Vanessa Cabban
The tooth fairy leaves a 6-year-old girl encouraging messages and surprises. Comforting and reassuring to young children.

How Many Teeth? by Paul Showers
Traces tooth growth from no teeth in babyhood to the appearance of secondary teeth. Bright illustrations and clever rhymes convey great oral health information to children K-2.

Open Wide: Tooth School Inside by Laura Keller
Thirty-two teeth spend a typical day in their classroom. Colorful illustrations cover many tooth facts in an amusing way. Even the tooth quiz at the end of the book is fun. Grades 3 through 6.

What Do the Fairies Do With All Those Teeth? by Michael Luppens
Imaginative text and cartoon-style illustrations entrance ages 4 through 8.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

- Science
  - Bacteria
  - Bicuspid
  - Cavity
  - Crown
  - Cuspid
  - Decay
  - Dentist
  - Enamel
  - Floss
  - Fluoride
  - Gargle
  - Gingivitis
  - Gum
  - Hygienist
  - Incisor
  - Molar

- Visual arts
  - Size
  - Sphere
  - Symmetry
  - Texture

- Orthodontist
- Plaque
- Primary
- Root
- Secondary
- Teeth

Artwork by students from Weisenberg Elementary School, Kutztown, Pennsylvania.
Teacher: Karly LeMonnier
Artwork by students from Wachusett Regional School, Holden, Massachusetts. Teacher: Ralph Caouette

Artwork by students from Mount Prospect Elementary School, Basking Ridge, New Jersey. Teacher: Susan Bivona
### Suggested Preparation and Discussion

Create a dental hygiene display that includes a full-mouth impression borrowed from a local dentist, pictures of smiles such as the Mona Lisa, and samples of oral hygiene items.

Invite a dental health expert to talk to the class about good oral hygiene. Encourage children to describe their own dental hygiene practices and chart different approaches to good dental health.

Review the names of the four different kinds of teeth and their functions. Learn dental terms and definitions.

Discuss the differences between primary and secondary teeth.

Encourage imaginative thinking by asking students what they think the tooth fairy does with collected teeth. Read *What Do the Fairies Do With All Those Teeth?*

Display reproductions of Victorian fairy paintings. Ask students to imagine a place where the tooth fairy might live. Share ideas.

Invent memory games to match names of teeth to tooth functions.

Talk with an orthodontist about the profession. What kinds of challenges do teeth and jaw structures present? What different types of braces are available? Why is it important to have a healthy smile?

Create a timeline of dental innovation. How has scientific discovery changed devices dentists use to replace teeth? What other inventions have aided in oral health?

### Crayola® Supplies

- Colored Pencils
- Glitter Glue
- Markers
- Model Magic® (white)
- School Glue
- Scissors
- Air-Dry Clay (optional)

### Other Materials

- String, yarn, or ribbon
- Chenille stems
- Cardboard boxes with lids
- Rulers
- Modeling tools
- White drawing paper

### Set-up/Tips

- Ask families and colleagues to donate small cardboard boxes with lids.

### Process: Session 1 30-45 min.

#### Create a tooth-fairy box

1. Trace the box lid on paper.
2. Illustrate a place where the tooth fairy might hide lost teeth. Label the illustration. Glue illustration to lid.

#### Create a toothy smile personality box

1. Break into small groups. Each group selects a famous or imaginary person whose teeth they will model.
2. Trace the box lid on paper. Draw a smiling portrait of the person whose model teeth will be placed inside the box. Label who the person is (Zach the hockey player, for example). Glue illustration to the lid.

### Research dental history

1. Break into small groups to conduct research on how dentistry has changed over time. What types of tools did dentists use? What did early tooth brushes look like? What was used for tooth paste? Dental floss?
2. What materials were used to create false teeth? Research famous people who had or have false teeth, such as George Washington.

### Process: Session 2 30-45 min.

#### Create tooth beads

3. Cut ribbon, yarn, or string into a bracelet length plus a little. Knot ends.
4. Children count how many teeth they have lost (or predict how many they will lose). Roll a marble-size Model Magic sphere for each lost tooth.
5. Wrap spheres around bracelet. Shape them into teeth. Add glitter glue for sparkle. Air-dry bracelet for 24 hours.

#### Model a set of teeth

3. Bend two chenille stems into U shapes.
4. Roll a marble-size sphere for each tooth. Wrap teeth around the chenille stick. Use modeling tools to shape the front incisors. Add cuspids, bicuspid, and molars.
5. Repeat for the bottom teeth. Air-dry Model Magic for 24 hours. Air-Dry Clay for 3 days.

#### Model tools and teeth

3. Replicate at least six dental tools and false teeth either with modeling compounds and/or in drawings to display on a timeline. Air-dry tools 24 hours (Model Magic) or 3 days (Air-Dry Clay).
<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
</tr>
</thead>
</table>
| **Process:**  
**Session 3**  
20-30 min. | **Process:**  
**Session 4**  
20-30 min. | **Assessment** |
| **Tell tooth-fairy stories**  
6. Students use their bracelets as storytelling devices to share their tooth stories. | **Discuss timelines**  
6. Students create an accurate model of a set of teeth.  
The decorated container illustrates the character to whom the teeth belong. | **Discuss timelines**  
6. Students create an accurate timeline and use proper spelling and grammar.  
Students include at least six events and/or replicas and three predictions on their timelines. They defend their predictions. |
| **Describe personalities**  
6. Label teeth with their names and functions. Include unique tooth characteristics (loose, missing, chipped, cracked, capped, filled) to match the personality depicted.  
7. Students use their models to orally describe the personality depicted. | **Construct timelines**  
5. Add a distinct “What the Future Holds” section to the timeline. Make at least three predictions about the future of dentistry. | **Assessment**  
• Child’s bracelet contains the same number of teeth as the child has lost.  
• Tooth-fairy boxes depict imaginative scenes showing where the tooth fairy takes their teeth.  
• Students name the four types of teeth and their functions. Students describe how to maintain good oral hygiene.  
• Students clearly present their creations to the class.  
• Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned. |
| **Extensions** | **Integrate the study of teeth with a math lesson. Have children create tooth-related math problems and solve those made by their classmates. Example:** There are 20 teeth in a complete set of primary teeth. Emily is 6 years old. She has lost five teeth. What percentage of her primary teeth has she lost?  
Encourage students who have advanced research skills to investigate and report on topics such as:  
a) historic dental procedures compared to modern practices such as orthodontics, implants, and cosmetic tooth whitening  
b) what has been learned about dinosaurs from studying their fossilized teeth  
c) how forensic experts use dental records | **Extensions**  
Children create and maintain a graph of lost teeth. Organize by months. Which month contained the most/least lost teeth? How many more/fewer were lost in each month? What conclusions can they draw?  
Children make cards with glitter glue that contain words, definitions, and images related to dental health.  
Children make charts to help young children and those with special needs remember to brush their teeth daily. Decorate charts with pictures of teeth and fairies.  
Conduct an experiment to demonstrate the effects of various liquids on tooth enamel. Fill six containers with one of the following substances: vinegar, soda, coffee, tea, juice, and water. Add an eggshell to each one and soak overnight. Compare results. Discuss and draw conclusions linked to dental hygiene. Why do pediatricians advise that only water be put in a baby’s bedtime bottle? |

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**Decorative Ceramic Tile**  
1999  
By Eisenhardt  
White talc clay, underglazes  
6” x 6” x 1/2”  
Private Collection.  
Anatomical model  
Artist unknown  
Private Collection.
How Do Shadows Move in Space?

Objectives

Students name objects found in this solar system, explain how the objects move, and describe the force that moves them. Students model and assemble a mobile composed of solar system components.

Grades 3-6 students create oil pastel shadow-motion drawings generated from the moving shadows of the mobile forms.

Multiple Intelligences

| Interpersonal | Naturalist | Spatial |

What Does It Mean?

Mobile: type of sculpture consisting of carefully equilibrated parts that move in response to air currents

Stable: abstract sculpture, resembling a mobile but with no moving parts

National Standards

- **Visual Arts Standard #2**
  Using knowledge of structures and functions

- **Visual Arts Standard #5**
  Reflecting upon and assessing the characteristics and merits of their work and the work of others

- **Visual Arts Standard #6**
  Making connections between visual arts and other disciplines

Science Standards

- **Unifying Concept and Process**
  Form and function

- **Science as Inquiry**
  Abilities to do scientific inquiry

- **Physical Science**
  Grades K-4
  Positions and motion of objects
  Grades 5-6
  Motions and forces

Background Information

Our solar system consists of the sun, eight planets, and various other celestial bodies. The sun is the center of our solar system and the planets orbit around it due to gravitational forces. Celestial bodies have unique characteristics. For example, from outer space the Earth looks like a marble in motion. Its surface is covered with various hues of blues, browns, and greens as well as white.

Sometimes one celestial body blocks the light of the sun from another. This creates a shadow called an eclipse. A lunar eclipse occurs when the Earth casts its shadow on the moon. Occasionally the moon blocks the light of the sun from the Earth. When this happens we experience a solar eclipse.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

- **Science**
  - Astronaut
  - Axis
  - Celestial
  - Eclipse
  - Force
  - Gravity
  - Lunar
  - Moon
  - Motion
  - Orbit
  - Phases of moon
  - Planets
  - Revolve
  - Rotate
  - Shadow
  - Solar system
  - Space
  - Stars
  - Sun
  - Waning
  - Waxing

- **Visual arts**
  - Armature
  - Balance
  - Form
  - Hue
  - Light
  - Models
  - Movement
  - Sphere
  - Suspend
  - Three-dimensional
  - Weight

Resources

- *Alexander Calder and His Magical Mobiles* by Jean Lipman with Margaret Aspinwall
  Text and illustrations bring to life the works of this 20th-century inventor of mobile and stabile sculptures. Includes 40 full-color illustrations. A series of flip photos shows one of the artist’s mobiles in action. All ages.

- *Destination: Jupiter* by Seymour Simon
  An exploration of the largest planet and its four moons. Close-up illustrations appeal to all ages.

- *Hand Shadows and More Hand Shadows* by Henry Bursill
  Illustrations show how to create 34 moving figures with the shadows cast by hands and fingers. All ages.

- *Our Solar System* by Seymour Simon
  An elementary introduction to the solar system for ages 4 through 8. Includes full-color photographs of planets, moons, asteroids, meteoroids, comets, and the sun.

- Artwork by students from College Oaks Elementary School, Lake Charles, Louisiana. Teacher: Bobbi Yancey
Artwork by students from Mount Prospect Elementary School, Basking Ridge, New Jersey. Teacher: Susan Bivona

Artwork by students from College Oaks Elementary School, Lake Charles, Louisiana. Teacher: Bobbi Yancey
**Suggested Preparation and Discussion**

Display a map or model of the solar system. Identify the sun as the center of our universe. Explain how everything else is in motion around it.

Point out and name the eight planets. Explain how the planets, their moons, comets, asteroids, and other space objects revolve around the sun. Identify gravity as the force that keeps planets in orbit around the sun, and the moon in orbit around the Earth.

Demonstrate how the Earth rotates on its axis.

Post a map of the solar system. Ask students to name the planets and review how the solar system works. Identify gravity as the force that keeps planets in orbit around the sun, and the moon in orbit around the Earth.

Collect and display NASA photos of celestial bodies with shadows cast upon them. Include photos of solar and lunar eclipses such as those shown here. Explain how an eclipse occurs. Ask students if they think that astronauts can observe moving shadows in space.

Discuss shadows and how they are made. Experiment with shapes and shadows using a projector and assorted objects. Demonstrate sample figures shown in *Hand Shadows and More Hand Shadows*.

Demonstrate how to create a balanced solar system mobile.

**Crayola® Supplies**

- Glitter Glue
- Model Magic®
- Paint Brushes
- School Glue
- Tempera Paint
- Oil Pastels

**Other Materials**

- Brown rolled craft paper
- Overhead projector (use with adult supervision)
- Paper clips
- Paper towels
- Recycled newspaper
- Sticks, twigs, or dowels
- String, yarn, or ribbon
- Water containers

**Set-up/Tips**

- Ask families to help collect sticks for mobiles.
- Recruit parent volunteers to assist groups of younger students with mobile construction.
- Demonstrate how to model simple celestial forms that reflect the colors, lines, patterns, and shapes observed in the NASA photos.
- Cover painting surface with recycled newspaper.
- Set up a workstation where students can hold each other's mobiles to cast shadows on craft paper.
| Process: Session 1 | 20-30 min. | K-2 | Create the mobile  
1. Working cooperatively in small groups, students model solar system components. Include stars, asteroids, comets, and meteoroids as well as planets. Embed glue-covered paper clips deeply into the forms for hanging. Air-dry 24 hours. |
| Process: Session 2 | 10-15 min. | 3-4 | 2. Paint the forms. Air-dry the paint. |
| Process: Session 3 | 20-30 min. | 5-6 | 3. Thread and then loosely tie the forms together on stick armatures.  
4. Work collaboratively to assemble mobiles. Experiment with weight and adjust string lengths to balance pieces.  
5. Decorate forms with glitter glue. Air-dry the glue. |
|Process: Session 4 | 30-45 min. |  | Draw colorful shadow designs  
6. Suspend mobiles so forms cast shadows on paper in the workstation.  
7. Quickly trace shapes of moving shadows with oil pastels to create action-like drawings. Fill shapes with color.  
8. Brush a thin tempera paint wash over the entire drawing. Air-dry the paint. |

**Assessment**
- Children correctly identify objects on their mobiles as planets, the sun, stars, comets, asteroids, and/or meteoroids.
- Children act out the terms *rotation* and *revolution*.
- Students name the eight planets and other objects in our solar system.
- Students describe rotation and revolution of celestial bodies.
- Students name and explain the force that keeps planets and moons in orbit.
- Randomly display the mobiles and action-shadow drawings. Ask students to analyze and match mobiles to the correct action-shadow drawings.
- Are mobiles balanced and do they accurately represent celestial bodies found in our solar system?  
- Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned about shadows, celestial bodies, and mobiles.

**Extensions**
- Invite younger children and those with disabilities to outline the shapes of their own shadows with markers on large paper or outdoors with sidewalk chalk.
- Challenge students to invent shadow games, such as Follow the Leader, Shadow Tag, and Simple Simon. Make an illustrated book of shadow game suggestions.
- Invite students who benefit from kinesthetic learning experiences to demonstrate how the planets orbit the sun while the Earth rotates on its axis.
- Build and use a sundial. Compare the time indicated on the sundial to the time indicated on the classroom clock. Adjust sundial to more closely match actual time.  
- Have students imagine that they are on the moon, looking back at Earth. Draw a picture of how the Earth and the sun would look if viewed from the moon.
- Invite students skilled in research and technology to prepare and present an audio-visual presentation about solar and lunar eclipses for younger students.
- Challenge students to research a specific planet. Identify what they would need to pack to survive there and explain the purpose of each item.

*Lunar eclipse*  
*Photo by permission Jon Sullivan, San Diego, California.*
Objectives

Students observe and illustrate natural monthly changes in the size and mass of the moon as seen from Earth.

Students create a manga-like illustration that depicts a character in settings that accurately chart the eight distinct illuminated phases of the moon.

Multiple Intelligences

<table>
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<tr>
<th>Logical-mathematical</th>
<th>Spatial</th>
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<tbody>
<tr>
<td>Naturalist</td>
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</tbody>
</table>

National Standards

**Visual Arts Standard #4**
Understanding the visual arts in relation to history and culture

**Science Standards**

**Science and Technology**
Abilities of technological design

**Unifying Concepts and Process**
Form and function

**Science as Inquiry**
Properties and changes of properties in matter

Background Information

It takes about 27 days, 7 hours, and 43 minutes for the moon to revolve around the Earth. The phases of the moon are caused by the positions of the sun, moon, and Earth, relative to each other.

With the exception of lunar eclipses, when the moon passes through the Earth’s shadow, the sun always lights up the half of the moon facing it. The moon appears as a bright, round disk when the moon and sun are on opposite sides of the Earth. This is called a full moon. A dark or new moon is visible when the moon is between the Earth and sun. Between the new moon phase and the full moon phase, the moon’s lighted surface seems to grow (wax) and then decrease (wane). The edge between the dark and light areas is called a lunar terminator.

The moon’s familiar crescent shape is produced by Earth’s shadow, which is always curved because the Earth is round. The “horns” of the moon at the ends of the crescent always point upward in the sky because they face away from the rising or setting sun. See if you can spot an “impossible moon” (horns pointing downward) in art.

People have planned events and even used the light of the moon to help them perform certain tasks throughout history. Full moons also have traditional names according to the time of year they appear in the night sky. The indigenous peoples of North America gave names to many of the moons according to conditions of the land and how it affected them.

**January—Full Wolf Moon:** Packs of hungry wolves often howled outside villages.

**February—Full Snow Moon:** Heavy snow often falls during this month. Also called the Full Hunger Moon.

**March—Full Worm Moon:** When the ground gets warmer, earthworms become active again and birds return. Also called the Full Crow Moon or the Full Sap Moon because tree sap begins to run again.

**April—Full Pink Moon:** Pink Phlox, one of the first spring flowers, are in full boom and cover the ground.

**May—Full Flower Moon:** When flowers were most abundant. Also known as the Full Milk Moon or the Full Corn-Planting Moon.

**June—Full Strawberry Moon:** Time to gather strawberries. In Europe this is called the Full Rose Moon.

**July—Full Buck Moon:** New horns appear on buck deer. Also called Full Thunder Moon for the many thunderstorms and Full Hay Moon.

**August—Full Sturgeon Moon:** The sturgeon, a large fish, is ready to be caught. Also called the Full Red Moon.

**September—Full Harvest Moon:** Moon that occurs closest to the autumn equinox. At the peak of harvest this moon gives enough light that farmers can work late in their fields.

**October—Full Hunter’s Moon:** After harvest many hunting seasons begin.

**November—Full Beaver Moon:** Beavers begin to prepare for winter. Also called the Full Frosty Moon.

**December—Full Cold Moon or Full Long Nights Moon:** Nights are very long and temperatures drop.

Resources

*How the Moon Regained Her Shape* by Jane Ruth Heller
A Native American folk tale introduces the waxing and waning moon to elementary students. Includes phases of the moon charted in the corner of each page, plus a section containing fun moon activities.

*Learn How to Draw Manga—A Step-by-Step Guide* by Emmett Elvin
Easy-to-follow directions provide valuable tips as artists of all ages learn to create dynamic manga-style characters.

*Manga—Sixty Years of Japanese Comics* by Paul Gravett
An in-depth history of manga, displaying hundreds of detailed examples of Japanese art.

*Papa, Please Get the Moon for Me* by Eric Carle
Bright and beautiful illustrations introduce the monthly lunar cycle to children ages 4 to 8.
Vocabulary List
Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

- Illustration
  - Chart
  - Design
  - Display/exhibit
- Drawing
- Exaggeration
- Movement
- Proportion
- Sequence

- Moon
  - Impossible moons
  - Revolve
- Shadow
- Terminator

- Moon phases (in order)
  - Full moon
  - Waning gibbous
  - Last quarter
  - Waning crescent
  - New moon
  - Waxing crescent
  - Waxing gibbous
  - First quarter

- Japan
- Culture
- Communication
- Visual literacy
  - Books
  - Cartoons
  - Characters
  - Comics
- Visual literacy (contd.)
  - Fine art
  - Manga
  - Symbols

- Nature
- Earth
- Rotate
- Space
- Universe

What Does It Mean?
Anime: Japanese animated cartoons featuring short characters with large eyes
Illuminate: make resplendent by decorating letters, pages, paragraphs, or borders with colors and gold or silver as was done in the Middle Ages
Impossible moon: the Earth’s moon illustrated with its terminators pointing down
Lunar terminator: the curved edge of the shadow on the moon that creates the horns (pointed ends) of the moon’s crescent; these horns always point upward
Manga: Japanese comic book illustrations that emphasize proportion, movement, and exaggerated facial expression
Triarama: 3-D triangle formed with a paper square

Artwork by students from Asa Packer Elementary School, Bethlehem, Pennsylvania.
Teacher: Linda Kondikoff
### Suggested Preparation and Discussion

**K-2**

Show the relative positions of the sun, Earth, and moon. Demonstrate how the sun is stationary, and that Earth and its moon revolve around the sun. The Earth-bound view of the moon changes every day, depending on how much of the sunlit portion is facing Earth. The constant changes in the view of the moon from Earth are called moon phases.

Ask student volunteers to cut and display paper shapes of the eight phases of the moon. Add word cards that list the moon’s phases.

**3-4**

Display side-by-side samples of Japanese manga and comic illustrations from the United States or other cultures. Discuss how comics in Japan are called manga and are considered an art, along with Japanese animated films (anime). List what is similar and different in these types of art.

**5-6**

Talk about the historical significance of moon names. How did moons get their names?

Students research other cultures and time periods. How did people determine when events happened? How was a year established? A month? A day?

Ask students questions such as, When talking about the moon, what is a terminator?

Students choose a story character that can be depicted looking at phases of the moon over the course of a month. The setting must be at night so the moon is visible. Students illustrate the moon phases in a sequential manga or cartoon illustration.

### Crayola® Supplies

- Colored Pencils  
- Markers

### Other Materials

- Drawing paper
- Straight edges
- Oak tag
- Rulers

### Process: Session 1 20-30 min.

**Sketch four moon phases**

1. Fold drawing paper into four identical rectangles.
2. Trace the fold lines with a dark marker.
3. In correct sequence, sketch the four moon phases (full, half, quarter, new), one in each rectangle.

**Sketch eight moon phases**

1. Fold drawing paper into eight identical rectangles.
2. Highlight the folds with a dark marker. Use a straight edge for accuracy.
3. Write the sequence of the eight phases of the moon on the back of the paper.

**Create a triarama**

1. Cut oak tag or a recycled file folder into a 12-inch square. Fold square diagonally both ways, creating an X. Unfold.
2. Cut one crease to the center point (see diagram). Overlap triangles over one another and glue to form a triarama.
3. Sketch idea of moon phase setting in manga style on all surfaces.

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Detail

*The Story of King Solomon and Queen of Sheeba*

2003

By Telawun

Oil on canvas

3’ 4 1/2” x 15 1/2”

Ethiopia

Private Collection.
<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process:</strong>&lt;br&gt;Session 2&lt;br&gt;15-20 min.</td>
<td><strong>Illustrate story</strong>&lt;br&gt;4. Depict the story in manga-like sequential drawings of the character inside each rectangle.</td>
<td><strong>Illustrate story</strong>&lt;br&gt;4. Sketch a manga-like drawing of a nighttime scene inside each rectangle. Be sure that the story charts the correct sequence of the phases of the moon. Include signs and symbols.</td>
</tr>
<tr>
<td><strong>Process:</strong>&lt;br&gt;Session 3&lt;br&gt;20-30 min.</td>
<td><strong>Illustrate details</strong>&lt;br&gt;4. Create background to support meaning of the moon phase. Add details and color as appropriate.</td>
<td><strong>Add figures and statement</strong>&lt;br&gt;5. Sculpt and glue Model Magic anime-like figures into triarama. Air-dry 24 hours. 6. Write a supporting statement about the full moon and its significance to display with the work.</td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td>- Children correctly label full, half, quarter, and new moon phases in their drawings. &lt;br&gt;- Students correctly name, in order, the eight phases of the moon depicted in their drawings. They accurately describe how these phases come about. &lt;br&gt;- Students display manga-style triaramas with statements. Check for accuracy and cultural significance. &lt;br&gt;- Figures are created in anime style. &lt;br&gt;- Children describe how Japanese manga and other comic styles are alike and different. &lt;br&gt;- Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.</td>
<td></td>
</tr>
<tr>
<td><strong>Extensions</strong></td>
<td>Illustrate a chart of moon references found in children’s literature, such as the man in the moon and the cow who jumped over the moon. Children write poetry that incorporates the phases of the moon. If possible, visit a planetarium to learn more about the night sky. Some children with motor challenges may draw their manga using assistive technology.</td>
<td>Ask students to keep a moon journal. Sketch the appearance of the moon each night for a month. Compare journals. Note similarities and differences. Learn more about how to draw in the manga style. How did this art form begin?</td>
</tr>
</tbody>
</table>

**How to make a triarama**

1. Fold corner A to corner B.
2. Fold corner C to corner D.
3. Cut A to B.

This experiment shows how the phases of the moon look (NOT how they are actually formed). One student holds a flashlight. Another student holds a foam ball with a pencil inserted in it (moon). Darken the room. The student with the flashlight slowly moves counterclockwise around the moon. The student holding the moon will first see waxing phases. As the flashlight continues to move around the moon, it will wane back to a new moon. Repeat so all students can see.
Objectives

Students research oology to learn more about where and by what creatures’ eggs are laid, variations in appearance and incubation periods, the structure of an egg, and how eggs are protected from predators.

Students create and embellish egg models using their imaginations and knowledge of cultural traditions of egg decorating.

Students make illustrations or models of the imaginary creatures which might hatch from the eggs they made based on the size, shape, and markings of the eggs.

Multiple Intelligences

Naturalist

Spatial

Background Information

Eggs come in a wide variety of sizes, colors, and shapes. The sizes and shapes of eggs are clues as to what will hatch from them. An ostrich egg is one of the largest eggs, and the ostrich is a large bird. Archeologists have found that dinosaur eggs were even larger. In contrast, the bee hummingbird egg is the smallest bird egg, weighing just half a gram. Hummingbirds are small. Fish eggs, insect eggs, and other invertebrate’s eggs are even smaller than the bee hummingbird egg.

People from every part of the world have used their imaginations to decorate eggs using various materials. A Russian jeweler, Peter Carl Fabergé designed incredible fantasy eggs that have brought enduring fame to the House of Fabergé. Ukrainian folk artists use a wax-resist method to create intricately detailed Pysanky eggs. Highly decorated eggs often were used as gifts for very special occasions. In some religious communities eggs hold symbolic significance.

At one time egg collecting was a hobby, but taking eggs from a natural environment endangered some species, so today there are laws prohibiting egg collecting. Birds and their eggs are protected under the International Migratory Bird Convention.

Resources

Chickens Aren’t the Only Ones by Ruth Heller
Catchy, chock-full-of-information rhymes, touches of humor, and beautiful illustrations. Includes many species of animals that lay eggs. Illustrates a variety of eggs, sizes, colors, and shapes.

Fabergé Eggs: A Book of Ornaments—The Forbes Magazine Collection by Peter Carl Fabergé
Exquisite, full-color photographs of eye-catching, jeweled ornaments.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

- Oology
  - Albumen
  - Birds
  - Brood
  - Burrows
  - Camouflage
  - Chicken
  - Clutch
  - Ecology

- Visual arts
  - Batik
  - Color
  - Decorative
  - Decoupage
  - Design
  - Detail

- Multiple Intelligences
  - Nature
  - Spatial

What Does It Mean?

Embellish: add detail

Pasanky: the traditional Ukrainian art of decorating Easter eggs by writing on them with beeswax and dipping the eggs into dye

Resist art: technique in which wax is applied to parts of a surface and paint is applied on top so that the wax resists the paint

Horton Hatches the Egg by Dr. Seuss
A kind elephant sits on a lazy bird’s nest, tending the egg through bitter cold and blazing heat. The compelling verse and illustrations, as well as the surprise ending, delight ages 4 through 8.

Rechenka’s Eggs by Patricia Polacco
A wounded goose accidentally breaks all of its caretaker’s exquisitely hand-painted eggs. Colorful illustrations appeal to ages 4 through 9.
Artwork by students from Mount Prospect Elementary School, Basking Ridge, New Jersey.
Teacher: Susan Bivona

Artwork by students from CS 102, Bronx, New York.
Teacher: Neila Steiner
### Suggested Preparation and Discussion

Collect and display a wide variety of natural and decorative eggs such as Pysanky and Fabergé eggs. Thoroughly wash natural eggs. Discuss the differences observed between natural eggs and decorative ones.

Introduce and define the term *oology*. Explain that sometimes the color, size, detail, shape, and texture of an egg help us know what will hatch from it. What features might help disguise an egg from predators?

What are some materials used to embellish eggs? What different cultural traditions are associated with decorative eggs? What symbols are associated with eggs?

Invite students to imagine an unusual creature and the egg from which it would hatch. What characteristics might the egg have? Consider size, shape, textures, colors, and markings.

Display books and illustrations of birds and their eggs such as those included here.

### Crayola® Supplies

- Crayons
- Glitter Glue
- Model Magic®
- Paint Brushes
- School Glue
- Watercolors

### Other Materials

- Modeling tools such as plastic dinner knives, craft sticks, and toothpicks
- Natural, found materials such as feathers, twigs, raffia
- Recycled newspaper
- Paper towels
- Plastic coffee stirrers or plastic flatware
- Plastic eggs
- Masking tape
- White watercolor paper

### Set-up/Tips

- Cover painting surface with recycled newspaper.
- Ask families and members of the school community to contribute plastic eggs.

### Process: Session 1 20-30 min.

#### Create the decorative egg

1. Flatten Model Magic compound into a thin layer. Wrap it around a plastic egg. Gently shape and model it to create a fanciful design.
2. With adult help, score around the middle of the egg, so it opens as it did originally. Air-dry the eggs 24 hours.

#### Create the decorative egg

1. Tape together tightly crumpled balls of newspaper to use as egg armatures.
2. Press Model Magic compound into a 1/4-inch slab. Wrap the slab around armature. Shape the modeling compound to create a fanciful egg. Use modeling tools to add texture. Air-dry the egg 24 hours.

### Assorted Decorative Eggs

Private Collection.

1. **Russian Wood Egg**
   - Carved and woven low-relief dyed wood
   - 2 3/4" x 2" x 2"

2. **Ostrich Egg**
   - Natural egg shell
   - 5" x 5" x 6"

3. **Painted Wood Egg**
   - Wood, paint, gold leaf
   - 5" x 3 1/2"

4. **Lomonosov Porcelain Egg**
   - 14-carat gold, blue glaze, porcelain
   - 4" x 3" x 3" w/o base

5. **Wooden Egg**
   - Curly burl maple wood
   - 3" x 2 1/2"

6. **Russian Crystal Egg**
   - Etched lead crystal
   - 3" x 3" x 3 3/4"

7. **Babergé-style Egg**
   - Enamel, rhinestones, gold plate over base metal
   - 2 1/2" x 1 3/4" x 1 3/4"

8. **Red Ware Sgraffito Egg**
   - Red clay, yellow slip, glaze
   - 3 1/2" x 2 1/2" x 2 1/2"

9. **Amber Egg**
   - Cut and polished amber, organic material
   - 2 1/2" x 1 1/2" x 1 1/2"

10. **Pysanky Egg**
    - Egg shell, dyes, shellac
    - 2 1/2" x 1 1/2" x 1 1/2"
<table>
<thead>
<tr>
<th>Process: Session 2 10-20 min.</th>
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<tbody>
<tr>
<td></td>
<td>3. Paint the egg with watercolor designs. Air-dry the paint.</td>
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</table>

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<thead>
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<th>Process: Session 3 5-10 min.</th>
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<tbody>
<tr>
<td></td>
<td>4. Coat the surface with glue. Air-dry the glue.</td>
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</table>

<table>
<thead>
<tr>
<th>Process: Session 4 30-40 min.</th>
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<th>5-6</th>
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</thead>
<tbody>
<tr>
<td>Sculpt the creature 5. Sculpt a Model Magic creature that might hatch from the egg and will fit inside. Include characteristics that are similar to those visible on the egg. Air-dry the creature 24 hours.</td>
<td></td>
<td>Draw the creature 5. Draw or paint a creature that might hatch from the egg. Use characteristics of the egg for inspiration. Air-dry the painting.</td>
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<thead>
<tr>
<th>Process: Session 5 15-20 min.</th>
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</thead>
<tbody>
<tr>
<td>6. Embellish the egg and creature with glitter glue and/or found materials. Air-dry the glue.</td>
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<thead>
<tr>
<th>Process: Session 6 15-20 min.</th>
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</thead>
<tbody>
<tr>
<td>7. Carefully open the egg and set the creature inside. Display egg and creature with those made by classmates.</td>
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<td>7. Create a display of eggs and drawings.</td>
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<thead>
<tr>
<th>Assessment</th>
<th>K-2</th>
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</thead>
<tbody>
<tr>
<td>• Ask children to describe the features of their eggs. Children explain what kind of creature they imagine would hatch from it and why.</td>
<td></td>
<td>• Ask students to explain the correlations they see between each other’s eggs and their creature drawings.</td>
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<tr>
<td>• Can children correctly identify two species that hatch from eggs?</td>
<td></td>
<td>• Can students correctly identify several species that hatch from eggs?</td>
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<tr>
<td>• Ask students to describe how nature protects eggs from predators.</td>
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<td>• Ask students to name several ways eggs are protected from predators.</td>
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</table>

<table>
<thead>
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<tbody>
<tr>
<td>• Can students name three components of the structure of an egg?</td>
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<tr>
<td>• Do the model eggs show evidence of attention to color, texture, and design?</td>
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<tr>
<td>• Randomly display egg forms, creature sculptures, and drawings. Challenge students to match eggs to creatures based on clues observed in both artworks.</td>
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<tr>
<td>• Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned about natural and decorative eggs.</td>
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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Set up an incubator in the classroom. Students watch and record the egg-hatching process using written and illustrated journal entries.</td>
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<tr>
<td>Invite students to create and donate decorated eggs for an egg tree display at a community or residential facility. Some children with special needs may need to use adaptive technology to design their eggs and creatures.</td>
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<tr>
<td>As part of a graphing lesson, invite children to collect and organize data depicting classmates’ favorite ways to eat eggs. Explore crayon and watercolor resist techniques, similar to the techniques used in creating Ukrainian Pysanky eggs.</td>
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<tr>
<td>Challenge gifted students to design packages to prevent eggs from breaking when dropped from an 8-foot height. Hypothesize, test, and improve designs if needed. Restrict container sizes. Ask students to apply what they learned to a discussion of the effectiveness of bike and skateboard safety helmets.</td>
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Objectives

Students design, create, and fly a personalized “You” wind banner to gather baseline data on wind direction.

Students develop hypotheses about the most frequent wind direction and then use banners to gather, record, and summarize data in order to compare it to their original hypotheses.

Multiple Intelligences

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National Standards

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<tr>
<td>Reflecting upon and assessing the characteristics and merits of their work and others</td>
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</table>

<table>
<thead>
<tr>
<th>Science Standards</th>
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<tbody>
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<tr>
<td>Motions and forces</td>
</tr>
</tbody>
</table>

Background Information

Scientists use equipment to measure from what direction the wind blows. Even flags and banners, which come in all shapes, sizes, and colors, reveal the wind’s direction.

Many countries use banners in celebrations. These banners are typically brightly decorated and contain cultural symbols and images. Children’s Day (Kodomo no hi) celebrated in Japan on May 5, was traditionally called the Boy’s Festival (Tango no Sekku). Typically, banners on display in Japanese homes are hand-painted.

On March 3, Japanese families celebrate Hina Matsuri (Doll Festival or Girl’s Festival). On this day, families with girls wish their daughters a successful and happy life. Banners are personalized with symbols of family crests called mons. The name of the child the banner honors, written in kanji, is included in the design.

Resources

Kites: Magic Wishes That Fly Up to the Sky by Demi
Written for ages 5-8, showcases lively, colorful Chinese kites incorporated into a touching mother/son story. Includes complete instructions for making a kite and a thorough discussion about the history of the Festival of Kites.

The Great Kite Book by Norman Schmidt
Older students enjoy this collection of unusual designs for 19 kites. Straightforward directions for assembly and decorating.

The Wing Shop by Elvira Woodruff
Amazing colored pencil/watercolor illustrations do most of the storytelling about a boy who tries on various sets of wings in his attempt to fly back to his old home and neighborhood. For grades 1 to 3.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

- Weather
  - Meteorologist
  - Forecaster
  - Research scientist
  - Technology
  - TV personality
  - Computer
  - Doppler weather radar
  - Radar

- Weather vanes

- Materials
  - Metal
  - Wood
  - Aluminum
  - Plastic
  - Folk art

- Wind
  - East
  - North
  - South
  - Speed/velocity
  - Chart
  - Data
  - Miles per hour
  - West
  - Windsock
  - Airports

What Does It Mean?

Horizontal: a position that is parallel to the horizon, running across from side to side

Hypothesis: a theory or proposed explanation

Kanji: traditional Chinese characters used in contemporary Japanese writing

Self-portrait: representation of an individual made by that person
Artwork by students from Foothills Elementary School, Colorado Springs, Colorado. Teacher: Kay La Bella
Discuss how Japan and Korea celebrate Children’s Day. Some families make and display banners they fly in the wind to honor their children.

Create a sample banner that emphasizes your own traits and characteristics. Tell students they will create banners to reflect their personalities. Banners will be used to chart and test their hypotheses about which direction the wind blows most often. Ask students questions such as, “Who knows how wind direction is determined?” Explain how weather vanes, windsocks, banners, and flags can all indicate the direction the wind blows. Weather vanes and windsocks are made to freely rotate in a horizontal plane.

Research the history of weather vanes. Display images.

### Crayola® Supplies
- Fabric Markers
- Markers
- School Glue
- Scissors

### Other Materials
- Clothesline and clothespins
- Fabric panels
- Hole punch
- Iron (for adult use only!)
- Oak tag (9 x 12 inches)
- Paper
- Poster board
- Yarn or string

### Set-up/Tips
- Ask parent volunteers to recycle, measure, and cut apart clean, plain cotton or 50/50 cotton/polyester bed sheets into banner panels at least 9 inches wide and 3 feet long.

---

Tibetan prayer flag
Artist unknown
Printed cotton
10” x 12”
Private Collection.

Tibetan Windsock
Artist unknown
Cotton, thread, mirrors
30” x 10”
Private Collection.
K-2 | 3-4 | 5-6
--- | --- | ---
**Process: Session 1**
**30-40 min.**
1. Fold oak tag into a 6-by-9-inch folder. Measure and mark two dots with markers, one inch in from both ends, on the fold. Punch holes at the dots. Thread yarn or string through the holes for hanging the banner. Tie the ends.
2. Open the oak tag. Spread glue on both open ends about 3” inches wide. Place a fabric panel on the glue. Fold the flap closed to sandwich the fabric between the glued areas, and press down. Air-dry the glue.
3. Draw a self-portrait head with detailed facial features on the oak tag. The top of the head should be near the yarn or string.
**Process: Session 2**
**30-45 min.**
5. Draw and color a clothed torso, with arms and legs, on the fabric panel with fabric markers. Encourage the addition of symbols and banner backgrounds in which the shapes, forms, and colors emphasize each student’s personal traits and characteristics.
6. Iron the fabric so designs become permanent.
**Process: Session 3**
**30 minutes**
7. Make a class wall chart titled *In What Direction Do “You” Usually Fly?* List student names and their hypotheses about wind direction, one per row, in the left-hand column. Create columns for each calendar day students will measure the direction their “You” banners fly.
**Process: Session 4**
**30 minutes daily for 2 weeks**
8. Hang a clothesline in a safe outdoor area where the wind blows freely. Hang banners on dry days only. Children observe and mark the chart with a wind direction letter: N = north, S = south, E = east, W = west. Combine directions where necessary such as NE and SE. Collect data for at least 2 weeks. Summarize and analyze data.

**Assessment**
- Children examine banners and share observations about the creativity and personality depicted on each one.
- Children verbally reveal their direction predictions and, after collecting data, compare their predictions with the data recorded on the chart.
- Students critique each other’s banners for symbol and self-portrait relevance, color, and creativity.
- Students verbally offer reasons for their original wind direction hypotheses and then present a comparison of their hypotheses with the data.
- Display banners with numbered labels. Match numbered banners to students listed on the chart. Discuss, explain, and debate choices.
- Students offer written reasons for their hypotheses and compare hypotheses with data. End with a new hypothesis based on the data.
- Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.

**Extensions**
- Walk around the neighborhood to locate weather vanes and seasonal banners.
- Set up a weather area. Record and display data related to sunny, rainy, windy, cloudy, and other days.
- Use weather data to practice math skills and vocabulary.
- List careers that depend on wind direction or speed.
- Find out more about power-generating windmills. How do they work? What effects do they have on the environment?
- Research windsocks at airports. Why do pilots need to know wind direction?
- Gifted children find out how and why wind direction and other factors affect local weather. Use findings to forecast weather. Compare to meteorological forecasts.
- Examine a world weather map. Locate phenomena such as the Mistral in France and Italy.
- Design, create, and display a classroom banner with symbols and words representing favorite classroom activities and inside jokes.
- Invite a local meteorologist into the classroom to share additional wind direction information with students.
Objectives

Students explore entomology, describe the characteristics of insects, and give examples of ways insects depend on their environments.

Students create models of imaginary insects with realistic anatomy and characteristics.

Students in grades 3-6 create an enclosed environment for the model insect and describe the characteristics of that environment which make it suitable for the survival of that species.

Students in grades 5-6 describe some adaptive characteristics necessary for the survival and reproduction of their model insect in a new or different ecosystem.

Multiple Intelligences

<table>
<thead>
<tr>
<th>Naturalist</th>
<th>Logical-mathematical</th>
<th>Spatial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

Background Information

There are more than 800,000 identified species of insects and probably millions more not yet discovered. All insects have three major anatomical parts: a head, thorax, and abdomen. Most insects also have two antennae, six legs, and wings. They are the only invertebrates (lacking a backbone) capable of flight. They also are capable of communicating through pheromones, sounds, and visual signals. Their life spans vary from the short 6-week life cycle of a common housefly to as many as 20 to 40 years for certain termites and wood-eating beetles. Although most insects are small, there is evidence that prehistoric dragonflies had wingspans of up to 30 inches. The Goliath spider living in South America has an 11-inch leg span and feeds on small birds.

Like other organisms, insects live in ecosystems that have the conditions necessary for their species to survive. Insects are found in mountains, deserts, forests, tundra, grasslands, and fresh water. They live in both hot and cold climates and even in rocks deep beneath the Earth’s surface. About the only place they are rarely found is in the sea. Some, like the beetle, are very adaptable and can live in many different biomes. According to Paul Beckman, author of Living Jewels, the beetle has evolved over 250 million years, adapting to every climate and landscape on Earth. It has developed a “phantasmagorical diversity of shapes and sizes, colors, patterns, and textures.”

Resources

Everything Bug: What Kids Really Want to Know About Insects and Spiders by Cherie Winner
Latest information about the bizarre world of insects for ages 9 through 12. Lively writing and beautiful, appealing illustrations.

Living Jewels by Paul Beckmann

Old Cricket by Lisa Wheeler
Rich language, strong plot, and skillfully drawn characters. Provides a bug’s-eye view of the world for ages 4 through 8. Detailed acrylic illustrations of crickets, katydids, ants, and grasshoppers.

The Very Clumsy Click Beetle by Eric Carle
Bold, bright, tissue-paper illustrations help tell the story of a little beetle who landed on his back and couldn’t right himself. The never-give-up theme and click beetle sound effects appeal to all ages.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

- Science
  - Adaptation
  - Anatomy
  - Abdomen
  - Head
  - Thorax
  - Ant farm
  - Antennae
  - Biosphere
  - Camouflage
  - Classification
  - Cleoptera
- Ecosystem
- Entomology
- Environment
- Evolution
- Habitat
- Manufactured
- Natural
- Hemiptera
- Hypothesis
- Insect
- Invertebrate
- Life cycle
- Magnify
- Metamorphosis
- Observation
- Pheromones
- Predators
- Prehistoric
- Species
- Survival
- Terrarium
- Wings
- Color
- Pattern
- Shape
- Size
- Symmetry
- Texture
Building fun and creativity into standards-based learning

Artwork by students from Mount Prospect Elementary School, Basking Ridge, New Jersey. Teacher: Jennifer Braun

Artwork by students from Madison Elementary School, Colorado Springs, Colorado. Teacher: Judy Curtis
<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
</tr>
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<tbody>
<tr>
<td><strong>Suggested Preparation and Discussion</strong></td>
<td><strong>Suggested Preparation and Discussion</strong></td>
<td><strong>Suggested Preparation and Discussion</strong></td>
</tr>
<tr>
<td>Display close-up photographs of insects such as those included here as well as human-made habitats in which insects are typically contained for study or observation, such as simple cages, terrariums, ant farms, or other closed containers. Include mounted insects; show live insects if possible.</td>
<td>Discuss ways in which animal bodies (including our own) differ from and are the same as insect bodies. Identify bug body parts such as the head, thorax, abdomen, and two antennae. Note that most insects also have six legs and many have wings.</td>
<td>Exhibit close-up photographs of insects on one half of a bulletin board and various types of natural environments where insects live on the other half. Students match the two with yarn. List attributes that make a healthy habitat for insects to thrive. Show and discuss artifacts or models that contain insects. Review the life cycles of some common insects.</td>
</tr>
<tr>
<td>Imagine an environment and picture an insect that might live there. Ask: What color is the insect? How large is it? How does it camouflage itself to hide from its predators? How does it move? Does it have long or short legs? How does it catch its food?</td>
<td>Discuss habitats that could be created inside a bottle, based on observation of insects through a magnifying glass and knowledge about their activities.</td>
<td>Ask: Could an insect adapt to a new environment? What adaptive characteristics might be required for survival in a different ecosystem? Ask students to invent a new species of insect that displays adaptations needed for its survival in a new environment.</td>
</tr>
</tbody>
</table>

**Crayola® Supplies**
- Glitter Glue
- Markers
- Model Magic®
- Paint Brushes
- School Glue
- Scissors
- Watercolors

**Other Materials**
- Chenille stems
- Magnifying glasses
- Modeling tools such as plastic dinner knives, craft sticks, and toothpicks
- Recycled newspapers
- Water containers
- Clean, clear 1-liter bottles
- Corrugated cardboard
- Natural, found materials such as feathers, twigs, raffia, stones, leaves

**Set-up/Tips**
- Cover art surface with recycled newspaper.
- Ask parent volunteers to save recycled clear plastic bottles and cut off the top 4 inches. Prepare one for each student.

**Create an insect**

**Process: Session 1 45-60 min.**

1. Observe insects with a magnifying glass. Study their shapes, colors, textures, and patterns.
2. Cut oak tag into small rectangles and fold in half. Cut toward the fold to create symmetrical wings. Add patterns and designs to the wings.
3. Shape Model Magic compound to create an insect body with a head, thorax, and abdomen. (Older students make sure it will fit in the bottle.)
4. Place wings over the body. Apply additional compound to attach wings to the body. Glue together as needed.
5. Embed chenille stems into the insect for antennae or other features. Use modeling tools to create texture. Air-dry the insect 24 hours.

**Insect Illustrations**

Color plate 19

*The Naturalists’ Library*

Collection of D. Jehle.

**Insectile**

Artist: William Skrips

Found welded steel, including barn shutter hangers, tuning fork tines, miscellaneous materials

32” x 9” x 4”

Collection of Bill and Cara Skrips.
K-2 | 3-4 | 5-6
---|---|---
**Process:**
**Session 2**
10-15 min.

6. Paint the insect with watercolors. Air-dry the paint.

**Process:**
**Session 3**
20-40 min.

7. Decorate the insect with glitter glue, feathers, or other craft materials. Air-dry the glue.

**Design a natural habitat**
8. Shape a Model Magic display base for the insect’s habitat. Glue raffia, twigs, or other natural elements to the base. Air-dry base overnight.
9. Cut cardboard slightly larger than circumference of the bottle openings. Paint cardboard to reflect the imagined environment. Air-dry the paint.

**Process:**
**Session 4**
30-45 min.

11. Place plastic bottle over model. Apply glue around the circumference of the bottle. Wrap a coil of Model Magic compound over the glue to seal the bottle to the cardboard. Air-dry the art.
12. Write a paragraph describing the model insect and its habitat.
13. Imagine the model insect in a different environment. Describe that environment and explain how the insect would have to adapt to that habitat.

**Assessment**
- Display insect models. Children point out and verbally label the body parts of their insects.
- Children describe the habitats that would be best for their insects.
- Do models accurately reflect knowledge of insect body parts? Are model insects suited to the environments created for them?
- Are descriptive paragraphs detailed enough that classmates can match them to the appropriate insect models?
- Can students name three characteristics of insects? Can students verbally provide two examples of ways in which insects depend on their environments?
- Are the adaptations described by students suitable for the survival of their model insects in the imagined new environments?
- Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned about insects.

**Extensions**
- Students draw their insects, create names for them, and label their body parts.
- Create a “bug museum” and invite families to visit. Students act as museum docents.
- Students design a chart to display examples of the three ways insects communicate (pheromones, sounds, and visual signals).
- Students research the lives of social insects. Write job descriptions for the various insect community duties.
- Encourage academically talented students to research the role insects play in the web of life. How does the environment affect the life cycle (metamorphosis) and life span of an insect? If insects disappeared, how would other creatures be affected?
- Create “travel brochures” to lure insects to a particular habitat. Cite temperatures, food, and environmental features.

Observe insects in their natural habitats. Locate an ant nest and watch the activities. Note what they carry into and out of the nest. What happens when ants encounter one another? Take notes, discuss, and hypothesize. Compare hypotheses with facts. Encourage students and their families to observe the behavior of fireflies at night.

To enhance meaning for students with learning differences, provide a center within the classroom for observing the metamorphosis of caterpillars into butterflies. Celebrate the release of the butterflies.
Objectives

Students observe and identify patterns in the night sky.

Students in grades K-2 create a night sky mural including a constellation shape of their own choosing.

Students in grades 3-6 identify and research specific star patterns that form constellations in the night sky.

Students in grades 3-6 design and paint constellation-map murals that accurately reflect local constellations observed in the night sky.

Students in grades 5-6 identify characteristics of objects such as planets, meteors, meteorites, comets, asteroids, and moons.

Background Information

For centuries, people have observed stars in the night sky. When groups of stars seem to form a pattern—people, animals, or objects—they are called constellations. The Big Dipper or Great Bear is just one of 88 constellations that have common names and are based on mythology.

Constellations are popular subjects for fine art. In the grand hall in New York City’s Grand Central Station, you can see a ceiling mural painting that includes constellations as part of the design. The constellations in this mural were intentionally painted as if one were flying high above the constellations looking down on them. The 59 points of light that represent the stars in the mural are actual lights.

Understanding celestial worlds has been an important area of discovery for people throughout history. Copernicus was a scientist who developed an early model of the solar system. Galileo Galilei discovered mountains and craters on the moon. Johannes Kepler established the three laws of planetary motion. Sir Isaac Newton developed theories of gravity and Edward Charles Pickering discovered the first binary star, Mizar.

Resources

*Find the Constellations* by H.A. Rey, Revised Edition

Suitable for grades 5-6. Colorfully illustrated book is an informative beginners’ guide to locating and identifying constellations in the Northern Hemisphere. Includes extensive index, glossary, and timetable for stargazing.

Once Upon a Starry Night: A Book of Constellations by Jacqueline Mitton

Two-page spreads present 10 constellations with brief retellings of the Greek myths related to them. Glittering foil stars form the constellations. Endpapers include star maps. Ages 5 to 9.

The Constellations: Stars and Stories by Chris Sasaki

An introduction to star gazing for ages 9 to 12. Includes star maps and information about how patterns of stars become constellations. Eighty-eight alphabetized full-page illustrations.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

<table>
<thead>
<tr>
<th>Align</th>
<th>Light year</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asteroid</td>
<td>Major</td>
<td>Seasonal</td>
</tr>
<tr>
<td>Celestial</td>
<td>Meteor</td>
<td>Shape</td>
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<tr>
<td>Comet</td>
<td>Meteorite</td>
<td>Space</td>
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<tr>
<td>Configurations</td>
<td>Milky Way</td>
<td>Spatial</td>
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<td>Contrast</td>
<td>Minor</td>
<td>Stars</td>
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<tr>
<td>Cosmos</td>
<td>Moon</td>
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<tr>
<td>Darkness</td>
<td>Mural</td>
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<td>Form</td>
<td>Myths</td>
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<tr>
<td>Glow</td>
<td>Nebula</td>
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<tr>
<td>Gravity</td>
<td>Nova</td>
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<tr>
<td>Horizon</td>
<td>Orbit</td>
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<tr>
<td>Horizontal</td>
<td>Patterns</td>
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<tr>
<td>Iridescent</td>
<td>Planet</td>
<td></td>
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<tr>
<td>Light</td>
<td>Planetarium</td>
<td></td>
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</tbody>
</table>
Artwork by students from Chamberlin Elementary School, Colorado Springs, Colorado. Teacher: Patricia McKenna

Artwork by students from St. Theresa School, Hellertown, Pennsylvania.
## Constellations in the Night Sky

<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Suggested Preparation and Discussion</strong></td>
<td>Display a picture of a constellation aligned to the current local night sky a few days before introducing the lesson. Challenge children to identify the name of the constellation. List suggestions. Create a display of cosmological maps, such as those by Vincenzo Coronelli, with details of specific constellations. Create and display a night sky similar to those students will make.</td>
<td>Explain that a constellation is an arbitrary configuration of stars, usually named after the object, animal, or mythological being suggested by its star outline. Ask students to name some animals, objects, or other images they have seen in constellations. How many have to stretch their imaginations to see the characters? Show students a sample constellation mural. They will divide into teams to create a mural of a night sky with one real constellation as the focus. Tell the story associated with the displayed constellation.</td>
</tr>
</tbody>
</table>

Define stars as hot, rotating balls of gas that create their own light. Remind children that the sun is our closest star. Explain that constellations are patterns of stars in the sky. Discuss how people named these patterns and created interesting legends about them. Tell the story of the constellation on display. |

**Crayola® Supplies**
- Construction Paper™ Crayons
- Glitter Glue

**Other Materials**
- Construction paper (black)

**Set-up/Tips**
- Ask a parent volunteer to cut out major star openings with a utility knife. Place cardboard under the mural. Push a pencil point through the mural paper where the minor star holes are marked.
- Cover painting surface with newspaper. If more space is needed to spread out murals, consider painting outdoors.

---

*New York’s Grand Central Terminal’s Main Concourse Ceiling Winter Sky Zodiac Constellation*
By Paul Helleu of the Hewlett-Basing Studio
Paint, 24-carat gold leaf
275’ x 120’ x 125’
New York, New York
Photos by R. De Long
### Process: Session 1
#### K-2
**Create a night sky**
1. Create stars, planets, moons, and comets on paper. For interesting night sky effects, vary sizes. Use dots, hatching, and cross-hatching lines to fill shapes. Emphasize contours with dots or fine and thick lines. Add fiery comet tails.

#### 3-4
**Create a constellation**
1. Break into teams of 2 or 3 students to research, design, and draw a real constellation in the night sky with Gel Markers. Mark minor stars with small white circles and major stars with large white circles.
2. Paint the constellation with brushes and/or sponges. Leave the stars white. Air-dry the paint.
3. An adult cuts out the major star openings (see Tips) and presses a pencil point through the minor stars.

#### 5-6
**Add a constellation**
1. Break into teams of 2 or 3 students to research, design, and draw a real constellation in the night sky with Gel Markers. Mark minor stars with small white circles and major stars with large white circles.
2. Paint the constellation with brushes and/or sponges. Leave the stars white. Air-dry the paint.
3. An adult cuts out the major star openings (see Tips) and presses a pencil point through the minor stars.

### Process: Session 2
#### K-2
**Add a constellation**
1. Choose a constellation to place in the sky. Draw tiny circles on the paper to mark the constellation stars.
2. Add dots of glitter glue to the tiny dots. Air-dry the glue.

#### 3-4
**Add a celestial bodies**
4. Use Gel Markers to add celestial bodies such as the Milky Way, moons, planets, and suns.
5. Label the constellation and all celestial bodies.

#### 5-6
**Add a celestial bodies**
4. Use Gel Markers to add celestial bodies such as the Milky Way, moons, planets, and suns.
5. Label the constellation and all celestial bodies.

### Assessment
#### K-2
- Children correctly define a star and a constellation.
- Each child uses a crayon drawing to accurately depict a night sky with a constellation.

#### 3-4
- Does each mural include one constellation with a recognizable image and all stars marked in the correct positions?
- Tape murals to windows and remove all other sources of light. Students identify mural constellations based only on the major and minor starlight. Students orally share background information about the constellations they painted.

#### 5-6
- Does each mural include one constellation with a recognizable image and all stars marked in the correct positions?
- Tape murals to windows and remove all other sources of light. Students identify mural constellations based only on the major and minor starlight. Students orally share background information about the constellations they painted.

### Extensions
#### K-2
- Display projects close together as one huge night sky.
- Tell an adventure story about space travelers in the night sky portrayed.
- Write new words to a constellation version of “Twinkle, Twinkle Little Star.”

#### 3-4
- Research the myths behind the constellations. Compare and contrast stories from different cultures and time periods.
- Create illustrations for the signs of the zodiac. In small groups, research the meaning of each.

#### 5-6
- Invite students with strong mathematical skills to determine the coordinates for graphing each star in a particular constellation. Exchange lists of coordinates with other students to identify the constellation graphs.
- Students pretend they are ancient farmers or astronomers who spot an unusual night sky pattern. Have them draw the star pattern, outline and name the constellation, and write a journal entry explanation.

---

After reviewing the location of the North Star, assign an evening star watch. Attempt to locate constellations including Ursa Major (Great Bear), which contains the Big Dipper star pattern.

Outdoors, draw giant constellations with Crayola Sidewalk Chalk or Sidewalk Paint. Invent names, games, and stories about the night sky.

Visit a local planetarium to view constellations.
Objectives

Students use prior knowledge and conduct research to determine the extent of the interdependence of plants, animals, humans, and the environment.

Students design and illustrate an example of an ecologically friendly home, school, neighborhood, or community environment in which people depend on each other and the environment to thrive.

Multiple Intelligences

<table>
<thead>
<tr>
<th>Interpersonal</th>
<th>Naturalist</th>
<th>Spatial</th>
</tr>
</thead>
</table>

What Does It Mean?

**Biosphere**: any area of a planet that supports life

**Crosshatching**: use of lines that cross each other to shade, emphasize, and make shadows

**Ecology**: study of relationships between organisms and their environments

**Geosphere**: the solid parts of Earth

**Visualize**: process of recalling or imagining mental pictures

Background Information

All organisms depend on their physical environments to survive. The study of the relationship between an organism and its environment is called **ecology**. Ecologists study Earth’s major systems or spheres including the **atmosphere**, the **geosphere**, and the **hydrosphere**. The atmosphere is the envelope of gasses surrounding the planet. The Earth itself and the ocean crusts are referred to as the geosphere. The hydrosphere is made up of all the water on the planet. Vladimir Vernadsky is credited with first using the word **biosphere**.

The **anthrosphere** is that part of the environment made or modified by humans. Most people recognize the negative impact that humans have had on this planet. For centuries, people have been burning fossil fuels, causing a buildup of greenhouse gasses that trap heat and lead to global warming. Chemicals from agriculture and industry have contaminated the world’s water resources.

Many nations and scientists are taking steps to solve these problems. Using renewable resources, finding alternative energy sources, rethinking transportation methods, and recycling products are just four ways to create a more eco-friendly environment. Nature and wildlife conservation are other important considerations. When rainforests are burned, plants and animals that may have the potential to cure diseases are destroyed.

Resources

*Brother Eagle, Sister Sky: A Message From Chief Seattle* by Susan Jeffers

Adaptation of a speech said to have been given by Chief Seattle. Contains profoundly beautiful words and an enduring, relevant message about the importance of living in harmony with nature.

*Just a Dream* by Chris Van Allsburg

Beautiful abstract images tell the story of a careless 10-year-old boy who learns a powerful dream lesson about protecting the environment. Grades 2 to 5.

*The Lorax* by Dr. Seuss

A timeless and compelling ecological warning about the importance of environmental preservation. Colorful images, clever word plays, and extraordinary rhymes. Ages 4 to 8.

National Standards

<table>
<thead>
<tr>
<th>Visual Arts Standard #6</th>
<th>Science Standards</th>
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<tr>
<td>Making connections between visual arts and other disciplines</td>
<td><strong>Unifying Concept and Process</strong></td>
</tr>
<tr>
<td></td>
<td>Systems, order, and organization</td>
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<td></td>
<td><strong>Science as Inquiry</strong></td>
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<td></td>
<td>Abilities necessary to do scientific inquiry</td>
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<tr>
<td></td>
<td><strong>Science in Personal and Social Perspectives</strong></td>
</tr>
<tr>
<td></td>
<td>Populations, resources, and environments</td>
</tr>
</tbody>
</table>

Concept List

*Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.*

- Science
  - Design
  - Alternative energy
  - Eco-friendly
  - Anthroposphere
  - Ecology
  - Atmosphere
  - Ecosystems
  - Biodegradable
  - Environment
  - Biosphere
  - Global warming
  - Compost
  - Geosphere
  - Conservation
  - Greenhouse effect
  - Crisis
  - Hydrosphere
  - Decompose
  - Interdependence

- Visual arts
  - Light
  - Color
  - Mood
  - Design
  - Movement
  - Form
  - Pattern
  - Visualize
  - Shapes
  - Texture

Artwork by students from Linden Elementary School, Oak Ridge, Tennessee.

Teacher: Carolyn S. Skeen
Artwork by students from Mount Prospect Elementary School, Basking Ridge, New Jersey. Teacher: Susan Bivona
### How Can You Contribute to a Healthy Ecology?

<table>
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<tr>
<th>K-2</th>
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<tbody>
<tr>
<td><strong>Suggested Preparation and Discussion</strong></td>
<td></td>
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</tr>
<tr>
<td>Create an Earth Stewardship Area. Students post information related to the greening of the planet, display examples of items made from recycled materials, and start a chart of Earth-friendly ideas.</td>
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<tr>
<td>Read the poem <em>Sarah Cynthia Sylvia Stout Would Not Take the Garbage Out</em> by Shel Silverstein. Discuss the mounting impact of garbage. Ask: Where does the garbage go? What if we ran out of places to take it? What happens to garbage after one year? Five years? Ten years?</td>
<td></td>
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</tr>
<tr>
<td>Create a web of life. One student labels a card the sun. Other students make cards with the names of plants, animals, and insects. Form a circle. The student holding the sun card holds one end of a long piece of yarn. All life needs the sun to grow. Ask what would be next in the web of life (plants). Everyone with plant cards takes a section of the yarn. Continue until all cards have been used and everyone is holding onto the yarn. Ask what would happen if one item disappeared from the environment. One student drops out of the circle. What other items are affected? (those students also drop yarn). As the chain collapses, discuss the contributions and needs of every living thing.</td>
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<tr>
<td>Encourage discussion of ways to improve the environment. Introduce the terms rethink, reduce, reuse, and recycle and the “chasing arrows” found on many manufactured containers.</td>
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</tbody>
</table>

#### Discuss the basic needs of living organisms. Consider how various organisms depend on each other and their environments.

#### Research the interdependence of living things in an environment. Discuss findings about the Earth’s major systems, including the atmosphere, geosphere, and hydrosphere.

### Crayola® Supplies

- Markers

### Other Materials

- White drawing paper

### Arpillera

2003

Artist unknown

Appliqué textiles, cotton, colored thread, yarn

19 1/2" x 19 1/2"

Peru

Private Collection.
K-2

Process: Session 1
30-45 min.

1. Students draw ideas for steps they and their families can take to help solve current environmental problems.
2. Add color, pattern, and texture to drawings with stripes, dots, crosshatching, and solid colors.

Extension:
- With students, create an environmental display for a hall bulletin board.
- Create birdhouses or feeders from recycled containers.

Assessment:
- * Children identify concrete solutions for protecting the Earth’s ecology.
- * Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned about contributing to a healthy biosphere.

3-4

Process: Session 1
30-45 min.

1. Students sketch their ideas for choices they could make that would lead to an improved atmosphere, geosphere, and/or hydrosphere. Consider transportation systems, recycling, conservation, and alternative energy solutions.
2. Fill sections of the drawing with Overwriters® under colors. Create lines, shapes, and textures with over colors.

Extension:
- Take a community survey. What alternative forms of energy are used? How clean and abundant is water? What items can be recycled? What happens to hazardous waste? Start an Ecology Club.
- Watch and discuss the video *An Inconvenient Truth*.
- Encourage students with good research skills and persuasive abilities to research local environmental issues. Present findings to the class and interested citizens.

5-6

Process: Session 2
15-20 min.

1. Students explain the ideas in their drawings to each other. What effect would their ideas have on the environment?
2. Create a key or legend that identifies the Earth’s major systems as portrayed in the drawing.
3. Share solutions with classmates and/or the community.

Extension:
- Participate in the Earth Day Groceries Project. Grocers donate paper bags to schools. Students decorate sacks and return them to the stores. Clerks fill the original artwork bags with customers’ groceries.
- Conduct an experiment. Submerge garbage such as apple cores, aluminum foil, banana peels, foam, eggshells, and plastic in soil. Check the biodegradability months later when the items are unearthed. Discuss observations.
- Visit a recycling center. How can students encourage more recycling?
- Students with special needs might create collages from magazine pictures or use assistive technology.
How Can You Help Save Endangered Species?

Objectives

Students research to learn how environmental changes cause some species to thrive, become ill, or perish.

Students use knowledge about endangered species and their habitats to design promotional literature that communicates, through text and illustrations, how people might take action to help save endangered species.

Background Information

Every day on Earth, an estimated 74 species of life forms become extinct, making it difficult to maintain balance of living things. Human behavior is often the cause for the elimination of living things. Humans can reverse their actions and help endangered species survive.

Sadly, fewer than 1,000 pandas remain in the mountainous bamboo forests of Southwestern China. The chances that the numbers of this animal will rebound are diminished by factors such as habitat destruction, poaching, and the panda’s low reproductive capacity.

Sea turtles are able to migrate hundreds and sometimes thousands of miles, traveling from their feeding ground to their nesting beach, which is usually the same beach on which they were born. Out of seven species of sea turtles, four are classified as endangered: the green turtle, the leatherback, the hawksbill, and Kemp’s Ridley.

Resources

Beaks by Sneed B. Collard III
Striking illustrations with painted and cut paper collage to create an amazing 3-D effect. Students in grades K to 3 learn about the uses and evolution of beaks of numerous bird species.

Our Wet World by Sneed B. Collard III
Ages 5 to 9 experience an underwater journey to 13 aquatic ecosystems. Clear descriptions and illustrations of water bodies such as rivers, marshes, streams, and shores. Excellent glossary to aid in research and report writing.

The Forest in the Clouds by Sneed B. Collard III
The ‘forest in the clouds’ is really a rain forest found high in the mountains. Beautifully illustrated book, written for grades 4 to 8. Identifies threats to rainforests and presents suggestions for what can be done to help. Includes glossary, map, and additional book and website suggestions.

Winged Migration—The Junior Edition by Stephanie Durand and Guillaume Poyet
Suitable for all ages. Beautifully chronicles many types of migratory birds. Some actually travel more than 100,000 miles in their flight for survival. Companion book to the film of the same name.

Multiple Intelligences

<table>
<thead>
<tr>
<th>Intrapersonal</th>
<th>Naturalist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linguistic</td>
<td>Spatial</td>
</tr>
</tbody>
</table>

Science Standards

Science and Technology
Abilities to distinguish between natural objects and objects made by humans

Unifying Concept and Process
Evolution and equilibrium

Science as Inquiry
Understanding about scientific inquiry

Vocabulary and Concept List

Use this list to explore new vocabulary and create idea webs.

- Design formats
  - Mini-booklets
  - One-page flyers
  - Pamphlets
  - Tri-folds

- Endangered species
  - Survival
  - Urban sprawl
  - Citizen responsibility
  - Advertisements
  - Awareness
  - Ecology
  - Air
  - Forests
  - Oceans
  - Wetlands
  - Promotions
  - Safety
  - Extinction
  - Perish
  - Poaching
  - Population control
  - Rebounding

- Watercolor techniques
  - Dry brush
  - Washes
  - Wet on wet

What Does It Mean?

Contour drawing: drawing that focuses on edges and three-dimensional outlines of objects, folds, or patterns using line without shading

Dry brush: technique using paint with a minimum of water on a dry surface

Dry on wet: technique using paint with a minimum of water on a wet surface

Endangered: plant and animal species that are in danger of becoming extinct

Extinct: plant or animal species that no longer live on Earth

Wash: technique of filling a surface with water and adding small amounts of paint

Wet on wet: technique using paint with a maximum of water on a wet surface
Artwork by students from Bullard Talent School, Fresno, California. Teacher: Ann Winters-Canfield

Artwork by students from Lakewood Elementary School, Fort Worth, Texas. Teacher: Diane McClure
### Suggested Preparation and Discussion

<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
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<tbody>
<tr>
<td>Display photos of insects, plants, and animals that are on the extreme endangered species list. Read about and discuss endangered species. What could be done to preserve habitats? How could pollution be prevented? Create a web of words related to the problems surrounding endangered species and their habitats. Discuss what the words <em>endangered</em> and <em>extinct</em> mean.</td>
<td>With students, research display photos of insects, plants, and animals that are on the extreme endangered species list. Design a chart with two columns and about 15 rows. Label one column “Endangered Species” and the second column “Solutions to Avoid Extinction.” Use the chart to begin a class discussion on the topic. Research the most critically endangered plants and animals. Invite students to add species to the chart if they can offer practical solutions that will help avoid extinction. What changes do environmentalists recommend to save endangered species? What laws would be needed to help guarantee survival of threatened species?</td>
<td>Design a display of various advertising and design formats such as tri-folds, brochures, mini-booklets, pamphlets, and one-page flyers. Demonstrate step-by-step watercolor pencil drawing and painting techniques that best illustrate Earth, sea, sky, and animals. Include dry brush, wet-on-wet, and dry-on-wet techniques. Encourage the use of contour lines and dark and light values to enhance species illustrations. Ask students to reflect on their knowledge about endangered species. Invite them to design a piece of literature whose text and illustrations call out solutions that help keep endangered species from becoming extinct. Design formats can vary.</td>
</tr>
</tbody>
</table>

### Crayola® Supplies
- Gel Markers
- Glitter Glue
- Paint Brushes
- Scissors
- Watercolor Colored Pencils

### Other Materials
- Construction paper
- Paper towels
- Recycled newspaper
- Water containers
- White paper

### Set-up/Tips
- Cover art surface with newspaper.
- Draw with dry watercolor pencils and then apply water washes over the drawing to generate painterly effects. Repeat the process to create layered effects.

### How Can You Help Save Endangered Species?
- **South African Giraffe**
  - Artist unknown
  - Raku fired and glazed clay
  - 13” x 3” x 7 1/2”
  - Private Collection.

- **African Elephant**
  - Artist unknown
  - Rosewood, ivory
  - 12” x 13” x 8”
  - Private Collection.
**Process: Session 1**
**30-45 min.**

**Sketch flyers**
1. Each child chooses a species on the extreme endangered list. In small groups of children who chose similar animals, generate solutions for what could be done to save the species from extinction. Brainstorm and then identify strong verbs and exciting adjectives to describe the situation and solution.
2. Use watercolor pencils to design and illustrate a flyer or brochure that informs people about these solutions.

**Design promotional brochures**
1. Each student selects a species listed on the extreme endangered list. Students identify possible solutions to reverse the grave situation that exists for the insect, plant, or animal.
2. Students visualize and sketch a promotional brochure to address the issues using watercolor pencils. Students clearly articulate detailed solutions so that the literature becomes an effective public relations tool and captures audience attention. Consider various design formats, styles of text, and illustrations.

**Process: Session 2**
**30-45 min.**

**Complete flyers**
3. Enhance brochures by using at least two watercolor drawing and painting techniques. Air-dry the brochures.

**Complete brochures**
3. Include three or more watercolor drawing and painting techniques in each brochure. Air-dry the brochures.

4. Students analyze each other’s work for its attention-getting effectiveness and attributes.
5. Arrange to exhibit the advocacy artwork at a local bank, community center, or other public venue.

**Assessment**
- Children’s brochures clearly identify the endangered species and present a practical solution to the dilemma.
- Students use at least two watercolor drawing and painting techniques in their design.
- Children verbally explain the terms endangered and extinct.
- Students critique each other’s endangered species promotional brochures for compelling text, illustrations, and formats.
- Students use three or more watercolor drawing and painting techniques in their design.
- Students analyze solutions to identify those that have the most potential for being implemented.
- Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.

**Extensions**
- Create an illustrated book of endangered species for the school library.
- Play endangered species charades. Children try to identify the animal being portrayed by a classmate and then read and listen to learn more.
- Young students and those with some types of disabilities could dictate their message for someone else to write on their brochure, or generate copy on the computer.
- Students select favorite endangered species and, after identifying their characteristics, imagine changes in their behaviors, habitats, or physical forms that would improve their chances for survival. Use visual presentations to share with classmates.
- Create a web of life. Investigate the effect of the disappearance of one species. Find out how any species impacts its environment and fits in the web of life. Use yarn to make connections among students taking the parts of various species.
- Create a school-wide campaign to support a chosen species.
- Contact environmental organizations such as The Audubon Society, The National Wildlife Federation, The Environmental Defense Fund, or The World Wildlife Fund to gather information about critically endangered species.
- Gifted students could research more about species that have become extinct, those that are currently on the threatened list, and those that have left the endangered list due to successful interventions. Students “are the species” and self-promote themselves using posters, campaign buttons, and speeches explaining their uniqueness and value to the world’s ecosystem.
Objectives

Students observe and research information about indigenous animals and wood carvings created in Oaxaca, Mexico.

Students (K-2) sculpt an animal using simple geometric forms such as spheres, cubes, cylinders, pyramids, and rectangular prisms.

Students (3-4) create animal sculptures using an armature and decorate them with authentic patterns similar to traditional Oaxacan arts.

Students (5-6) research information about the intricately patterned woodcarvings of real and imaginary animals created by artisans in Oaxaca and then create an animal model in an environment.

Multiple Intelligences

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<th>Naturalist</th>
<th>Spatial</th>
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What Does It Mean?

Alibrejes: wildly imaginative papier maché figures which combine animal and representations of human body parts, from Mexico

Authentic patterns: colors, shapes, and designs that are either found in nature or that replicate traditional designs used by a cultural group

Intricate patterns: detailed designs using colors and shapes

Background Information

In the state of Oaxaca, Mexico, woodcarving is a famous form of folk art. Artists carve and paint whimsical, colorful animal art that is reflective of real and imagined things. The activity of carving these animals has contributed a new industry to this state in Mexico. Residents of Oaxaca were primarily agricultural workers, living in a subsistent economy before woodcarving transformed an entire region.

Oaxacan woodcarvings are created from branches from the soft copal tree that grows locally. From the wood, people cut and carve local animals as well as fantasy-inspired creatures. The dried, finished carvings are painted in bright, highly decorative patterns and sold in local markets and galleries.

Oaxacan woodcarvings are sometimes called alibrejes (ah lee bray hess), which is actually a misnomer. Alibrejes are a combination of carved wooden animal and representations of human body parts. They are similar in surface detail to the Oaxacan woodcarvings but are constructed of paper maché over a wire armature. They undoubtedly spring from the Mexican tradition of paper maché used in creations such as piñatas and Day of the Dead decorations.

Resources

Crafting Tradition: The Making and Marketing of Oaxacan Wood Carvings by Michael Chibnik

Behind-the-scenes look at how the Oaxacan wood carving market developed. Beautiful illustrations. Valuable reference for all ages.

Dream Carver by Diana Cohn

Written as a tribute to Manuel Jimenez, who inspired a rebirth of wood carving in Mexico. Beautiful primitive animal paintings appeal to 4- to 9-year-olds.

Oaxacan Woodcarving: The Magic in the Trees by Vicki Ragan and Shepard Barbash

Great reference resource. Many photographs and a wealth of information about the Oaxacan wood carving process, wood carvers, and their families.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

- Alibrejes
- Animal forms
- Armature
- Artisan
- Authentic
- Copal tree
- Day of the Dead (Dia de los Muertos)
- Dotted pattern
- Fantasy
- Figurines
- Folk art
- Highly patterned
- Imagination
- Incense
- Mexico
- Oaxaca
- Oaxacan
- Overall pattern
- Papier maché
- Patterns
- Piñata
- Plaid
- Repetitive pattern
- Sculptor
- Sculpture
- Shapes
- Striped pattern
- Traditional crafts
- Unity
Artwork by students from Curlew Creek Elementary School, Palm Harbor, Florida.
Teacher: Nancy Rhoads
Wonderful Oaxacan Animals

Display a variety of prints and examples of Oaxacan wood carvings so children can touch them and observe details. Include a few small tree branches as part of the display. Research the animals that live in this area of Mexico.

Create two or three examples of branch-shaped animal forms. Decorate them in the traditional Oaxacan style of highly patterned ornamentation.

Ask students to take a close look at the carvings. What animal body parts can students identify? Who can figure out what is under the paint?

Look at the tree branches. Discuss: When you use your imagination, what sort of animal can you see in the branches? People in Oaxaca, Mexico, use their imaginations to carve unusual animals from tree branches.

Look at the colorful designs on the outside of the carvings. Ask: What do the designs remind you of?

Together, identify the animal parts that were carved in the display samples. Who can figure out what natural material is under the paint?

Break into small groups and have each group examine a tree branch. Ask groups to use their imaginations to brainstorm a list of animals they see in each branch as it is passed from group to group. Discuss why certain animals were apparent.

Notice the detailed designs on the outside of the Oaxacan animal carvings. What images and patterns do you recognize in the designs?

Look at tree branches. When you use your imagination, what sort of animal can you see in the branches? What animal would you carve into the wood?

People in Oaxaca, Mexico, use their imaginations to carve unique animals from tree branches. Notice the detailed designs on the outside of the carvings. What images and patterns do you recognize in the designs? Discuss new patterns that could be used to symbolize natural events observed by the Oaxacans.

Crayola® Supplies
- Glitter Glue
- Markers
- Model Magic®

Other Materials
- Tree branches
- Aluminum foil
- Corrugated cardboard
- Dried sticks
- Raffia
- Small pebbles

Set-up/Tips
- Use markers on dry Model Magic compound to achieve a crisp line for pattern work.

Process:
Select an animal
Session 1
20-30 min.

1. Children each choose an animal to sculpt. It could be a pet, a wild animal, a creature the class is studying in science, or an imaginary one from readings. If possible, find a picture that shows the shape of its body parts.

2. Discuss how armatures help support animal body construction

2. Research animals and their environments.
### Process: Session 2
**K-2**
- **Model a simple animal form**
  1. Form an animal with a tennis ball amount of Model Magic compound.
  2. Pinch, pull, and shape the compound into the desired animal and its primary features such as the head, legs, neck, and tail.
  3. Attach smaller Model Magic pieces to create animal details such as eyes, ears, and teeth. Air-dry at least 24 hours.

**3-4**
- **Combine forms to create an animal**
  1. Shape aluminum foil into an armature for a short, sturdy, skeletal structure. Apply Model Magic compound around the armature to form the animal body.
  2. Attach Model Magic pieces to the animal form to clearly develop the animal’s features. Air-dry for at least 24 hours.

**5-6**
- **Create a Model Magic and cardboard base that represents the animal’s environment.**
  1. Glue materials such as twigs, small pebbles, and dried grasses or raffia to the base. Air-dry the glue.

### Process: Session 3
**K-2**
- **Add patterns**
  1. Decorate the animal with intricate marker patterns that are similar to those on the carved Oaxacan animals. Use color, shapes, and line to create a unified look.
  2. Add glitter glue to highlight patterns. Air-dry the glue.

**3-4**
- **Assessment**
  1. Invite children to identify and list the simple geometric forms they used to create the animal models.
  2. Ask students to orally describe why an armature is important to construction of a sculpted model.
  3. Check to see that the animal is correlated with the environment model.

**5-6**
- **Ask students to identify whether the animal reflects a real or imaginary animal.**
- **Check to see if the animal models authentically reflect the decorative techniques used by artisans from Oaxaca, Mexico.**
- **Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.**

### Extensions
- **Discuss similarities and differences among classmates’ sculptures.** Sort and classify animals by habitats (farm, woods, jungle, and pets). Describe the common characteristics of animals in each group.
  - Talk about designs on the animals. Build vocabulary by noting patterns; zigzags, straight, and curved lines; plaids, circles, and dots.
  - Ask a local woodcarver to demonstrate the craft. Students document their learning with photographs, sketches, and narratives about the experience.
  - Children with some types of motor disabilities may find it helpful to work on a larger scale.

**3-4**
- **Discuss symbolism found in designs on completed Oaxacan sculptures.** Extend imagination by sketching alibres. Name the alibres.
  - Research animals indigenous to Oaxaca. Which animals live in the Oaxacan jungle? Near the beaches? In the mountains? What characteristics make it possible for them to adapt and thrive in the subtropical climate?
  - Ask advanced students to plan an expedition to Oaxaca. Locate it on a world map. Research details such as transportation, lodging, and wildlife tours, as well as markets for the animal carvings.

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**Indonesian Wooden Animal**
- Artist unknown
- Painted carved wood
- 14” x 8” x 3”
- Private Collection.
Objectives

Students use cultural symbols to decorate a windsock in increasingly complex ways as they mature.

Students (K-2) observe a windsock flying in a breeze to identify compass direction.

Students (3-4) use their windsocks to chart wind direction during a period of time and report findings.

Students (5-6) research wind velocity and use windsocks they create as a tool to record and analyze the direction of wind over a period of time.

Multiple Intelligences

Logical-mathematical
Spatial

What Does It Mean?

**Escutcheon**: shield or shield-like surface on which a coat of arms is depicted

**Family crest**: symbolic design that distinguishes people who are related

National Standards

**Visual Arts Standard #3**
Choosing and evaluating a range of subject matter, symbols, and ideas

**Science Standards**

**Science as Inquiry**
Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

**Physical Science**
Position and motion of objects

**Earth and Space Science**
Changes in earth and sky

Background Information

Windsocks are specially designed to catch the wind. A familiar windsock that resembles a fish can be seen in Japan and other countries. To help celebrate Boy’s Day, families create and fly these fish windsocks outside their homes. Families display one windsock for each son. Designs on the windsock usually contain a family crest.

Windsocks today are used at airports to show wind direction and speed. They help pilots choose the best runway when their planes must take off and land in the wind.

Resources

*Henry and the Kite* by Bruce Edward Hall
Detailed, dramatic paintings engage 4- to 8-year-olds. Story of a talented kite maker and his 8-year-old neighbor, who together solve a community problem using negotiation and compromise.

*How Artists See the Weather* by Colleen Carrol
Written for 9- to 12-year-olds. Shows how various artists, in diverse places and throughout different time periods, have depicted different weather conditions. Explains artists’ techniques and includes biographies.

*The Weather Detectives* by Mark Eubank and Mark Hicks
Appropriate for grades 3 to 6. Follows the adventures of three curious children as they explore extreme weather conditions on Earth and in space. Covers how weather works and what conditions produce storms such as tornados, thunderstorms, and hurricanes.

*Wind Power* by Christine Peterson
Clear and simple definition of wind and how its power can be harnessed to supply energy. Captioned photographs of windmills, wind turbines, and wind farms. A wealth of information for grades 3 to 5.

Vocabulary List

*Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.*

- Alternative energy
- Anemometer
- Atmosphere
- Aztec
- Boys Day
- Circular calendar
- Climate
- Cultures
- Egyptian
- Energy
- Environment
- Escutcheon
- Family crest
- Hex signs
- Hieroglyphics
- Hurricanes
- Meteorology
- Observation
- Pennsylvania Dutch (German)
- Recording data
- Rube Goldberg

Artwork created by students from Tipps Elementary School, Houston, Texas.
Teacher: Marcia Elise Peterson
Collect and display weather-related objects and news articles. Discuss. Together, read and closely note the illustrations in *How Artist’s See Weather* or a similar book. Relate the types of weather shown in the book to scientific information displayed, especially about wind and its direction.

Display examples of several cultural symbols, including community resources. Consider this lesson in conjunction with social studies topics and as a way to build community diversity awareness. Some possibilities: Pennsylvania Dutch (German) symbols such as those used on hex signs, Aztec images from circular calendars, and Egyptian hieroglyphics. Discuss the cultures children choose for their project themes. What symbols will they use? What is the meaning of the symbols? Why were they chosen?

Create a sample windsock to inspire children’s creativity.
**What’s the Weather? Check a Windsock**

<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crayola® Supplies</strong></td>
<td>• Colored Pencils</td>
<td>• Color Explosion™ Markers and Paper</td>
</tr>
<tr>
<td><strong>Other Materials</strong></td>
<td>• Compass</td>
<td>• Hole punch</td>
</tr>
<tr>
<td><strong>Set-up/Tips</strong></td>
<td>• Choose Color Explosion™ white or black. Both are designed for dramatic, colorful effects. Remind children to work with dry hands.</td>
<td>• These windsocks can also be made with recycled file folders or similar heavier paper stock. Decorate them with markers or crayons.</td>
</tr>
</tbody>
</table>

**Process:**

**Session 1**

**30-45 min.**

1. Explore how a compass works and identify the position of each direction with hands-on explorations.
2. Measure, mark, and cut a Color Explosion paper strip about 2 x 10 inches. Decorate the strip with diverse cultural symbols using a Color Explosion Marker. Use lines, patterns, and shapes.
3. Cut six strips of colored tissue paper (1 inch wide, varying in length from 6 to 10 inches).
4. Glue tissue paper to the back side of the decorated strip. Air-dry the glue.

**Session 2**

**30-45 min.**

5. Cut six 2-inch squares of paper. Create additional symbols on the squares with markers. Glue the backs of the squares on the ends of the tissue strips.
6. Punch three evenly spaced holes near the top of the Color Explosion paper strip. Bend it into a circle. Staple it closed.

**Session 3**

**30 min.**

8. Hang windsocks in an open, dry area to catch light breezes. As the wind blows, observe the motion of the tissue strips. Note wind direction. Use a compass to check wind motion with compass directions such as N, NE, E, SE, S, SW, W, and NW.
9. Discuss findings.
10. Vary the time of day to check and chart wind motion. Compare findings.

**Tibetan Prayer Flags**

*Artist unknown*

*10” x 30”*

*Private Collection.*
Assessment

• Can students identify all directions noted on a compass? Monitor their understanding of the direction wind socks fly in a breeze and how the direction is indicated on a compass.
• Verify that wind sock decorations accurately represent the culture chosen by the child.
• Confirm that students successfully created and assembled a functioning windsock.
• Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.

• Check wind direction charts for completeness and accuracy. Ask students to compare findings. Discuss.
• Check for accuracy and completeness of data compiled about wind direction.
• How thoughtful were students’ analyses of the findings?

• Make pinwheels. See these samples on Crayola.com:
  - Pinwheel With Sparkle
  - Party Pinwheels
  - See-Through Pinwheels
  Test them outside in the wind.
  With younger students and some who have special needs, this would make an excellent small-group activity. Consider making it a homework project for families to portray their culture.
  Conduct other weather observations (such as temperature and rainfall) and record findings. Try to identify any trends over time.
  Borrow an anemometer and observe how it works.

Extensions

What causes the wind? Find out. Research changing weather patterns, violent storms such as hurricanes, and other wind-related effects on people and property.

Advanced students could research to learn about the many alternative energy sources that use wind currently employed around the world. As a group, imagine additional possible uses for wind power. Sketch Rube Goldberg-like wind machines.

Research popular traditions such as kite flying and sailing in various cultures. Why are wind-driven activities so popular? Which designs are most aerodynamic? Suitable for catching the wind?

Ask an expert in the community to talk about why it is important for pilots to know wind direction and speed. How does plane size/design alter the effects of wind?

Explore the field of meteorology or atmospheric science. How do scientists measure and predict the weather? What other jobs are affected by or rely on knowledge of the wind?

Grades 3-4 Wind Direction Chart

<table>
<thead>
<tr>
<th>Days</th>
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<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
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</thead>
<tbody>
<tr>
<td>Time of day</td>
<td></td>
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<tr>
<td>Wind direction</td>
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Grades 5-6 Wind Direction Chart

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<th>Wednesday</th>
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<th>Friday</th>
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<tbody>
<tr>
<td>Wind direction weather forecast</td>
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<tr>
<td>Wind direction–prediction</td>
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<tr>
<td>Time of day</td>
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<tr>
<td>Wind direction–actual</td>
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</tbody>
</table>
Objectives

Students observe seasonal changes as depicted in art and in the natural and human environments around them.

Students (K-2) identify seasonal differences, create a painted quadarama that illustrates these differences, and then articulate to peers how they distinguished the seasons.

Students (3-4) investigate the impact of seasons on an environment and create a painted quadarama model that shows environmental differences among four seasons in a temperate climate.

Students (5-6) research, choose a world climate zone, and then create a painted quadarama model that illustrates environmental seasonal differences in the model of that zone.

Students compare and contrast their findings and models.

Multiple Intelligences

Interpersonal

Linguistic

Naturalist

Spatial

Background Information

When it is the first day of autumn in the Northern hemisphere, with days getting cooler and shorter, across the equator to the south, spring is arriving. The Earth’s yearly trip around the sun is responsible for these changes. Summer happens in the Northern hemisphere when the North Pole points toward the sun. In the summer, the sun’s rays hit the northern half of the world more directly. While the North Pole is pointed toward the sun, the South Pole is pointed away from the sun. At this time in the Southern hemisphere, it is winter. During winter, the sun’s light hits parts of the Earth at a less direct angle, spreading warmth over a larger area.

Often children (and adults) mistakenly believe the seasons are caused by how far the Earth is from the sun. Actually, the Earth’s orbit around the sun is almost circular. The distance between earth and sun differs by only about 3% during the year. The Northern hemisphere is actually closest to the sun in the first days of January, when the weather is coldest. And we are the farthest from the sun around July 4, when the weather is at its warmest. The angle at which sunlight hits the Earth is a much greater factor in seasonal temperatures.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

- Atmosphere
- Autumn
- Bloom
- Buds
- Camouflage
- Climate
- Clues
- Cold
- Coniferous
- Cycle
- Deciduous
- Dormant
- Dry
- Environment
- Evidence
- Fall
- Foliage
- Perennial
- Polar
- Precipitation
- Proportion
- Quadarama
- Seasons
- Shape
- Spring
- Summer
- Temperate
- Temperature
- Transformation
- Tropical
- Variety
- Weather
- Winter

Resources

Four Stories for Four Seasons by Tomie DePaola
For 4- to 8-year-olds. Story of animal friends’ adventures through the four seasons. Amusing illustrations.

In the Eyes of the Cat: Japanese Poetry for All Seasons by Tse-Si Huang
Japanese nature poetry, arranged according to season. Uncomplicated language and Asian-style images enhance 77 examples of traditional haiku poems. Grades 2 to 6.

The Seasons of Arnold’s Apple Tree by Gail Gibbons
Changing seasons as observed by a young boy and his special apple tree. Illustrations clearly depict nature.

Artwork by students from Mount Prospect Elementary School, Basking Ridge, New Jersey.
Teacher: Susan Bivona
Artwork by students from Albany Elementary School, Kempton, Pennsylvania. Teacher: Betsy Moerder
### Suggested Preparation and Discussion

Display photographs, art prints, and natural items such as leaves or fruit to portray different seasons and weather in temperate climates. Invite children to add to the collection. Ask students what they observe in fine art and outside the classroom window.

Create and display a sample quadarama that shows a deciduous tree, an animal that exhibits seasonal camouflage, or other familiar item as it changes through all four seasons.

Read *Four Stories for Four Seasons* or a similar book with students. Identify clues to each season that appear in the text and illustrations. Brainstorm categories of change—colors, weather, temperature, people’s clothing, plant growth, and animal behavior—that help readers identify the season. Point out how a tree visually changes with each new season.

Demonstrate how to construct the quadarama and plan each scene. Consider playing related music, such as Vivaldi’s “Four Seasons,” while children create. Divide into teams of four so each child completes one section of the quadarama.

Read and discuss books and poetry that incorporate the beauty of nature and changing seasons in temperate climates.

### Crayola® Supplies
- Markers
- Paint
- Paint Brushes
- School Glue
- Scissors

### Other Materials
- Oak tag or recycled file folders
- Paper towels
- Recycled newspaper
- Rulers
- Water containers
- White paper

### Set-up/Tips
- Cover painting surface with newspaper.
<table>
<thead>
<tr>
<th>Process: Session 1</th>
<th>Identify seasonal differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-45 min. or more</td>
<td>1. Ask students to make a chart that includes four columns, one for each season.</td>
</tr>
<tr>
<td></td>
<td>2. Identify and then list words or phrases that describe each season in the appropriate column.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process: Session 2</th>
<th>Construct quadarama sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-45 min.</td>
<td>3. Measure with a ruler, mark, and cut oak tag or a recycled file folder into a large square.</td>
</tr>
<tr>
<td></td>
<td>4. Fold the square diagonally from corner to corner in both directions and crease, creating an X in the center (see p. 29 for a diagram).</td>
</tr>
<tr>
<td></td>
<td>5. Cut along ONE fold line from a corner to the center, making two triangle flaps.</td>
</tr>
<tr>
<td></td>
<td>6. One triangle flap will become the “ground” in the scene. The other flap folds underneath and is left blank. The two upper triangles (connected at a fold line) are the background for a seasonal landscape.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process: Session 3</th>
<th>Plan and paint seasonal changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-45 min.</td>
<td>7. Teams of four children work together to choose nature’s seasonal clues they plan to include in each of their scenes—trees, flowers, clothing, or animals, for example. Decide how the clues will change to reflect the season in each scene. Sketch all four scenes on paper, keeping objects in proportion to each other. Sketch what goes on the two sides as well as the ground for each section.</td>
</tr>
<tr>
<td></td>
<td>8. Paint scenes using sketches as guides. Choose colors that represent each season. Air-dry the paint.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process: Session 4</th>
<th>Build quadarama</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-30 min.</td>
<td>9. Glue the bottom triangle flap to the top one and press. The sides fold so they stand upright.</td>
</tr>
<tr>
<td></td>
<td>10. Arrange the four quadarama scenes back to back, in order. Glue the back sides together. Air-dry the glue.</td>
</tr>
</tbody>
</table>

**Assessment**
- Observe that students can point out and articulate differences about the seasons. Do clues in their model change from season to season?
- Students check classmates’ quadaramas to see that their models accurately reflect seasonal changes in a temperate climate zone.
- Display the quadarama models. Challenge students to identify the world climate zone that is depicted in each model. Compare and contrast differences.

- Students explain how color was used to represent each season and how changes in line and shape contributed to the depiction of seasonal transformations.
- Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.

**Extensions**
- Children bring in seasonal magazine and newspaper illustrations. Sort, classify, and glue illustrations onto a collage titled with each season. Add seasonal words and phrases. Especially suitable for young children and those with learning disabilities to assure an understanding of the topic.
- Locate and adopt a nearby deciduous tree. Photograph or sketch to document its changes through all four seasons.
  - Students choose an area of the country or world that has a climate different from the one in which they live. Research seasonal changes there. What subtle changes are evident even in climates that appear to be similar year round?
- Compose four seasonal haiku poems from the perspective of the primary clue represented in the quadarama.
  - Find out how leaves change color in the fall. See the lesson on Color-Changing Cells on Crayola.com.
  - Challenge gifted students to research how the seasons are being affected by climate change. What are the trends locally? Statewide? Nationally? Worldwide? How are farming, housing, insurance, and other factors affected by these changes?
Objectives

Students identify the health benefits of exercise while exploring a variety of fun physical activities.

Students create Pantin-like stringed puppets.

Students (K-2) identify and duplicate the relationship of movement of puppet body part movements to their own movements.

Students (3-4) depict the sequence of position in motion of objects.

Students (5-6) create and manipulate puppets, observe the effects of push and pull forces on the motion of their puppets, and record visual representations correlated to the motion they observe.

Multiple Intelligences

| Bodily-kinesthetic | Interpersonal | Spatial |

Background Information

French puppets called pantins were popular, especially among the rich, during the mid 1700s. The figures, similar to paper dolls, were jointed so they could move. These toys were often used to make fun of nobility. Pierrette and Harlequin were two favorite pantins at the Commedia dell’Arte Theater. Today’s paper cutout dolls are probably derived from the animated cardboard pantins fashionable among 18th-century French courtiers. In the 19th century, a famous publisher, Pellerin, printed a French jumping-jack pattern in color on newsprint for the first time. Similarly, one of the earliest forms of mechanical toys in the United States was the Jumping Jack. Its moving arms and legs were often hand carved from sticks.

Paper folk art is found in many cultures including Japan (kirigami), Poland (wycinanki), China (hua yang), and Germany and Switzerland (scherenschnitte).

Vocabulary List

<table>
<thead>
<tr>
<th>Acrobats</th>
<th>Health</th>
</tr>
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<tbody>
<tr>
<td>Antique</td>
<td>Jumping Jack</td>
</tr>
<tr>
<td>Benefits</td>
<td>Living</td>
</tr>
<tr>
<td>Characters</td>
<td>Moveable</td>
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<tr>
<td>Choreograph</td>
<td>Paper</td>
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<td>Clothing</td>
<td>Pattern</td>
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<tr>
<td>Collage</td>
<td>Performances</td>
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<tr>
<td>Columbine</td>
<td>Commedia dell’Arte</td>
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<tr>
<td>Dance</td>
<td>Performances</td>
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<tr>
<td>Exercise</td>
<td>French</td>
</tr>
<tr>
<td>French</td>
<td>Harlequin</td>
</tr>
</tbody>
</table>

Resources

*Antique French Jumping Jacks* by Epinol
Eleven antique toys. Characters from Commedia dell’Arte, such as Pierrot, Pierrette, Harlequin, and Punchinello. Printed on heavy paper in full color. Suitable for 9- to 12-year-olds.

*Exercise (Rookie Read-About Health)* by Sharon Gordon
Colorful photos and simple text. Explains the importance of learning about different health and fitness activities. Written for 4- to 8-year-olds.

*Exercising (Slim Goodbody Good Health Guides)* by John Burstein
Nine- to 12-year-olds benefit from the Slim Goodbody health tips.

*Exercising for Good Health* by Shirley Gray
Explains the role of exercise in maintaining a healthy body. Photos and sidebars help grades K to 2 with additional information and advice.

What Does It Mean?

**Commedia dell’Arte**: popular form of improvisational theater that began in Italy in the 15th century

**Persuasive essay**: written attempt to convince someone about a point of view

**Punchinello**: a famous puppet, also a magazine published in 1870

**Vocabulary List**

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.
Artwork created by students from Princeton North Elementary School, Princeton, Minnesota. Teacher: Tom Tschumper
## Jumping Like a Pantin

<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Suggested Preparation and Discussion</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work with specialists, such as the school nurse and physical education teacher, to collaborate on this lesson. Identify healthy and unhealthy behaviors and choices, and the effects of each on the human body. Display reproductions of pantins or similar moveable puppets. With students, add pictures of people engaged in physical activities. Discuss how regular exercise contributes to a healthier life and a more creative and clever mind. Ask students to identify healthy, fun activities. Write suggestions on index cards and add to the display. Create two puppet examples, one depicting a healthy body and the other depicting how unhealthy living might affect the body. Ask students: What is unique about these puppets?</td>
<td></td>
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</tr>
<tr>
<td>Suggest that children work in pairs to create their puppets.</td>
<td>Research and discuss the following questions. What does fitness mean? How important is stretching when exercising? What is the difference between aerobic and anaerobic exercise?</td>
<td></td>
</tr>
</tbody>
</table>

### Crayola® Supplies

- Colored Pencils
- Crayons
- Markers
- School Glue
- Scissors

### Other Materials

- Brass fasteners (8 per student)
- Oak tag or recycled file folders
- Cotton cord
- Hole punch
- Paper plates
- White drawing paper

### Set-up/Tips

- Loosely affix brass fasteners to pantin body parts for most mobility.
- For very young children, some teachers may ask parent volunteers to create cardboard puppet templates that include a head, body trunk, arms with hands, and legs with feet. Invite them to assist with assembly of pantins.

### Process: Session 1

**30-45 min.**

**Create pantin body parts**

1. Trace or draw one head, one body, two legs with feet, and two arms with hands on oak tag to depict either a healthy body or a non-healthy body.
2. Fill the shapes with garment-like decorative lines, shapes, textures, patterns, and color. Add facial features depicting a healthy or unhealthy person, depending on the choice. Cut out body parts.

### Process: Session 2

**30-45 min.**

**Assemble pantins**

3. Punch holes on body parts as shown in the diagram (step 1).
5. Push brass fasteners through the holes from front to back. Close loosely so joints move smoothly.
6. Cut a long string. Connect arms and legs by tying the string, first to the center of the string joining the arms, then to the center of the string joining the legs. See diagram (step 3).
7. Tie a loop of string through the top of the head so the pantin can be held up with one hand and operated with the other.
8. Hold the head string in one hand. Pull gently on the bottom string to see the pantin jump up and down.
9. Students work with a partner. One holds and moves a pantin. The other imitates the pantin movement.
10. Gently experiment with different ways to move puppets to demonstrate changes in force and motion.
### Assessment

- Students observe if their partners’ movements match the movement of the pantin in action.
- Children demonstrate three exercises that could be done to contribute to good health.
- Check student illustration for accurate sequence drawings to illustrate the pantin’s motion.
- Students describe the health benefits of exercise and list at least three activities that could contribute to a healthy lifestyle.
- Invite students to orally present their research findings. They demonstrate to prove their hypothesis about how push/pull forces result in the puppet’s movement.
- Students write a short persuasive essay about the benefits of living a healthy lifestyle. Include five physical activity suggestions.

- Students display their pantins, explain how they were created, and demonstrate how to make them work.
- Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.

### Extensions

#### Younger children and some students with special needs might be more successful if they first create simple stick puppets.
- Use the pantin puppets as characters in shadow plays.
- Create a team, family, class, or other group of pantin puppets. Make different sizes and shapes to represent various ages.

#### Several students work together to create and perform a simple pantin dance or ballet, complete with written, choreographed dance instructions, which can be shared with others.
- Choose and perform a different type of exercise each day for a week or two. Write daily reflections in a journal.
- Gifted children could gather data on students’ favorite aerobic activities and time spent doing them. Compile a list of the top 10 activities. Display an illustrated list in the school lobby, with pantin puppets dressed and positioned as if participating in the activities.
- Take close-up photos of pantins doing fun activities. Add text and compile into an exercise book for younger children. Place in school library.

As a class, choose and carry out a daily group exercise routine. Help maintain interest by changing routine weekly.

### Back view of how to assemble a pantin

1. Cut out the pantin pattern.
2. Attach the pantin puppets to the cardboard using cotton cord.
3. Use the cotton cord to create the pantin’s movement.

**Diagram:**

- Step 1: Cut out the pantin pattern.
- Step 2: Attach the pantin puppets to the cardboard using cotton cord.
- Step 3: Use the cotton cord to create the pantin’s movement.

Crayola Dream-Makers

Building fun and creativity into standards-based learning

Science 69
Objectives

Students (K-2) create a simple pop-up book to show the physical properties of materials and how a simple position and motion feature impacts objects.

Students (3-4) investigate and incorporate their understandings of the effects of push and pull forces on the motion of objects as they design safe, fun, innovative features for a pop-up playground book.

Students (5-6) create a themed playground pop-up book with two or more position and motion features per page, and include images of themselves in the design.

Background Information

Recess in school in the late 19th and early 20th century mostly consisted of children going outside the school to play on school grounds. Later some teacher education programs began to pay attention to designing and constructing playgrounds. In 1912, students at the University of Virginia Summer School for Teachers designed and constructed a model playground, called a maquette. Their design included sand, a balancing tree, jump standards, see-saw, slide, swing frame with sliding poles and ladder, a Flying Dutchman, and a giant stride (swings with ladders that go in a circle).

A maquette is used to visualize and test shapes and ideas without incurring the cost and effort of producing a full-scale sculpture. It is similar to a painter’s cartoon or sketch. For commissioned sculptures, especially huge public sculptures, a maquette may be used to show the client how the finished work will fit the proposed site. Sometimes cut paper, glue, and other materials are used to assemble maquettes.

Harlequinades are simple, movable books. When a folded part is lifted, the reader reveals a new picture that blends with the first one. Although some movable books were available as early as the 14th century, they were not designed for children until the early 19th century. Contemporary designers such as Robert Sabuda delight young and old alike with their intricate pop-up book art.

Resources

America the Beautiful by Robert Sabuda
Appropriate for grades K-6. Inspiring interpretation of the famous American anthem with awe-inspiring, pop-up illustrations.

Dinosaurs: Encyclopedia Prehistorica by Robert Sabuda and Matthew Reinhart
Each spread features an amazing paper sculpture of everything from a humungous brachiosaurus to a meticulously crafted T-Rex skeleton. Smaller foldout sections feature even more pop-ups. Thrills grades K-4.

Raggedy Ann and Andy and the Camel With Wrinkled Knees by Johnny Gruelle and Kees Moerbeek
Written for grades 2-4. Beautifully illustrated, updated version of the kidnapped French doll and Raggedy Ann and Andy’s rescue. Features stunning large- and small-scale pop-ups.

The Elements of Pop-Up by David Carter and James Diaz
Practical manual for students 10 years and older to achieve expertise in many types of pop-up mechanisms. Provides working examples of each structure.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

- Apparatus
- Motion
- Sketch
- Operational
- Playground
- Texture
- Descriptive
- Pop-up
- Visualize
- Force
- Progressive
- Futuristic
- Proposed
- Harlequinades
- Pull
- Sabuda
- Maquette
- Safety
- Monumental
- Sculpture
Artwork created by students from Hiller Elementary School, Madison Heights, Michigan. Teacher: Craig Hinshaw

Artwork created by students from Mount Prospect Elementary School, Basking Ridge, New Jersey. Teacher: Susan Bivona
## Innovative Playground Pop-Ups

<table>
<thead>
<tr>
<th><strong>K-2</strong></th>
<th><strong>3-4</strong></th>
<th><strong>5-6</strong></th>
</tr>
</thead>
</table>

**Suggested Preparation and Discussion**

Collect playground catalogs. Create a playground bulletin board divided into sections labeled present (today) and progressive (future). Children research and cut out traditional as well as state-of-the-art, environmentally friendly samples of playground equipment and sort them for display under one of the headings.

Display a variety of good-quality pop-up books. Teach children how to do simple pop-up techniques. Make a simple playground pop-up to share with students.

Find images of sculpture maquettes. Explain that maquettes are three-dimensional replicas of much larger, finished pieces of artwork.

Discuss the examples of current playground furnishings displayed. Talk about playground innovation and safety. Invite students to think of three innovative and safe playground furnishings.

| Students sketch playground design ideas. Meet in small groups to reflect on them. | Students write a short description of their innovative equipment design. Share written ideas with the class. Modify plans as needed. |

**Crayola® Supplies**

- Colored Pencils
- Markers
- School Glue
- Scissors

**Other Materials**

- Construction paper
- Recycled file folders
- Decorative craft materials
- Photographs of students (full body)

**Process: Session 1**

**30-50 min.**

Create a simple pop-up book

1. Cut off the file folder tab. Make two cuts, each about 1 or 2 inches into the fold to create the support for the pop-up (see diagram). Make more cuts for multiple pop-ups (older children).
2. Fold tab away from the fold edge. Open folder and gently pull tab through to the other side.
3. Texture layers of marker color on the top and bottom insides of the folder so that it appears to be the playground landscape.

---

**Antique Pop Up Cards**

*Artist unknown*  
*Printed paper*  
*5" x 7" x 2"*  
*Private Collection.*

**Arbor constructed by children and their families**

*Sticks, yarn, ribbon, found objects*  
*Northampton Community College Children’s Center*  
*Bethlehem, Pennsylvania*  
*Photo by J. McCracken*

**Outdoor Xylophones**

*Northampton Community College Children’s Center*  
*Bethlehem, Pennsylvania*  
*Photo by J. McCracken*
Process:
Session 2
30-45 min.

Add one playground pop-up
4. Choose at least one innovative playground equipment idea to portray on the pop-up. Draw it in detail to fit on the pop-up support. Color and cut it out.
5. Glue drawing to the vertical pop-up tab. Air-dry the glue.

Add two playground pop-ups
4. Study the card space to plan two pop-up playground features.
5. Create both pop-up features. Glue drawings to the pop-up tabs. Air-dry the glue
6. Embellish the background to assure unity with the pop-up features.

Design intricate playground pop-ups
4. Photocopy portraits in black and white. Embellish them with colored pencils. Cut out the body shape.
5. Plan areas to place pop-up features in the space. Create two or more simple pop-ups. Glue them in place.
6. Glue decorative materials to the pop-ups and embellish background.

Assessment
• Does the pop-up feature work?
• Children orally explain how and why their design ideas contribute to fun on the playground.
• Students designed two features into their pop-up.
• Students write descriptions of their playgrounds and take turns reading them. Class members match writings with displayed models.
• Students analyze designs for creativity, detail, and originality.
• Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned about designing playground furnishings.

Students review pop-ups for unity of theme, two or more pop-up features, and that a full, colored self-portrait appears in the pop-up design.

Extensions
Younger children and some with special needs could illustrate their playground ideas inside a simple folded card. Or they could make sculptures with Crayola Model Magic® or build the playground with recycled materials.

On a local playground, find and sketch examples of simple machines such as inclined planes, levers, pulleys, wedges, screws, wheels, and axles.

Gifted students could create a design and budget for a unique playground design. Consider costs such as labor to design, build, and install equipment; land; materials; and maintenance.

Invite a representative from a playground equipment or design company to talk about what is involved in planning a stimulating play environment.

Research to learn about the playground features available to children in different time periods. Interview generations of family members about their favorite playground memories.

Discuss, design, and build a model of a school playground. Include ideas for incremental expansion of the playground over a period of 5 years. Present the plan as a request to school officials.

Design, create, and display playground safety posters.

How to create a simple pop-up

- - - = cut
- - = fold

Crayola Dream-Makers
Building fun and creativity into standards-based learning
Objectives

Students (K-2) distinguish between natural objects and objects made by humans, and make 3-D models of Roman arches.

Students (3-4) demonstrate what they learned about designing a blueprint by forming and assembling blocks to construct a free-standing, self-supporting Roman arch.

Teams of students (grades 5-6) demonstrate what they learned about the principles of thrust and force as they put at least three sets of each other’s blocks together to construct an arcade of Roman arches.

Multiple Intelligences

<table>
<thead>
<tr>
<th>Interpersonal</th>
<th>Logical-mathematical</th>
<th>Spatial</th>
</tr>
</thead>
</table>

National Standards

<table>
<thead>
<tr>
<th>Visual Arts Standard #6</th>
<th>Science Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Making connections between visual arts and other disciplines</td>
<td>Science and Technology</td>
</tr>
<tr>
<td></td>
<td>Abilities of technological design</td>
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<td></td>
<td>Unifying Concepts and Processes</td>
</tr>
<tr>
<td></td>
<td>Form and function</td>
</tr>
</tbody>
</table>

Background Information

The Romans ruled much of present-day Europe, the Middle East, and Great Britain from 753 BCE to 76 AD. In France today, there are many ruins of theaters, arenas, and aqueducts—which carried water to growing cities—that are examples of Roman architectural and engineering ingenuity. The primary feature of these ruins is the Roman arch, which is still used in building design. Romans also invented cement, a mixture of lime, clay, and water that is both strong and acts like glue to construct buildings.

Contractors continue to use the rounded arch, commonly called the Roman arch, and builders seek to perfect the arch into various forms. The Roman arch contains voussoirs (voo-swars) or bricks. The keystone is the central voussoir that supports the other bricks. The thrust of the central voussoir pushes outward and downward in the arch, which provides strength to the structure and keeps all the other voussoirs in place. A row of arches is called an arcade.

Resources

Ancient Rome by Peter Connolly
Outstanding illustrations. 8- to 12-year-olds enjoy the fascinating details of what it was like to live in the ancient city of Rome.

Ancient Rome by Susan Altman and Susan Lechner
Intended for ages 9 to 12. Contains 27 brief poems inspired by the buildings, residents, and daily activities of ancient Rome.

Rome Antics by David McCauley
Crosshatched pen and ink drawings provide a homing pigeon’s point of view as he swoops around the architectural treasures of ancient Rome. Grades 5 and 6 will make good use of the map, which features 22 famous Roman buildings with interesting facts about each one.

The Roman Colosseum by Elizabeth Mann
Full-color drawings, paintings, and photographs enhance fascinating facts. Covers the innovative architecture and construction used in the building of the Coliseum. For ages 9 to 12, includes information about the brutal world of gladiators who fought in the arena.

What Does It Mean?

Arcade: a row of arches
Façade: the front or face of a building
Keystone: central voussoir (brick) that supports Roman arches
Low relief: short 3-D projections on a surface, as in sculpture or weaving
Triumph: celebrate or commemorate a major event

Vocabulary List

Use this list to explore new vocabulary and concepts in physics and history.

<table>
<thead>
<tr>
<th>Arcades</th>
<th>Push</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch</td>
<td>Romans</td>
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<tr>
<td>Aqueducts</td>
<td>Thrust</td>
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<td>Architecture</td>
<td>Trapezoid</td>
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<td>Blueprints</td>
<td>Vault</td>
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<tr>
<td>Bricks</td>
<td>Voussoirs</td>
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<td>Building blocks</td>
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<td>Cement</td>
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<td>Coliseum</td>
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<td>Column</td>
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<td>Construction</td>
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<td>Façade</td>
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<td>Features</td>
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<td>Force</td>
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<td>Dome</td>
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<td>Keystone</td>
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<td>Low relief</td>
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<td>Model</td>
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<td>Motion</td>
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</tr>
</tbody>
</table>

Artwork created by students from Triangle Elementary School, Hillsborough, New Jersey. Teacher: Nancy Knutsen
Artwork created by students from Triangle Elementary School, Hillsborough, New Jersey. Teacher: Nancy Knutsen

Helsinki Train Station
Main Entrance Arch
Helsinki, Finland
Photo by R. De Long

Pont du Gard Roman Aqueduct
Circa 50 AD
Near Remoulins, France
Photo by J. McCracken
### Suggested Preparation and Discussion

With children, create a bulletin board about Triumphal Arches. Display pictures of buildings that reflect ancient Roman architecture. Show simple Roman arch diagrams, blueprints, and examples. Include a front view of a Roman arch. Briefly discuss the lives of the ancient Roman people. Ask questions about the display such as, What features in Roman buildings are similar to contemporary buildings and bridges? What is different? Make a list of words for a word wall.

Ask students to describe a Roman arch. It is an inverted U-shaped structure, usually made of masonry and stone, which forms the curved, pointed, or flat upper edge of an open space, while supporting the weight above it, as seen in a bridge support or doorway. Emphasize the importance of a keystone in the arch formation by pointing out keystones in real arches, both local and in pictures.

Demonstrate how to create a simple Roman arch using a keystone to help the arch stand freely. If available, use commercial wooden architectural blocks. Try building an arch on a board. Ask a student to tip the board and keep the arch standing. (Hint: Use a trapezoid for the keystone).

Create building blocks like those students will make to assemble into a freestanding Roman arch.

### Crayola® Supplies

- Colored Pencils
- Markers
- Model Magic® (white)
- School Glue
- Air-Dry Clay
- Colored Pencils
- Markers
- Paint Brushes
- Tempera Paint
- Texture It! Tempera Mixing Medium
- Paper plates
- Paper towels
- Recycled newspaper
- Ruler
- Water containers
- White paper

### Other Materials

- Oak tag
- River rocks
- Water containers
- White paper

### Set-up/Tips

- Construct arches on paper plates on a flat surface to be sure that the arch will stand and support itself during and after construction.
- Use an arch line-drawing blueprint to help guide the arch construction.
- Cover art surface with recycled newspaper.

### Process:

#### Session 1

30-45 min.

**Draw a Roman arch**

1. On oaktag, sketch an inverted, block-shaped U for a bridge, doorway, aqueduct, or gateway. Draw lines to indicate the keystone at the top of the arch. Add lines to create the other stones.
2. Add people, animals, and embellish the setting.

**Draw a building façade with a Roman arch**

1. Sketch the façade of a building that includes a simple Roman arch. Draw the arch to include two columns of stones with a curve connecting an arch of stone joining the two columns. Make each stone in the columns and arch approximately one inch square. Pay special attention to the formation of the keystone!
2. Enhance the spaces surrounding the arch with decorative elements including windows and other architectural features.

#### Session 2

30-45 min.

**Create blocks for the arch**

3. Discuss differences between manufactured blocks and river rocks like those the Romans used.
4. Shape Model Magic® into 3-D stones to match the sizes and shapes of the Roman arch illustrations.
5. Gently press each stone in place on the drawing. Place the keystone first. Glue to the oak tag. Air-dry the arch at least 24 hours.
6. Use markers to color the Roman arches.
7. Display Roman arches near the bulletin board.

**Create blocks for the arch**

3. Model air-dry clay blocks so that each block exactly matches the blocks in the façade drawings, accurately reflecting the spatial dimensions and curves in the Roman arches. Gently tap blocks gently against a work surface to flatten sides.
4. Position each block against the corresponding block in the design until all blocks in the arch are complete. Separate blocks to dry. Air-dry at least 3 days.
5. Paint the blocks. Use the mixing medium to add texture and other decorative effects—either mixed into the paint or added on top. Air-dry the paint.
6. Assemble the blocks so they are free standing and support themselves as a Roman arch.
### Process:
**Session 4**
20-30 min.

<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Test the Roman arch to see if it supports itself.</td>
<td>7. Teams of students collaborate to assemble an arcade of arches. Before assembly, they predict whether the thrust and force that supports each arch will support an arcade of arches. Test and observe results.</td>
<td>8. Challenge students to hypothesize about what would need to be done to modify an arcade to prevent any arch from collapsing other arches.</td>
</tr>
</tbody>
</table>

### Assessment
- Students can state differences between river rocks and blocks made by humans.
- Children correctly identify the location of the keystones in their arches.
- Children verbally explain what their Roman arch supports (bridge, doorway, aqueduct, gateway). Illustration matches their explanation.

- Arches match the blueprints/templates.
- Students exchange arches at least three times. They reassemble the arches so they stand without support or glue.

- Teams of students analyze arch and arcade designs.
- Students verbally articulate why some arch designs are more stable than others.

- Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.

### Extensions
- Encourage children with special needs to build arches and columns with architectural blocks.
- Suggest that children collaborate to create body sculptures of arches, a dome, columns, and an arcade.

- Learn about blueprints and how they are used in architecture. Create blueprints of their bedrooms or other familiar structures.
- Learn more about force and geometry—and the relationship between the two when constructing an arch, cantilever, and other architectural structures.
- Try building an arch without using a template first. It is not as easy as it appears!
- Gifted students can work in small groups to research and construct models of other architectural elements such as domes and vaults that incorporate arches.
- Study the shapes and forms of Byzantine, Gothic, Tudor, and Moorish arches. Compare and contrast them with Roman arches.
- Explore the history of Roman aqueducts. How and why were they built? Locate them on a map.
- Learn more about a Coliseum, which is an ancient example of a multistoried building utilizing Roman arches.

- Invite an architect to share information about architecture and the profession.
- Ask a stone mason to demonstrate the craft.

### How to assemble a Roman arch

![Roman Arch Diagram]
Objectives

Students use scientific inquiry to identify and sketch plant and animal organisms living within a tropical or temperate rainforest environment.

Students analyze each other’s drawings and then develop a class watercolor resist mural based on those drawings.

Students (K-2) select and draw a simple plant, animal, or water feature representative of a rainforest.

Students (3-4) choose three features found in a rainforest and illustrate how they are connected to each other.

Students (5-6) research and represent the biodiversity, health, and culture of a rainforest.

Multiple Intelligences

<table>
<thead>
<tr>
<th>Interpersonal</th>
<th>Naturalist</th>
<th>Spatial</th>
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What Does It Mean?

Biome: a complex ecosystem of plants, animals, and climate located in a defined geographic area

Crayon resist: art technique in which crayon is applied to parts of a surface and paint is applied on top so that the crayon wax resists the paint

Digitized image: computerized representation with pixels (number of dots in a given area)

Understory: plants growing beneath the main canopy of a rainforest

National Standards

<table>
<thead>
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<th>Visual Arts Standard #5</th>
<th>Science Standards</th>
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<tr>
<td>Reflecting upon and assessing the characteristics and merits of their work and the work of others</td>
<td>Unifying Concepts and Processes</td>
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<td>Evidence, models, and explanations</td>
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<td>Science as Inquiry</td>
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<td>Understanding about scientific inquiry</td>
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<td>Life Science</td>
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<td>Organisms and environments</td>
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Background Information

Rainforests are found in many different places on Earth. Most rainforests, located around the equator, are tropical. Temperatures in tropical rainforests range between 75 and 80 degrees F. Temperate rainforests, which are found in places such as the northern Pacific Coast of North America and in New Zealand, are cooler, but they rarely freeze. About 80 inches of rain falls each year in rainforests. Temperate rainforests have both dry and wet seasons, but it rains most of the time in tropical rainforests.

Tropical rainforests have more diverse plants and animals than any other biome. Rainforest ecosystems are very important in maintaining a balance in the Earth’s ecology, because plants generate oxygen and remove carbon dioxide from the air.

Different animals and plants live in each part of the rainforest. The canopy, which is formed by most of the treetops, is where a variety of birds, insects, reptiles, and mammals live. Giant trees, called emergents, grow even higher than the canopy. Birds and insects live in these immense trees, too. It is dark and cooler in the understory, below the tree leaves. The largest animals and many insects live on the forest floor.

Resources

A Walk in the Rainforest by Kristin Joy Pratt
Stunningly illustrated environmental alphabet book. Each letter features a rainforest animal or plant accompanied by an explanatory paragraph. Written for ages 4 to 8, includes compelling warnings about the plight of our planet.

Garden of the Spirit Bear: Life in the Great Northern Rainforest by Dorothy Hinshaw Patent and Deborah J. Milton
Delicate watercolor illustrations. Basic information about the extraordinary flora and fauna found in the layers of British Columbia’s coastal rainforest. Familiarizes third to fifth graders with the interrelationships that form a delicate environmental balance.

Tropical Rainforests (Biomes of the Earth) by Michael Allaby and Richard Garratt
Colorful illustrations, including maps, diagrams, and photographs. Reveals the diversity of animals and plants present in this biome. Explains importance of forest layers and food chains, threats to the environment, and ways to promote conservation. Illustrations and photos provide valuable insights for all ages.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

- Biome
- Canopy
- Carbon dioxide
- Conclusion
- Conservation
- Digitize
- Diversity
- Ecology
- Emergent
- Environment
- Equator
- Experiment
- Food chain
- Forest floor
- Forest layers
- Hypothesis
- Indigenous
- Model
- Mural
- Oxygen
- Phenomenon
- Rainforest
- Repetition
- Resources
- Scientific inquiry
- Process
- Temperate
- Texture
- Tropical
- Understory

Palm Tree in Tropical Rainforest
Costa Rica
Photo by J. McCracken
Artwork by students from St. John Neumann School, Palmerton, Pennsylvania. Teacher: Paula Zelienka

Tropical Rainforest Flower
Costa Rica
Photo by J. McCracken
### Suggested Preparation and Discussion

With children, use the scientific inquiry process to conduct a simple outdoor experiment related to rainforests, such as measuring the evaporation rate of puddles in the sun and shade. Choose a question to be answered, form a hypothesis, predict what will happen, perform experiment, observe and record results, compare prediction and results, and decide to form a new hypothesis or retain the original.

Ask students what they know about rainforests. Who has been to a rainforest or a simulated one? What do you imagine it would be like to be in a rainforest? What kinds of plants and animals would you see? Would it be sunny?

Find and display photographs of temperate and tropical rainforest images and reproductions of paintings, such as Henri Rousseau’s “Surprised! Storm in the Forest.” How do artists use texture, repetition, and line to convey the lushness of the rainforest? Are these realistic depictions? Why or why not?

Explain that students will make a wall-size watercolor-resist mural depicting a rainforest.

### Crayola® Supplies

- Colored Pencils
- Crayons
- Paint Brushes
- Watercolor Colored Pencils
- Watercolors

### Other Materials

- Overhead projector
- Paper towels
- Recycled newspaper
- Rolled craft paper
- Transparency
- Water containers
- White paper

### Set-up/Tips

- Cover painting surface with recycled newspaper.
- Make a transparency of digitized image of the chosen drawing. Use an overhead projector or computer to enlarge it for the class mural.
- Ask small groups of children to work on specific sections of the mural at one time.

### Process: Session 1

**30–45 min.**

1. As a class discuss the similarities and differences between a tropical or temperate rainforest. List findings.

2. Students select one feature found in a rainforest such as an animal, a plant, or a water feature.

3. Students draw a detailed crayon picture of their feature. Show the work in progress to classmates.

4. Reflect on opinions of others and add any features to enrich the drawing.

2. Students select three features found in a rainforest that have a direct relationship to each other. For example, a student might draw a frog, salamander, snake, or lizard eating an insect while sitting in the rainforest canopy.

3. Students draw a detailed picture of their combination of features using colored pencils.

4. Discuss the drawings in progress with others to assure accuracy in detail.

2. Students research the biodiversity, health, and culture of a rainforest.

3. In teams, students select one topic to focus on in a mural that showcases what they discovered.

4. Students sketch their research findings.

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**Flowering Plant in Tropical Rainforest**

Costa Rica

Photo by J. McCracken
<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
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</thead>
<tbody>
<tr>
<td><strong>Process:</strong> Session 2 30 min.</td>
<td>5. Hang artwork. Discuss the merits of each sketch. Choose the most accurate and detailed elements of these sketches to scale up into a class mural.</td>
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<tr>
<td></td>
<td>6. Project the chosen images on mural paper or create a grid scale to enlarge the images. Together, enlarge the sketch.</td>
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</tr>
<tr>
<td><strong>Process:</strong> Session 3 30-45 min. or more</td>
<td>7. As a group, color parts of the mural with crayons to block out areas that will not be painted.</td>
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<tr>
<td></td>
<td>8. Paint over the design with watercolors. For subtle effects, wet the surface before painting. Try mixing colors, using more or less water, and other watercolor techniques as well. Air-dry the paint.</td>
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</tr>
<tr>
<td><strong>Process:</strong> Session 4 30-45 min.</td>
<td>9. Use watercolor colored pencils, wet and/or dry, to add details to the biome. Hang it for display.</td>
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</tr>
</tbody>
</table>

**Assessment**

- Did students depict a plant, animal, or water feature representative of a temperate or tropical rainforest?
- Did students work together to create the mural?
- Did students combine three or more related elements in their sketches? Students summarize what they learned by discussing the relationship of the elements.
- Students review the finished mural. Are all four layers of the rainforest shown? What animals and plants are included? Complete the K-W-L chart. Were all student questions answered? Is all information accurate and clearly depicted?
- Ask students to reflect on the team murals and to identify what topic each team selected to showcase in their work.
- Summarize what the students learned about the biodiversity, health, and culture of a rainforest. Make list to compare and contrast.

**Extensions**

- Children choose a favorite rainforest creature to draw and color. Cut out and add to the mural with accordion-fold strips to make the animals “pop” out of the background. Children explain to the class why they chose their creatures.
- Create individual miniature rainforest biome dioramas in recycled shoeboxes. Sculpt animal replicas with Crayola Model Magic®.
- Students choose a favorite rainforest creature. Research and prepare a report to present to the class. Include information about its appearance, food, habitat (layer of the rain forest), and unusual facts. Present reports in first person (“Hello, I am a ___”) along with a visual aid such as a poster or puppet.
- Compare and contrast in detail the differences between temperate and tropical rainforests.
- Learn about threats to the rain forest and ways to promote its conservation.
- Investigate the healing properties of rainforest plants. Which are currently being harvested to provide new drugs that fight disease? Present findings to the class using posters, brochures, or pamphlets.
- Gifted students research the economic and environmental implications of deforestation of the world’s rainforests.

**Trouble in Paradise**
1965
Artist: Mary Helsaple
Transparent watercolor on paper
36” x 48”
Collection of the artist.
Objectives

Students experiment with the forces of gravity and the changes heat causes in the properties of matter as evidenced by the flights of hot-air balloons.

Students create a miniature, detailed replica of a hot-air balloon to represent their knowledge about the properties of heat.

Background Information

A scientist named Pilatre De Rozier launched the first hot air balloon, called the Aerostat Reveillon, on September 19, 1783. Inside the balloon were three passengers: a sheep, a rooster, and a duck. The balloon was airborne for 15 minutes. Two months later, on November 21, 1783, the first manned attempt was made. Two French brothers named Etienne and Joseph Montgolfier launched a hot-air balloon in Paris that flew for 20 minutes. The first men to fly a balloon across the English Channel were French balloonist, Jean Pierre Blanchard, and his co-pilot from the United States, John Jeffries.

Ballooning came to North America on January 7, 1793. U.S. President George Washington was present to see Jean Pierre Blanchard launch his craft. It rose 5,800 feet above Philadelphia, Pennsylvania, and landed 46 minutes later in New Jersey. Blanchard had one passenger with him...a little black dog.

The high-altitude record was set in 1960 when Captain Joe Kittinger parachute jumped from a balloon that was at 102,000 feet! The balloon broke the altitude record and Captain Kittinger broke the high-altitude parachute jump record. He broke the sound barrier with his body!

Distance was the next record to break. Many people flew across the Atlantic and then the Pacific Oceans. In 1999, Bertrand Piccard and Brian Jones completed the first around-the-world hot-air balloon flight. Leaving from Switzerland and landing in Africa, they smashed all previous distance records, flying for 19 days, 21 hours, and 55 minutes.

Resources

Air by Antonella Meiani
Written for 9 to 12-year-olds. Provides carefully written, well-organized, clearly illustrated experiments dealing with air. Includes related topics such as flight and combustion.

Fire and Silk: Flying in a Hot-Air Balloon by Neil Johnson
Elementary students relish this start-to-finish photo essay. Shows what it is like to ride in a hot-air balloon. Discusses the invention of hot-air balloons and how they work.

Flying in a Hot-Air Balloon by Cheryl Walsh Bellville
For grades 2 to 5. Introduces the art and history of ballooning. Outlines steps necessary for a successful launch. Experience how it feels to be a passenger and flight crew on a flight!

Hot-Air Henry by Mary Calhoun
Early elementary students enjoy this story. A mischievous Siamese cat, Henry, stows away on a hot-air balloon.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

- Aerial shots
- Aloft
- Altitude
- Ascend
- Aviation
- Balance
- Balloon envelope
- Balloon rally
- Basket
- Buoyancy
- Burner

- Bird’s-eye view
- Cargo
- Chase crew
- Deflate
- Descend
- Distance
- Energy
- Flight
- Form
- Gases
- Gravity

- Heat
- Hot-air balloon
- Inflate
- Landing
- Passenger
- Pattern
- Properties of matter
- Steering
- Symmetric

National Standards

Visual Arts Standard #5
Reflecting upon and assessing the characteristics and merits of their work and others

Science Standards
Physical Science
Grades K-4
Properties of objects and materials
Light, heat, electricity, and magnetism
Properties of motion of objects
Grades 5-6
Properties of objects and materials and changes of properties in matter
Transfer of energy

Multiple Intelligences

Logical-mathematical
Naturalist
Spatial

What Does It Mean?

Critique: to study, observe, and offer constructive criticism

Knead color: work marker color into, or mix two or more colors of, Model Magic® modeling compound. To marbleize colors, mix a little; for uniform color, mix more
Introduce a science unit on changes in the properties of matter and energy with a simple experiment such as this one. Open a large black garbage bag outdoors in a shady area. Pull it through the air to inflate it. Tie it shut with a long ribbon. Tie the bag to a pole in a sunny spot. As the sun warms the bag, the bag will rise. Explore theories about how gravity, heat, and buoyant forces play a role in this phenomenon.

Display posters and pictures of hot-air balloons. Review the three essential parts of a hot-air balloon: the burner to heat the air; the balloon envelope to hold the air; and the basket, which carries passengers and/or cargo.

Create a sample of the project for children to see how the balloon replica is assembled.

Ask children to think of other examples of heat doing work as it rises. How can you tell the heat on a black macadam road on a hot humid day is going up or rising? Why does a fireplace need a flue?

Ask children to think of other examples of the physical forces of heat at work, such as toasting marshmallows over a campfire or warming a room with a fireplace. Create a chart of vocabulary words associated with air rising and hot-air balloons.

Look at pictures of hot-air balloons. Identify the parts and their purposes. Notice the variety of patterns, colors, and shapes on the balloons. What designs are most compatible with the shape of the balloon? What geometric forms (space figures) do you see?

What other forms of energy could accomplish a similar outcome?
### Hot-Air Balloons—Physics in Motion!

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<tr>
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<th>5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crayola® Supplies</strong></td>
<td><strong>Markers</strong></td>
<td><strong>Model Magic® (assorted colors, including Naturals)</strong></td>
</tr>
<tr>
<td><strong>Other Materials</strong></td>
<td><strong>Clear adhesive tape</strong></td>
<td><strong>Construction paper</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Recycled sheets or similar fabric</strong></td>
<td><strong>Ribbon</strong></td>
</tr>
<tr>
<td><strong>Set-up/Tips</strong></td>
<td><strong>Ask families to provide clean, plain white fabric, such as recycled bed sheets.</strong></td>
<td><strong>Place white paper under fabric. Fabric Markers are permanent.</strong></td>
</tr>
</tbody>
</table>

**Process: Session 1 30-45 min. or more**

**Draw lines to reflect heat and motion**

1. Students draw the symbol of a bright sun on a hot summer day.
2. Which students created a sun with rays?
3. Discuss the similarities and differences in the ray drawings. Why did children use lines (to express the air motion)?

**Illustrate a mirage**

1. Explain that a mirage forms when light rays, emitted from a source, reflect off an object and bend as the path of the light crosses air layers of different densities.
2. Divide paper in half. On one side, students draw a typical landscape with mountains, trees, and a winding road. On the other half, draw the same image as a mirage.
3. Discuss similarities and differences in the two drawings.

**Research air density**

1. Research the motion of fluids, liquids, and gases.
2. Why does hot air rise? Is cooler, denser air “pulled” down, “pushing” up the less dense hot air? Students form hypotheses.
3. List and debate the findings in class and consider simple experiments that can prove a motion-of-air hypothesis.

**Process: Session 2 30-40 min.**

**Prepare the basket**

4. Use markers to create wide stripes of color on white construction paper.
5. Cut out stripes.

**Weave a basket**

4. On two pieces of white construction paper, use markers to create wide stripes of color. Fold one piece of the paper in half by bringing the shorter sides together. Measure and mark a line 1 inch from the open ends. Cut four equidistant parallel lines from the fold up to the line. Unfold the weaving base.
5. Cut the second sheet into at least six long strips. Weave strips over and under the slits into the base. (There will be at least one strip left over.) Glue loose ends to the base. Air-dry the glue.

**Process: Session 3 30-45 min.**

**Add people and a burner**

7. Form Model Magic compound into pretend people and a burner. To make new hues, knead washable marker color into the modeling compound. Add hats, hair, and faces. Air-dry the sculptures overnight.

**Process: Session 4 20-30 min.**

**Create a balloon envelope**

8. Punch four holes around the top edge of the basket. Glue people and the burner inside the basket. Air-dry the glue.
10. Design the balloon with fabric markers. Add borders, words, and pictures. Experiment with geometric patterns, symmetrical designs, and/or large and small dots. Add stripes and fill each section with color. Punch or cut holes in each of the corners and in the middle.

**Process: Session 5 30-40 min.**

**Assemble balloons**

11. Thread ribbon through the middle hole in the fabric. Place the fabric over an inflated Mylar® balloon. Tape the ribbon to the top of the balloon. Thread and tie four ribbons in the corner holes. Tie the other ends in the holes in the basket. Make sure the balloon looks balanced!
12. Hang the balloon indoors. The balloon will spin in the breeze. What will it do if it hangs in a sunny window?
Assessment

- Did students create lines radiating from the sun representative of sun rays?
- Children state what makes each balloon unique (color, pattern, design, neatness).
- Children identify and verbally label each part of their balloon.
- Children act out what happens to air as it heats.
- What are the differences in the two landscape line drawings?
- Students critique each other’s balloons for craftsmanship, originality, and accuracy. Can they correctly name the balloon parts and accurately describe why hot-air balloons rise?
- Check the air density research lists to see if the data collected helps prove an air density hypothesis.
- Discuss simple experiments that students identified and ask them to explain experiment results.
- Students critique each other’s balloons for craftsmanship, originality, and accuracy. Can they correctly name the balloon parts and accurately describe why hot-air balloons rise?
- Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.

Extensions

- Children draw what they might see if they could float in their hot-air balloons over their home or school. Find out more details about how hot-air balloons work. How are these balloons similar to, and different from, weather balloons?
- Explore weaving with various materials including yarn and ribbon. Children with special needs and younger children may be more successful with these media when they begin to weave. Gifted students could plan an imaginary trip to a hot-air balloon festival. Calculate expenses, mileage, and develop an agenda for each day of the trip.
- Students research and reflect on creative ways hot-air balloons might be used in the future. Summarize findings and conclusions in writing. Compile into an illustrated book. Gifted students could compare the form of energy used for hot-air balloons to others. Which are more efficient? Could any others be used to propel hot-air balloons? Why or why not?

To display balloons in a more formal way, cut out the center of a large sheet of foam core. Decorate around the edges. Suspend the balloon (top and bottom) in the middle of the space with ribbons. For a similar style display, see the lesson plan Knights in Armor on Crayola.com.

If possible, observe a hot-air balloon flight on video or in person.

Children could work in teams of three to assemble one balloon, doing sessions 2, 3, and 4 simultaneously.

Pumpkin Hot-air Balloon
Albuquerque Balloon Festival
Albuquerque, New Mexico
Photo by E. Willett

Scarecrow Hot-air Balloon
Albuquerque Balloon Festival
Albuquerque, New Mexico
Photo by E. Willett
Objectives

Students predict, observe, record, and analyze how time and environment affect the mass and size of matter as illustrated by the decay of simulated shipwrecks.

Students (3-6) compare and contrast the characteristics of two modeling materials they use to sculpt and paint model ships.

Students (3-6) document the appearance of the models through a set of detailed sequence drawings depicting changes in the matter of submerged ships over time.

Multiple Intelligences

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<th>Naturalist</th>
<th>Spatial</th>
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</table>

Background Information

When ships sink in the ocean, the combination of ocean water and the materials that ships are made of go through dramatic changes over time. Examples of what happens to ships can be seen in photographs of the White Star liner Titanic lying at the bottom of the ocean. The Titanic was considered by many to be unsinkable. On her fifth day at sea, April 14, 1912, the Titanic hit an iceberg off the coast of Newfoundland and sank. Explorers have documented how water and time have destroyed this great ship as it lies on the ocean floor. Other famous shipwrecks include King Henry VIII’s Mary Rose, the Lusitania that was sunk by a German torpedo, and the Bismarck that was sunk by British battleships.

Many changes can occur on wrecked ships as they rest in their watery graves. The ships often become encrusted with sea life. Shipworms or woodborers may destroy wooden components within a few months. Many times, underscouring of the ships’ keels takes place due to strong currents moving the ocean floor sand. Complex communities of bacteria and fungi interact with iron ship parts and produce rusticles, destructive structures that resemble icicles. Sunken ships eventually recycle back to nature and become havens for many species of sea life.

Resources

Inside the Titanic: A Giant Cut-Away Book by Ken Marschall
Students in grades K to 2 will devour the detailed cut-away pages and easy-to-read text. A true-life story of two children who were aboard the Titanic.

Shipwreck by Clare Aston
Full color, two-page spreads and short explanations document changes in a sunken ship over centuries. Grades 3 to 5 see the ship during its building, a year later when pirates sink it, and on through to 200 years later when it becomes part of a coral reef.

Science Standards

<table>
<thead>
<tr>
<th>Life Science</th>
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<tbody>
<tr>
<td>Grades K-4</td>
</tr>
<tr>
<td>Organisms and environments</td>
</tr>
</tbody>
</table>

Science as Inquiry

| Grades K-6 |
| Abilities necessary to do scientific inquiry |

Unifying Concepts and Processes

| Grades K-6 |
| Evidence, models, and explanations |

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

Analyze
Artifact
Anchor
Bismarck
Artifact
Bow
Building
Clay
Construction
Corrode
Decay
Differences
Disintegrate
Disperse
Dissolve
Drawing
Encrusted
Erode
Evidence
Experiment
Findings
Form
Join
Keel
Lighthouses
Line
Manifest
Lusitania
Mass
Model
Modeling compound
Predict
Results
Rust
Salt water
Salvage
Sequence
Ship
Shipwreck
Similarities
Simulate
Stern
Submerge
Time
Titanic
Vessel
Water

Story of the Titanic by Diane Thistlewaite and Steve Noon
Borders, which contain fascinating facts and trivia, contribute to the allure of this over-sized book. Colorful, cut-away drawings depict the history of the Titanic, from its building to rescue of survivors. Written for grades 3 to 6.

The Tragic History of the Sea: Shipwrecks From the Bible to the Titanic by Anthony Brandt
Fascinating anthology of shipwreck tales from around the world. Includes annotations and commentary that add context and background. Suitable for grades 3 to 5, and a fascinating read-aloud for younger children.
<table>
<thead>
<tr>
<th>Suggested Preparation and Discussion</th>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect photographs of the <em>Titanic</em> before and after the ship sank into the Atlantic Ocean. Discuss similarities and differences between the pictures. Point out changes over time and what factors caused them, such as salt water, currents, rust, and sea life.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiment with how objects such as sugar cubes and hard candy dissolve in water. Make sketches to record changes with the passage of time. Children conclude that water and time affect different materials in different ways. Ask questions such as: What do you think will happen to wood if it is submerged in water for a long time? Metal? Plastic? Stone or glass? Explain that children will model ships, draw predictions of how that ship would look as a long-submerged shipwreck, and choose one boat to float in water.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extra boats could be fabricated if children are not willing to use their sculptures as test vessels.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compare and contrast the meanings of these words: dissolve, disintegrate, erode, rust, corrode, and disperse. Predict and research what happens to different materials when they are submerged in water for long periods of time. Will the matter change at the same rate? How might salt, as found in sea water, make a difference? How could sea life (plant or animal) affect changes in matter? Tell students that they will work in teams to model ships using two different modeling materials. At least one ship made with each kind of modeling compound will be submerged in water to observe and document the effects of time and water on the material. Demonstrate modeling and joining techniques for both compounds.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Crayola® Supplies
- Air-Dry Clay
- Colored Pencils
- Glitter Glue
- Markers
- School Glue
- Tempera Mixing Mediums
- Model Magic®
- Scissors

### Other Materials
- Large, shallow, water container
- Recycled wide-mouth clear plastic bottles with lids (two)
- Stapler and staples
- Modeling tools such as plastic dinner knives, craft sticks, and toothpicks
- Paper plates
- Decorative craft materials such as feathers and buttons
- White drawing paper

### Set-up/Tips
- Ask parents to provide clean, clear plastic, large, wide-mouth containers with lids. Remove labels.
- Sculpt, dry, and paint boats on paper plates. Label plates with children’s names.

### Process: Session 1 40-50 min.
**Create model boats**
1. Sculpt boats with Air-Dry Clay. Add details such as stacks, masts, decks, and railings. Air-dry the boats for at least 3 days.

**Sculpt model ships**
1. Ask students to choose whether they prefer to work with either Model Magic or Air-Dry Clay. Divide volunteers accordingly into teams of four or five.
2. Each team uses one wide-mouth container. **Stress that the finished ships must fit through the bottle opening.**
3. Teams design and model a ship. Encourage them to make detailed models with a variety of ship parts. Air-dry the ships for at least 3 days.

### Process: Session 2 10-15 min.
**Imagine ships afloat**
2. Draw a picture of how the painted ships would look if they were floating on water.

### Process: Session 3 40-50 min.
**Embellish ships**
3. Use glitter glue, tempera paint, and tempera mixing mediums as well as decorative craft materials to embellish the boats. Suggest that children use their boat drawings as references when adding lines and colors. Air-dry the boats overnight.

**Create sequence drawing book**
5. Each student folds two or more sheets of drawing paper in half. Staple the sheets together to create a book with a front cover, internal pages, and a back cover. Add a title such as *Effects of Time and Water on Our Ships*. Illustrate the front cover with a picture of every team’s ships.

---

Artwork by students from College Oaks Elementary School, Lake Charles, Louisiana.
Teacher: Bobbi Yancey
### K-2

**Process:**  
**Session 4**  
**15-20 min.**

<table>
<thead>
<tr>
<th>Predict and label shipwrecks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Draw predictions of how the boats might look beneath the water if they were shipwrecked. Older students may draw several scenes—the initial shipwreck as well as at different points in time.</td>
</tr>
<tr>
<td>5. Write, dictate, and/or label explanations of changes they would expect in their ships due to the effects of water and time.</td>
</tr>
</tbody>
</table>

### 3-4

**Process:**  
**Session 4**  
**30-45 min.**

<table>
<thead>
<tr>
<th>Experiment and make sequence drawings</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Students select one Model Magic ship and one Air-Dry Clay ship to use as experimental vessels. Place ships in containers. Fill containers with water, tightly screw on the lid, and place both in a central location where changes can be observed from all directions.</td>
</tr>
<tr>
<td>8. On a blank page in the books, write three sentences predicting how ships will look as they disintegrate and which one will deteriorate faster.</td>
</tr>
</tbody>
</table>

### 5-6

<table>
<thead>
<tr>
<th>Predict and label shipwrecks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Draw predictions of how the boats might look beneath the water if they were shipwrecked. Older students may draw several scenes—the initial shipwreck as well as at different points in time.</td>
</tr>
<tr>
<td>5. Write, dictate, and/or label explanations of changes they would expect in their ships due to the effects of water and time.</td>
</tr>
</tbody>
</table>

### Assessment

- Children define the words shipwreck and Titanic.
- Children display and discuss their before and after boat illustrations.
- Children share verbal explanations for predictions they made about changes in their boats.

### 9. Each day, students observe and draw the two ships in the appropriate spaces. Carefully document any differences in the submerged ships.

### Extensions

- Visit a marina to see first-hand the effects of water and other natural phenomena on boats, piers, and other structures.
- Extend children’s imaginations by using Crayola Sidewalk Chalk to create a life-size shipwreck outline. Label ship parts such as stern, bow, and keel.
- Explore sinking and floating with cargo such as marbles and pennies.
- Encourage children with disabilities to use pictures of boats to inspire their imaginations when they sculpt. For those with physical challenges, offer opportunities to draw on computers.

- Visit a marina to see first-hand the effects of water and other natural phenomena on boats, piers, and other structures.
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### Gifted students can research more about changes in underwater wreckage due to darkness, water depth, pressure, and/or temperature.

- Find out what typical causes are of shipwrecks. Weather? Icebergs? Faulty construction? Coral reefs?
- Research actual ship manifests to learn what items passengers carried with them as they boarded ship. Examine salvage lists to learn about found artifacts such as unbroken sets of china or ancient currency.
- Students sketch and model real or imaginary shipwrecks. Name and label the sunken ships.
- Write journal entries from the perspective of a ship’s crew member. Describe daily life and adventures that may have occurred while on board.

- Learn and use the international hand signals used by underwater divers.

---

**Souvenir Cruise Ship Bank**  
Artist unknown  
Nickel coated metal  
10" x 4" x 2 1/2"  
Private Collection.
Objectives

Students (K-4) incorporate their knowledge of properties of space objects and materials to create space paintings.

Students (5-6) research and analyze images such as Hubble telescope photographs that reveal the origin of and changes in the solar system. They create space paintings depicting the properties of changes in matter.

Students use various painting techniques to create their own unique celestial bodies.

Multiple Intelligences

Naturalist

Spatial

Science Standards

Unifying Concepts and Processes
Grades K-6
Evidence, models, and explanations

Science as Inquiry
Grades K-6
Understanding about scientific inquiry

Earth and Space Science
Grades K-4
Objects in the sky
Grades 5-6
Earth in the solar system

Background Information

A very important object orbits our planet and keeps an “eye” open so people can better understand the cosmos: the Hubble space telescope. Hubble helps people see things more clearly because it has a very powerful lens and camera to capture images. Human eyes have lenses but these lenses are not nearly as strong as the lens in the Hubble telescope.

This famous telescope was launched on the Space Shuttle on April 25, 1990. Since that time the telescope and the camera on board have taken hundreds of photographs of celestial bodies in this solar system. Several times since its launch, the U.S. National Aeronautics and Space Administration (NASA) has decided to repair and upgrade the equipment so that we can continue to look into space through at least 2013. Hubble is powered by the sun, has four mirrors, and three high-tech cameras.

Great Achievements of Hubble

June 1994: NASA released Orion Nebula images that confirmed the births of planets around new stars.

November 1995: NASA released Eagle Nebula images showing where stars are born.

January 1996: NASA released the “Deep Field” images in which Hubble peered back in time more than 10 billion years. The images revealed at least 1,500 galaxies at various stages of development.

February 2001: New images of Ant Nebula were released.

Resources

hubblesite.org

Offers the latest Hubble news and discoveries, a gallery of Hubble images, Telescope Facts and Fun, teacher activities, resources, and materials. Features a monthly guide to constellations, planets, and cosmic events.

The Hubble Space Telescope by Diane and Paul Sipiera
Written for ages 4 to 8, describes and illustrates how the Hubble Space Telescope was sent into orbit and its role in answering questions about the universe.

The Hubble Space Telescope by Margaret Carruthers
The Hubble Telescope’s history, how it works, what is seen by the camera, and future plans. Written for 9- to 12-year-olds. Includes a timeline and glossary of space terms.

The Reader’s Digest Children’s Atlas of the Universe
Fascinating information about planets, constellations, space, stars, black holes, telescopes, satellites, and spacecraft for 9- to 12-year-olds. Illustrations, photographs, maps, diagrams, projects, activities, experiments, and a glossary complete this thorough exploration of the universe.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

Ant Nebula
Monochromatic
Barred spiral galaxy
Nebulae/nebulae
Black cloud
Perspective
Black hole
Pluto
Blotting
Primary colors
Complimentary colors
Progenitor star
Crab Nebula
Scumbling
Dabbing
Secondary colors
Dry brush
Solar systems
Dust disk
Springtime on
Glitter
Neptune
Interacting spiral
Star birth cloud
galaxies
Star clusters
Intermediate colors
Stars
Light echoes
Super nova
Mediums
Super nova rings

What Does It Mean?

Scumbling: a painting technique—load a brush with paint, roll the brush handle so bristles apply paint to the surface from the side and not the point

Secondary hues: the colors orange, green, and violet, created by mixing two primary colors

Wet on wet: a painting technique—load a brush with paint mixed with a maximum amount of water, apply it on a wet surface
Artwork by students from CS 102, Bronx, New York.
Teacher: Neila Steiner
### Suggested Preparation and Discussion

Display Hubble space photos found on NASA’s Web site. Explain that the colors are not exact. Color is sometimes used to enhance detail or to call attention to what ordinarily could never be seen by the human eye.

With students, prepare labels with skill-level appropriate space vocabulary words. Attach them to the images. Agree on a title for the display, perhaps “Hubble Happenings! Words to Inspire Our Paintings.”

Ask questions such as: Why do you think this is called a black hole? How similar is this star to the stars you usually draw? How are the planets alike? Different? What words describe a nebula? A galaxy? Record and display the descriptive words.

Become familiar with the space objects that the Hubble telescope camera has captured and that are on display. Cameras on the Hubble telescope record light from the universe with special electronic detectors. These detectors produce images of the cosmos not in color, but in shades of black and white. Finished colored Hubble images are actually combinations of two or more black-and-white exposures to which color has been added during image processing.

With a color wheel, explain the principles of color theory and the use of color in art. Demonstrate these color-mixing techniques: wet-on-wet, washes, scumbling, blotting, dry brush, and tie-dye. Experiment on paper towels. Students mix primary colors to create secondary, intermediate, complimentary, and monochromatic colors as well as tints and shades.

Students correlate what they see in the Hubble telescope photos and the painting techniques. Ask questions such as: Which painting techniques resemble Whirlpool Galaxy photos? What painting technique and colors would you use to create a super nova? A black hole?

### Crayola® Supplies

- Colored Pencils
- Paint Brushes
- School Glue
- Scissors
- Tempera Mixing Mediums
- Tempera Paint

### Other Materials

- Bubble wrap
- Color wheel
- Compass
- Construction paper (black)
- Containers of water
- Cotton string
- Foam produce trays (for palettes)
- Paper towels
- Plastic wrap
- Recycled newspaper
- Sponges

### Set-up/Tips

- Ask families to contribute paper towels, bubble wrap, plastic wrap, and clean recycled plastic containers and produce trays.
- Cover painting surface with newspaper.
- Rinse the brush and blot on a paper towel before changing colors.
- Squeeze mixing mediums onto produce trays.

### Process: Session 1 30-60 min.

**Study properties of space objects**

1. Look at space photos. Discuss list similarities and differences observed in space objects.

### Process: Session 2 30-60 min.

**Experiment with painting techniques**

2. Load brushes with water and drip water on the cakes of watercolor pigment.
3. Dampen a paper towel with water. Gently gather it in the center with fingers. Roll it closed with hands. Tightly wind a cotton string around the outside. Wrap tightly and tie.
4. Load the brush with watercolor paint and apply to the paper roll. Repeat with other colors. Unroll the paper towel. Place it on newspaper.
5. Spread mixing medium over the damp paper towel. Try spattering additional paint on the surface for added special effects.
6. Mix tempera paint and a mixing medium on a produce tray. Dip crumpled plastic wrap, sponges, or bubble wrap into paint. Dab it on the damp paper towel. Air-dry the painted paper towel.

### Process: Session 3 30-45 min.

7. Apply additional coats of paint and media with brushes to embellish the space objects.
8. Name the celestial bodies using new vocabulary.

7. Apply additional layers of paint to replicate some of the space properties that are observed in the space photos.
8. Name the celestial bodies using new vocabulary.
Create lens-like circular frames

9. In the center of black construction paper, mark and cut a circle that is slightly smaller than the painted paper towel. This forms a circular window that simulates the lens of a camera.

10. Glue the space painting behind the opening. Add a backing sheet to hold it in place. Air-dry the glue.

11. Display the images for all to view.

Assessment

- Children identify Hubble as a telescope with cameras that take photos of images in outer space.
- Students correctly match new space-related vocabulary words to the display.
- Children verbally describe a link between the celestial body they created and a displayed space image.
- Ask students to reflect on this lesson and write a DREAM statement to summarize why it is important that we build and use spacecraft such as Hubble.

- Students correctly match space word cards to outer space images in the display. They define them orally or in writing.
- Students explain their mixing medium choices and painting techniques so that the written work is correlated with their research, space photos, and changes that occur in properties in space matter.

Extensions

An adult may need to assist younger students and some with disabilities to wrap and tie their paper towels.

Extend imaginations by inventing new names for planets in the solar system.

Invite younger children and students with special needs to explore the blotting and bleeding effects of dabbing watercolors onto wet, highly absorbent papers such as coffee filters.

Have students pretend to be Hubble, moving in space without gravity. Act out the movements of a shooting star, the rings and moons circling Uranus, a star being born, and a whirlpool galaxy.

Paint what students imagine Earth would look like when viewed from Hubble cameras. Compare paintings with actual Earth photos taken by Hubble.

Gifted students could use data found on the Internet to calculate how old they would be and how much they would weigh on other planets.

Gifted students could research to find out what future plans there are for the Hubble telescope. Write letters to NASA with their own suggestions for future Hubble uses.

Find out more about how the Hubble telescopic cameras work.

Create a large class mural. Encourage all students to select one part of their mini-universe paintings and then replicate it somewhere on a large black sheet of craft paper. Embellish the painted designs with Texture-It!, Glitter-It!, and Pearl-It! Mixing Mediums.

Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.

Visit a nearby planetarium. Engage students in making the arrangements. Ask for parent volunteers.
Objective

Students (K-4) research the physics of holograms and distinguish differences between living and inanimate objects.

Students (5-6) collect and analyze science and technology information about where holograms are used today and how they could be used in the future.

Students use tools and precise construction methods to assemble a three-dimensional viewer that creates the illusion of length, width, and depth.

What Does It Mean?

Hologram: a flat image, created with laser light, that looks three-dimensional

Illusion: a false or misleading impression of reality, fantasy

Background Information

If you have ever visited Disneyworld or Disneyland and experienced the Haunted House you most likely have seen a hologram. Holograms are amazing photographs. Technically, to make a hologram the light that is reflected off objects is reconstructed. The inventor of the first holographic image was Dennis Gabor, a Hungarian physicist. He won a Nobel Prize in Physics in 1971 for his invention.

Today holograms are useful in many ways, such as medical imagery in CT scans. Holograms are found on products to get a buyer’s attention. Many drivers’ licenses and currencies have holograms embedded within their designs.

Holograms can also be used for data storage. Every document ever written from ancient times until today could be stored in a hologram the size of a human brain!

Resources

Shoebox Holography by Frank DeFrietas
Step-by-step manual for older students. Shows how to make a tabletop-size hologram without expensive equipment.

The Complete Book of Holograms by Joseph E. Kasper
Written for older students. Clear explanation of holography and how it works. Detailed instructions on how to make a hologram.

The Mirrorstone by Michael Palin
Ages 9 to 12 enjoy the holograms, which integrate beautifully into the watercolor illustrations. Story about magic and time travel.

The Rainbow Fish by Marcus Pfister
Popular story about inner beauty for young children. Richly illustrated with holograms and watercolors.

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

Depth
Dimensions
Energy
Form
Height
Hologram
Holography
Illusion
Image
Laser
Light
Light wave
Mold
Patterns
Photograph
Plane
Reconstruction
Reflection
Refraction
Shadow
Shape
Slides
Texture
Three-dimensional
Transparent
Two-dimensional
Width

Artwork by students from Clearview Elementary School, Clear Lake, Minnesota.
Teacher: Kathy Gerdts-Senger
Artwork by students from Clearview Elementary School, Clear Lake, Minnesota. Teacher: Kathy Gerdts-Senger
## Hologram Viewers

<table>
<thead>
<tr>
<th>K-2</th>
<th>3-4</th>
<th>5-6</th>
</tr>
</thead>
</table>
| **Suggested Preparation and Discussion** | Display illustrations and samples of holograms, including magazine and book covers, expired credit cards, holographic packaging, hologram sunglasses, and other items.  
Ask: Has anyone ever seen a hologram? How do a photograph and a hologram differ? Compare a 3-D hologram with a 2-D or flat photograph. Use objects such as spheres, cubes, and rectangular prisms as examples of 3-D.  
Review the two dimensions (width and height) seen in a photograph and explain the added dimension of depth (thickness) visible in a hologram. The added dimension of depth allows people to see “into” the hologram.  
Explain that holographic lenses bend light. Looking at holograms is like looking at something that is really in front of your eyes, but if you reach to touch, your hand will close on air.  
Study the cover of *The Rainbow Fish*. Ask: What looks different with the scales? How does the light get inside? | Describe the power of holograms. If viewed under a microscope, a hologram of a leaf with a droplet of water on it could reveal even the one-celled organisms living in the water droplet!  
Light travels fast (186,000 miles/second) and straight. What is 186,000 miles away from Earth? | Demonstrate how to create a holographic viewer with slides that create the illusion of a third dimension. Students work in small groups to create their viewers. |

### Crayola® Supplies
- Glitter Glue
- Markers
- Model Magic®
- Paint Brushes
- School Glue
- Tempera Mixing Mediums
- Watercolors

### Other Materials
- Paper plates
- Recycled clear plastic food containers
- Rulers
- Water containers

### Set-up/Tips
- Ask parents to collect clear plastic food containers. Heavy-weight transparency film can also be used for the slides.  
- Cover painting surface with recycled newspaper.

### Process: Session 1 15-20 min.

**Create slides**

1. Team members measure and cut smooth, flat surfaces of plastic containers into five squares or rectangles, all the same size.  
2. Blend watercolors with a mixing medium on a paper plate. Load a brush with the mixture.  
3. In the center of two viewer slides, paint a design smaller than the diameter of a penny.  
4. In the center of two other slides, carefully paint slightly larger designs.  
5. On the fifth side, paint a large design that takes up most of the space. Air-dry the slides.

---

**Holographic Portrait**  
*Artist unknown*  
*Glass film sheet with image*  
*2” x 1/8”*  
*Private Collection.*
### How to assemble a hologram viewer

1. Flatten a tennis ball amount of Model Magic® compound into a 1/2-inch thick, rectangular slab.
2. Place slab on a flat surface. Carefully press the slides with painted circles into the slab. Arrange circles in this sequence: small, medium, large, medium, small. Press slides into the compound parallel to each other and about 1/4 inch apart.
3. Make two more identical Model Magic slabs. Place them on both sides of the slides to hold them in place. Make sure the slides stand straight!
4. Create one more slab. Press it on top of the viewer to create a box around the slides. Air-dry at least 24 hours.
5. Use markers to add decorative shapes, patterns, and textures to the surface of the viewer case. Add glitter glue for dramatic effects. Air-dry viewer.
6. Show other children the viewers. Explain hologram technology and how holograms are different from typical photo images.
7. Research and collect examples of how holograms are used in various ways such as the haunted house in Disneyland or Disney World, driver’s licenses, or other forms of technology.
8. Write a paragraph that tells others how you would use holograms constructively.
Objectives

Students (K-4) identify and describe environmental conditions in which polar bears would thrive, become ill, or perish.

Students (5-6) research, write, and orally present solutions to how humans can reverse the effects of global warming.

Students create glacial-like sculptures of polar environments that include polar bears.

Multiple Intelligences

| Naturalist | Spatial |

What Does It Mean?

Etch: impress on a surface to add detail

Score: etch lines in flat surfaces that are to be joined (modeling compounds) or folded (paper)

Slab: modeling compound that is rolled or pressed flat

National Standards

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<th>Science Standards</th>
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<td>Unifying Concepts and Processes</td>
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<td></td>
<td>Science as Inquiry</td>
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<td>Abilities necessary to do scientific inquiry</td>
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<td></td>
<td>Science in Personal and Social Perspective</td>
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<td>Populations, resources, and environments</td>
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</tbody>
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Background Information

Some scientists forecast that half of the Arctic’s summer glacial and sea ice will be melted by the end of this century. Experts are becoming increasingly concerned about the state of the Arctic, the Earth’s natural air conditioner. If the massive glaciers and ice sheets were to melt, it could raise the Earth’s sea level by more than 20 feet.

Already a threatened species, polar bears face even more serious threats from global warming. The bears depend on glaciers and sea ice as platforms from which they can hunt their prey, mainly seals. As more sea ice melts, and polar bears are left only with rocky ground, hunting for food becomes increasingly difficult for these large mammals. Polar bears appear to be moving northward as temperatures warm. Whether these species can outrun the warming temperatures is unclear, as some scientists say that climate change will lead to their extinction in the next 50 years.

Resources

Icebergs and Glaciers by Seymour Simon
Engrosses third to sixth graders with fascinating facts about glaciers and icebergs. Beautiful color photographs closely support text.

Life in the Polar Regions by Melvin Berger
This close look at the Arctic and Antarctic, for grades K-5, portrays geography and climate. Text and illustrations convey how people, plants, and animals survive in these harsh environments.

nationalgeographic.com
Information about animals and their habitats, as well as maps, history, photos, and news.

The Polar Bear Family Book by Thor Larsen
Amazing, full-color photos and clear, well-written text describe the first 2 years of two polar bears’ lives. Written by an expert who studied polar bears for 20 years. Offers a peek at the cubs’ birth, 6-month stay in the snow den, and eventual entry into life on the ice.

Concept List

Use these questions to create idea webs.

- Polar bears
  - What are they? World’s biggest bears, swim in icy water, walk on ice and snow, have black noses
  - Where do they live? Throughout the circumpolar Arctic: Canada, Russia, Greenland
  - What are the effects of climate change on them? Reduced habitat for seals, fewer prey for polar bears to eat results in fewer cub births, thinning ice makes it harder to hunt for food
- Glaciers
  - What are they? Formed from compressed fallen snow, move and flow like slow frozen rivers, large thickened ice masses
  - Where are they? Antarctica, Greenland, and all continents except Australia
  - What are the effects of global warming on glaciers? Retreating and disappearing on six continents, in countries such as Canada, and New Zealand, and in the Himalayan Mountains. Seas rise globally, smaller glaciers means decreased cooling of local environment, leads to changes in biodiversity of local flora and fauna
Artwork created by students from Lacey Middle School, Forked River, New Jersey. Teacher: Linda Devlin

Artwork by students from St. Theresa School, Hellertown, Pennsylvania.
## Suggested Preparation and Discussion

**K-2**
Display photographs and paintings of glaciers and polar bears such as those featured with this lesson. Gather carved polar bear figures for students to handle.

Discuss how polar bear survival is dependent on glaciers and sea ice platforms. Join in an inquiry brainstorm, listing questions students have about glaciers and polar bears. Find answers to their questions. Learn about the habitat and survival patterns of polar bears. Investigate the effects of global warming on these ice bears.

**3-4**
Ask students to observe commonalities. How might a glacier be viewed as an enormous ice bear? Look at photographs of polar bears and glaciers to see their interdependence and similarities. Draw a Venn diagram to show how these two Arctic entities are alike and different. How and why are each threatened by global warming?

Research different kinds of glaciers and how they form and flow. Locate them on world maps.

**5-6**
Prepare a sample scene to experiment with techniques for using Air-Dry Clay. Demonstrate how students can sculpt impressions of polar bears and glaciers and the traits and plights they share.

## Crayola® Supplies
- Air-Dry Clay
- Glitter Glue
- Paint Brushes
- Watercolors

## Other Materials
- Modeling tools
- Paper plates
- Paper towels
- Recycled newspaper
- Recycled toothbrushes
- Rolling pin
- Sponges
- Water containers
- Pebbles

## Set-up/Tips
- Sculpt and paint on a clean, dry surface such as a paper plate.
- Provide modeling tools such as rolling pins, wooden craft sticks, and toothpicks.
- To join sections of Air-Dry Clay, dampen with a finger. Score surfaces with a modeling tool. Press parts together.
- Cover the painting area with newspaper.
- Air-dry sculptures for at least 3 days before adding glitter glue.

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*Margery Glacier, Calving*
*Glacier Bay National Park, Alaska*
*Photo by J. McCracken*

*Melting Glacial Ice, Mendenhall Glacier*
*Juneau, Alaska*
*Photo by J. McCracken*
### Process: Session 1 30-60 min. or more

**Correlate words to images**
1. Look at pictures that illustrate polar bears in their environment.
2. Create lists of words that describe all the features that are observed in the photo images.
3. Write simple descriptive sentences that use the words from the word list.

### Process: Session 2 30-60 min.

**Create a glacial wildlife sculpture**
4. Flatten a small slab of Air-Dry Clay with hands or a rolling pin to form the base.
5. Roll another chunk of clay into a ball. Pull, pinch, and poke clay to form a polar bear's legs, body, and head.
6. Use tools to carve and etch facial and body details. Smooth any cracks with damp fingers.
7. Create fur texture with toothbrushes. Texture snowy ground with sponges. Attach to sculpture base.
8. Sculpt another small slab of clay into a glacier. Attach to sculpture base.
9. Embed small pebbles in glaciers to create the impression of rocky debris from glacial movement.

### Process: Session 3 30-45 min.

**Add realistic color**
10. Sculptures may be painted wet or dry. Create shadows and light effects with watercolors. Brush blues, purples, and black into shadowed areas such as crevices. Paint rocky debris. Brush white on glacier tips and ridges. Tint polar bears yellow for a realistic look. Add black details to bears' feet and faces. Air-dry sculpture at least 3 days.

### Process: Session 4 20-30 min.

**Create sparkles**
11. Add an icy sparkle to the polar scene! Use silver or white glitter glue for a realistic touch, or try colors to create a fantasy impression. Blue can enhance the effect of a melting or calving glacier. Air-dry the glue.

### Assessment
- Children correctly name the main elements of their sculptures and explain why polar bears and glaciers are both endangered.
- Check to see that reports are soundly researched and solutions make sense.
- Students name two ways polar bears and glaciers differ and are alike and correctly explain what is jeopardizing the Arctic environment and its inhabitants.
- Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.

### Extensions
- Some students with special needs may prefer the feel and texture of Crayola Model Magic® compound. Substitute media as needed to assure that children are comfortable.
- Polar bears can be up to 10 feet tall! Mark a spot, 10 feet up from the floor. Predict and measure how many students tall a polar might be.
- Polar bears can weigh up to 1400 pounds. Calculate how many students would equal the weight of one polar bear.
- Talk with experts and research data on global warming. What evidence demonstrates changes in world climate?
- Predict some adaptive characteristics required for the polar bear's continued survival. Add the adaptations to the sculptures. Write persuasive arguments to explain a need for the adaptations. Display with the sculptures.
- Exceptional students may want to explore in depth the reasons for and effects of climate change. Explore various methods for generation of electricity. Consider the impact on factors such as water supplies, food sources, population growth, animal life, coastal areas, and insurance rates.
- What can schools and families do to reduce energy consumption and work to take better care of the Earth's fragile environment?
- Find out what it means to be carbon neutral.
The lessons in this guide suggest types of art materials. This chart outlines the specific characteristics of different Crayola art materials. Use it to choose which variation best meets your needs and those of your students.

<table>
<thead>
<tr>
<th>CRAYONS/OIL PASTELS</th>
<th>CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regular Crayons (3-5/8” x 5/16”)</strong></td>
<td>• Brilliant colors; smooth, even color lay down.</td>
</tr>
<tr>
<td><strong>Large Size Crayons (4” x 7/16”)</strong></td>
<td>• Brilliant colors; smooth, even color lay down.</td>
</tr>
<tr>
<td></td>
<td>• Larger size for younger child palm grip.</td>
</tr>
<tr>
<td><strong>Triangular Crayons</strong></td>
<td>• Brilliant colors; smooth, even color lay down.</td>
</tr>
<tr>
<td></td>
<td>• Triangular shape helps guide correct pincer grip.</td>
</tr>
<tr>
<td></td>
<td>• Anti-roll.</td>
</tr>
<tr>
<td><strong>Washable Crayons</strong></td>
<td>• Brilliant colors; smooth, even color lay down.</td>
</tr>
<tr>
<td></td>
<td>• Available in regular, large, and triangular sizes.</td>
</tr>
<tr>
<td></td>
<td>• Superior washability from walls, tables, and most surfaces.</td>
</tr>
<tr>
<td><strong>Construction Paper™ Crayons</strong></td>
<td>• Brilliant colors; smooth, even color lay down.</td>
</tr>
<tr>
<td></td>
<td>• Color shows on dark paper, brown craft paper, and similar surfaces.</td>
</tr>
<tr>
<td><strong>Fabric Crayons</strong></td>
<td>• Permanent when drawing is heat transferred to synthetic fabric.</td>
</tr>
<tr>
<td><strong>Twistables® Crayons</strong></td>
<td>• Brilliant colors; smooth, even color lay down.</td>
</tr>
<tr>
<td></td>
<td>• Durable plastic barrel.</td>
</tr>
<tr>
<td></td>
<td>• No sharpening with easy twist-up action.</td>
</tr>
<tr>
<td><strong>Twistables Erasable Crayons</strong></td>
<td>• Complete erasability of marks.</td>
</tr>
<tr>
<td></td>
<td>• Brilliant colors; smooth, even color lay down.</td>
</tr>
<tr>
<td></td>
<td>• Durable plastic barrel.</td>
</tr>
<tr>
<td></td>
<td>• No sharpening with easy twist-up action.</td>
</tr>
<tr>
<td></td>
<td>• Eraser on each crayon.</td>
</tr>
<tr>
<td><strong>Twistables Slick Stix™ Crayons</strong></td>
<td>• Super-smooth color glides on paper.</td>
</tr>
<tr>
<td></td>
<td>• Water soluble upon application.</td>
</tr>
<tr>
<td></td>
<td>• Dries quickly with no smearing.</td>
</tr>
<tr>
<td></td>
<td>• Durable plastic barrel.</td>
</tr>
<tr>
<td></td>
<td>• Great for older student crayon techniques.</td>
</tr>
<tr>
<td></td>
<td>• Appropriate for students with special needs due to ease of color lay down.</td>
</tr>
<tr>
<td><strong>Oil Pastels</strong></td>
<td>• Opaque colors blend easily.</td>
</tr>
<tr>
<td></td>
<td>• Good color lay down.</td>
</tr>
<tr>
<td></td>
<td>• Hexagonal shape prevents rolling.</td>
</tr>
<tr>
<td><strong>Portfolio® Series Oil Pastels</strong></td>
<td>• Opaque colors blend and layer well, with velvety lay down.</td>
</tr>
<tr>
<td></td>
<td>• Unique water solubility allows watercolor washes.</td>
</tr>
</tbody>
</table>
### MARKERS CHARACTERISTICS

<table>
<thead>
<tr>
<th>MARKERS</th>
<th>CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular Markers</td>
<td>• Bright, brilliant, transparent colors.</td>
</tr>
<tr>
<td></td>
<td>• Conical tip draws thick and thin lines.</td>
</tr>
<tr>
<td></td>
<td>• Fine tip draws thin lines and detail.</td>
</tr>
<tr>
<td>Washable Markers</td>
<td>• Washability you can trust™—superior washability from hands and most clothing.</td>
</tr>
<tr>
<td></td>
<td>• Bright, brilliant, transparent colors.</td>
</tr>
<tr>
<td></td>
<td>• Conical tip draws thick and thin lines.</td>
</tr>
<tr>
<td></td>
<td>• Fine tip draws thin lines and detail.</td>
</tr>
<tr>
<td></td>
<td>• Wedge tip provides ease in broad strokes and vertical applications.</td>
</tr>
<tr>
<td>Gel Markers</td>
<td>• Bright, opaque colors that deliver bold marks on black and dark papers.</td>
</tr>
<tr>
<td></td>
<td>• World’s most washable marker with superior washability from hands and most clothing.</td>
</tr>
<tr>
<td></td>
<td>• Writes on glass, foil, glossy, and other non-porous surfaces.</td>
</tr>
<tr>
<td></td>
<td>• Conical tip draws thick and thin lines.</td>
</tr>
<tr>
<td>Overwriters® Markers</td>
<td>• Bright “overcolors” magically color over darker “undercolors” for exciting and dramatic effects.</td>
</tr>
<tr>
<td>Color Changeables™ Markers</td>
<td>• Students have fun seeing colors magically “pop out” over each other for new creative expression possibilities.</td>
</tr>
<tr>
<td></td>
<td>• Increased color variety as “wand” changes 7 colors to 7 new colors.</td>
</tr>
<tr>
<td>Twistables Markers</td>
<td>• No lost caps!</td>
</tr>
<tr>
<td></td>
<td>• Bright, brilliant, transparent colors.</td>
</tr>
<tr>
<td>Fabric Markers</td>
<td>• Permanent bright color on cotton or cotton blends when heat set.</td>
</tr>
<tr>
<td></td>
<td>• Bullet tip for medium and fine detail.</td>
</tr>
<tr>
<td>Dry-Erase Markers</td>
<td>• Low odor, bold color that can be viewed from a distance.</td>
</tr>
<tr>
<td></td>
<td>• Chisel and bullet tips.</td>
</tr>
</tbody>
</table>

### COLORED PENCILS CHARACTERISTICS

<table>
<thead>
<tr>
<th>COLORED PENCILS</th>
<th>CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colored Pencils</td>
<td>• Bright, vivid colors with opaque lay down.</td>
</tr>
<tr>
<td></td>
<td>• Good blending.</td>
</tr>
<tr>
<td></td>
<td>• Thick 3 mm lead; made from reforested wood.</td>
</tr>
<tr>
<td>Watercolor Colored Pencils</td>
<td>• Water soluble for watercolor and drawing effects.</td>
</tr>
<tr>
<td></td>
<td>• Bright, vivid colors with opaque lay down.</td>
</tr>
<tr>
<td></td>
<td>• Good blending.</td>
</tr>
<tr>
<td></td>
<td>• Thick 3 mm lead; made from reforested wood.</td>
</tr>
<tr>
<td>Erasable Colored Pencils</td>
<td>• Complete erasability of pencil marks.</td>
</tr>
<tr>
<td></td>
<td>• Bright colors with opaque lay down.</td>
</tr>
<tr>
<td></td>
<td>• Good blending.</td>
</tr>
<tr>
<td></td>
<td>• Eraser on each pencil.</td>
</tr>
<tr>
<td></td>
<td>• Thick 3 mm lead; made from reforested wood.</td>
</tr>
<tr>
<td>Twistables Colored Pencils</td>
<td>• Bright colors; smooth, even color lay down.</td>
</tr>
<tr>
<td></td>
<td>• Durable plastic barrel.</td>
</tr>
<tr>
<td></td>
<td>• No sharpening with easy twist-up action.</td>
</tr>
<tr>
<td>Twistables Erasable Colored Pencils</td>
<td>• Complete erasability of pencil marks.</td>
</tr>
<tr>
<td></td>
<td>• Bright colors; smooth, even color lay down.</td>
</tr>
<tr>
<td></td>
<td>• Durable plastic barrel.</td>
</tr>
<tr>
<td></td>
<td>• No sharpening with easy twist-up action.</td>
</tr>
<tr>
<td></td>
<td>• Eraser on each pencil.</td>
</tr>
<tr>
<td>Write Start® Colored Pencils</td>
<td>• Thick 5.3 mm lead and large hexagonal barrel is great for young students.</td>
</tr>
<tr>
<td></td>
<td>• Bright, vivid colors with opaque lay down.</td>
</tr>
<tr>
<td></td>
<td>• Anti-roll.</td>
</tr>
<tr>
<td></td>
<td>• Made from reforested wood.</td>
</tr>
<tr>
<td>MODELING COMPOUNDS</td>
<td>CHARACTERISTICS</td>
</tr>
<tr>
<td>----------------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Air-Dry Clay</td>
<td>• No firing, air-dry clay.</td>
</tr>
<tr>
<td></td>
<td>• Good for high-detail projects.</td>
</tr>
<tr>
<td></td>
<td>• Natural clay body to create solid, durable forms.</td>
</tr>
<tr>
<td></td>
<td>• Suitable for all clay techniques.</td>
</tr>
<tr>
<td></td>
<td>• White color suitable for all color/surface decoration.</td>
</tr>
<tr>
<td></td>
<td>• Air-dries hard.</td>
</tr>
<tr>
<td>Model Magic®</td>
<td>• Soft, easy-to-manipulate compound.</td>
</tr>
<tr>
<td></td>
<td>• Good for low-detail projects.</td>
</tr>
<tr>
<td></td>
<td>• Good for young students and those who are developing manual dexterity.</td>
</tr>
<tr>
<td></td>
<td>• Air-dries to consistency of a foam cup.</td>
</tr>
<tr>
<td>Modeling Clay</td>
<td>• Traditional oil-based clay.</td>
</tr>
<tr>
<td></td>
<td>• Non-hardening and reusable.</td>
</tr>
</tbody>
</table>

**PAINTS**

<table>
<thead>
<tr>
<th>PAINTS</th>
<th>CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premier™ Tempera</td>
<td>• Ultimate opacity and coverage.</td>
</tr>
<tr>
<td></td>
<td>• Creamy consistency flows smoothly and will not crack or flake.</td>
</tr>
<tr>
<td></td>
<td>• Intense, true hues for accurate color mixing.</td>
</tr>
<tr>
<td>Artista II® value-priced Tempera</td>
<td>• Fine-quality colors with good opacity.</td>
</tr>
<tr>
<td></td>
<td>• Creamy consistency flows smoothly and will not crack or flake.</td>
</tr>
<tr>
<td></td>
<td>• Good hue positions for excellent color mixtures.</td>
</tr>
<tr>
<td></td>
<td>• Washable from skin and fabrics.</td>
</tr>
<tr>
<td>Washable Paint</td>
<td>• Washability you can trust™—superior washability from skin and fabrics.</td>
</tr>
<tr>
<td></td>
<td>• Bright, clean colors for consistent color mixing.</td>
</tr>
<tr>
<td></td>
<td>• Smooth-flowing formula will not crack or flake.</td>
</tr>
<tr>
<td>Acrylic Paint</td>
<td>• Pigment-rich colors are intense even when diluted; achieve accurate color mixes.</td>
</tr>
<tr>
<td></td>
<td>• Thick, tube-like viscosity, for a variety of techniques from air-brushing to impasto.</td>
</tr>
<tr>
<td></td>
<td>• Permanent, water resistant, and flexible when dry.</td>
</tr>
<tr>
<td>Washable Finger Paint</td>
<td>• Bright colors, thick consistency.</td>
</tr>
<tr>
<td></td>
<td>• Washable from skin and fabrics.</td>
</tr>
<tr>
<td>Watercolors</td>
<td>• Bright, intense, transparent colors.</td>
</tr>
<tr>
<td></td>
<td>• True hues for accurate color mixing.</td>
</tr>
<tr>
<td></td>
<td>• Ideal for opaque and transparent techniques.</td>
</tr>
<tr>
<td>Washable Watercolors</td>
<td>• Washability you can trust—superior washability from skin and fabrics.</td>
</tr>
<tr>
<td></td>
<td>• Bright, intense, transparent colors.</td>
</tr>
</tbody>
</table>