

SCIENCE STANDARDS OF LEARNING
ENHANCED SCOPE & SEQUENCE

KINDERGARTEN

Commonwealth of Virginia
Department of Education
Richmond, Virginia
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by the

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Introduction

The *Science Standards of Learning Enhanced Scope and Sequence* is a resource intended to help teachers align their classroom instruction with the Science Standards of Learning that were adopted by the Board of Education in January 2003. The Enhanced Scope and Sequence contains

- units organized by topics from the 2003 *Science Standards of Learning Sample Scope and Sequence*. Each topic lists the following:
 - Standards of Learning relating to that topic
 - essential understandings, knowledge, and skills from the *Science Standards of Learning Curriculum Framework* that students should acquire
- sample lesson plans aligned with the essential understandings, knowledge, and skills from the Curriculum Framework. Each lesson contains most or all of the following:
 - an overview
 - identification of the related Standard(s) of Learning
 - a list of objectives
 - a list of materials needed
 - a description of the instructional activity
 - one or more sample assessments
 - one or more follow-ups/extensions
 - a list of resources.

School divisions and teachers can use the Enhanced Scope and Sequence as a resource for developing sound curricular and instructional programs. These materials are intended as examples of ways the understandings, knowledge, and skills might be presented to students in a sequence of lessons that has been aligned with the Standards of Learning. Teachers who use the Enhanced Scope and Sequence should correlate the essential understandings, knowledge, and skills with available instructional resources as noted in the materials and determine the pacing of instruction as appropriate. This resource is not a complete curriculum and is neither required nor prescriptive, but it can be a valuable instructional tool.

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Organizing Topic — Investigating the Five Senses

Related Standards of Learning

- K.1 The student will conduct investigations in which
- a) basic properties of objects are identified by direct observation.
- K.2 The student will investigate and understand that humans have senses that allow one to seek, find, take in, and react or respond to information in order to learn about one’s surroundings. Key concepts include
- a) five senses and corresponding sensing organs (taste – tongue, touch – skin, smell – nose, hearing – ears, and sight – eyes); and
 - b) sensory descriptors (sweet, sour, bitter, salty, rough/smooth, hard/soft, cold, warm, hot, loud/soft, high/low, bright/dull).
- K.4 The student will investigate and understand that the position, motion, and physical properties of an object can be described. Key concepts include
- c) textures (rough/smooth) and feel(hard/soft);
 - d) relative size and weight (big/little, large/small, heavy/light, wide/thin, long/short); and
 - e) position (over/under, in/out, above/below, left/right) and speed (fast/slow).

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The students should be able to

- identify and describe the five senses: taste, touch, smell, hearing, and sight;
- match each sensing organ (eyes, ears, nose, tongue, and skin) with its associated sense;
- match sensory descriptors with the senses (taste: sweet, sour, bitter, salty; touch: smooth, hard, soft, cold, warm, hot; hearing: loud, soft, high, low; sight: bright, dull, color, black and white);
- observe objects and describe their basic properties. These include color, shape (circle, triangle, square, and rectangle), size (big, little, large, small), texture (rough, smooth, hard, soft), and weight (heavy, light).

The Five Senses: Smell

Organizing Topic Investigating the Five Senses

Overview Students use their sense of smell to describe and match odors.

Related Standards of Learning K.1a; K.2a, b

Objectives

The students should be able to

- smell an unknown odor and find its match;
- describe unknown smells;
- match their senses to a corresponding sense organ.

Materials needed

- Popped popcorn in a brown paper bag
- An even number of film canisters — one per student
- Cotton balls — one per film canister
- Extracts — lemon, peppermint, cinnamon
- Spices — onion, ginger, curry, pepper, garlic
- Other pungent odors — cocoa, perfume, baby powder
- Picture cards of things that have good and bad smells

Instructional activity

Content/Teacher Notes

One of our strongest senses is our sense of smell. We use our nose to smell. Smells can change our attitude about a place or situation. Smells can make us cringe or even bring back memories. Some animals use their sense of smell to locate their babies.

To prepare the canisters, label half of them with letters A through M, and half with numbers 1 through 13. In each lettered canister place the cotton ball and a few drops of the odor. For each lettered canister, make a match. When you are finished, you should have a pair of lettered and numbered canisters that matches by smell. You may want to make a key for your own reference showing the matching letters and numbers.

Safety Note: Teach children to waft — wave the smell from a canister. Smelling directly from a canister can be dangerous; wafting is a safer way to smell odors.

Introduction

1. Teach the children the song “Eyes, Ears, Nose and Mouth” (to the Tune of “Head, Shoulders, Knees and Toes”):
*Eyes, Ears, Nose and Mouth, Nose and Mouth,
Eyes, Ears, Nose and Mouth, Nose and Mouth,
Hands and Fingers make the Five,
Eyes, Ears, Nose and Mouth, Nose and Mouth!*
2. Talk about today’s sense: SMELL. Ask: What do we use to smell?
3. Have students close their eyes. Open the bag of popcorn, and wave it under their noses. Talk about what they smell. Ask: What might be in the “mystery” bag today?

Procedure

1. Randomly pass out the canisters, one to each student. Demonstrate safe smelling — wafting.
2. Explain the game and how to play:
 - On the count of 3, open your canister.
 - Smell it and think about it.
 - On the count of 5, walk around and find someone that has a match to your smell. Use your nose and not your mouth to find this match!
 - When you think you have a match, sit down with your partner, and talk about what you smelled. Talk about what the smell might be called.
3. Play the game.

Observations and Conclusions

1. Watch and listen as the children play the game.
2. Notice how they describe their smell and what they think might be giving off the odor.
3. Come together as a class, and list some of the words the students used to describe their smells. Talk about the nose and how it sends messages back to your brain.
4. Show pictures (see next three pages) to children, and have them vote (thumbs up or down) to tell if it shows a good or bad smell.

Sample assessment

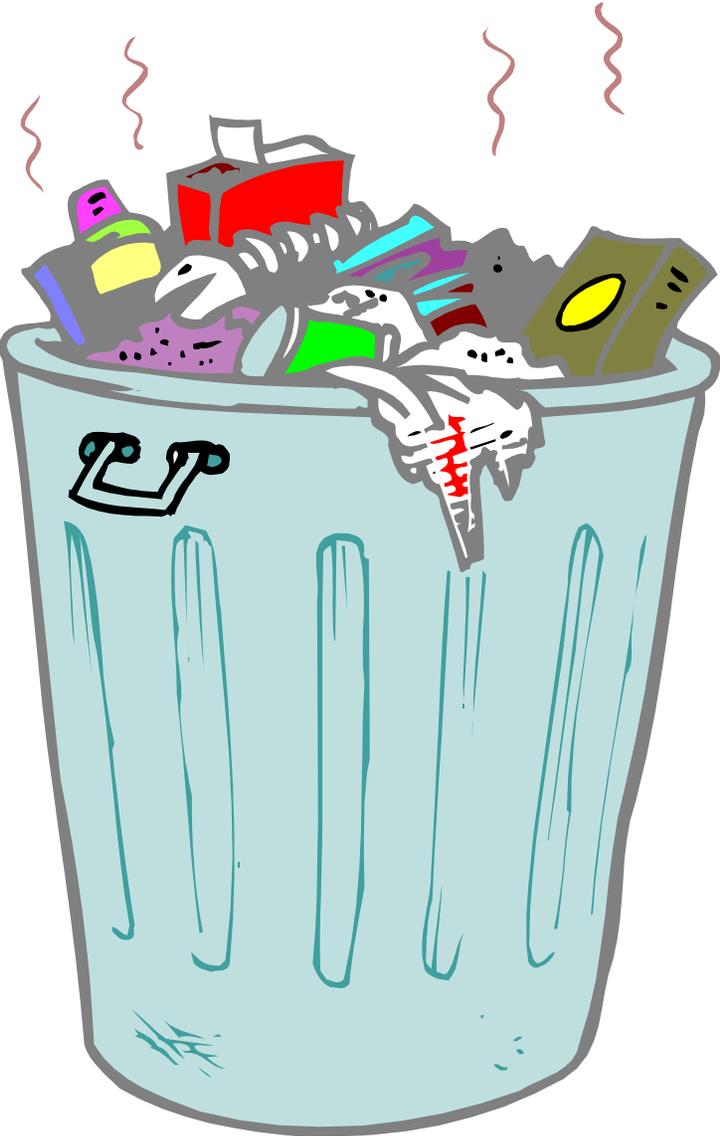
- Have students draw their noses and then complete a two-box drawing of things that smell good and things that do not smell good (see p. 7).

Follow-up/extension

- Send home brown paper bags for families to play “mystery object,” using only their sense of smell. One person places a mystery object in the bag, and another person smells the object and uses this information to try to guess the mystery object.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.







Name: _____

We use our _____ to smell. Mine looks like this:

Things that smell <i>GOOD</i>	Things that <i>DO NOT</i> smell good

The Five Senses: Touch

Organizing Topic

Investigating the Five Senses

Overview

Students touch and feel a variety of objects that they describe and compare.

Related Standards of Learning K.1a; K.2a, b; K.4c

Objectives

The student should be able to

- observe the basic properties of objects, using their hands and sense of touch;
- describe objects as *rough*, *smooth*, *hard*, *soft*, *cold*, and *warm*, by using their sense of touch;
- relate their sense of touch to the sensory organs hands, fingers, and skin.

Materials needed

- Large plastic zip bags — one per student — containing one of each of the following objects:
 - Cotton balls
 - Plastic forks
 - Corrugated cardboards
 - Poster board squares
 - Felt squares
 - Socks
 - Sandpapers
 - Unifix cubes
 - Erasers
 - Blocks
 - Rocks
- Paper plates to be used as “science mats”
- Lunch-size paper bag — one per student — for follow-up and take-home activities

Instructional activity

Content/Teacher Notes

We use our five senses to learn more about the world around us. Our hands and fingers do most of our feeling. The nerve endings in our hands and fingers send messages to our brain. These nerves tell our brain whether something is *hot*, *cold*, *smooth*, *rough*, *sharp*, *dull*, *soft*, and *hard*. Although we can “feel” with many parts of our body, our fingers are the most sensitive. Our feet are also more sensitive than other parts.

Introduction

1. Show students a brown bag containing a mystery object, e.g., a unifix cube, eraser, or block. Ask students: What’s inside? How could we figure out what’s inside without looking? What other clues would help. Brainstorm ideas. Conclude that TOUCHING would probably help the most, giving us the most information.
2. Pass around the brown bag, and have children feel it and share what they felt, using these clues to make conjectures about what it might be. Then look and see what is inside.

Procedure

1. Show “science mats” (paper plates) and large plastic zip bags. Talk about expectations:
 - Keep all items on the science mat;
 - Keep plastic bag under your bottom after it is empty;
 - Listen, focus, and tell others what you think.
2. Pass out bags, and have children open them and spread out items onto their science mat.
3. Have students take five minutes to feel each item and get ready to share how the items feel.

Observations and Conclusions

1. Watch children feel each item, and listen for descriptive words.
2. After children have gotten a chance to feel everything, call for hands in lap.
3. Call out one item at a time and have students find it and pick it up. As each object is shown, have children call out words to describe it:
 - Cotton — *soft, fluffy, squishy*
 - Rock — *hard, smooth, bumpy, cool, stiff*
 - Poster board — *smooth, slick*
 - Sandpaper — *rough, bumpy, scratchy*
 - Corrugated cardboard — *bumpy, hilly*
 - Felt — *fuzzy, smooth, squishy*
 - Fork — *smooth, flat, pointy, sharp, flexible, straight, curved*

Sample assessment

- Call out descriptive words such as those listed above. Have students find and hold up an object on their mat that matches that descriptor.
- Have students fold a piece of paper to make 4 or 6 boxes, choose a descriptive word for each box, and write the word and draw an object to match it. If students have difficulty writing the words, the words can be written ahead of time and copied by students.

Follow-up/extension

- Send home brown paper bags for families to play “mystery object,” using only their sense of touch. One person places a mystery object in the bag; another person feels the object and uses this information to try to guess the mystery object.
- Place large plastic cups in clean gym socks. Create feely brown bags for a classroom center by placing these mystery objects inside the bags and having students describe what they feel. Have students draw what they think is inside.
- Have students make textured paintings with sand, paint, glitter, fabric, and other three dimensional objects.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

The Five Senses: Sound

Organizing Topic Investigating the Five Senses

Overview Students investigate a variety of sounds and describe them to one another.

Related Standards of Learning K.1a; K.2a, b

Objectives

The students should be able to

- listen to a variety of sounds and classify them as *loud*, *soft*, *high*, or *low*;
- understand that ears are the sensory organs that collect sounds;
- match a variety of sounds by similarities and differences.

Materials needed

- Gift box or jewelry box
- Giant paper clip or other metal object to use in a mystery box
- Sound cards (half sheets of construction paper) that say *loud*, *soft*, *high*, and *low*
- Four film canisters per student or small group of students, labeled with a heart, smile, circle, and nothing, and filled as follows:
 - Heart — water
 - Smile — rice
 - Circle — two or three pennies
 - Nothing — cotton ball

Instructional activity

Content/Teacher Notes

We use our ears to hear the world around us. Many people live without being able to hear sounds. Ask students: What would you miss if you could not hear sounds? What sounds are out there?

- Music
- Phone ringing
- Birds chirping

Brainstorm some other sounds that you might miss. Our ears are sound catchers! They are shaped round so they can catch sounds and send them down a tunnel, the ear canal, to our eardrum. Our eardrum is a piece of skin stretched across this tunnel. It sends vibrations to our brain. Our brain senses these vibrations and can tell what sounds make them.

Introduction

1. Introduce the mystery box. Ask students: What could be inside? What clues or information do we need to figure it out? Tell them: We are not going to use our eyes, hands, mouths, or noses today. Today we are going to concentrate on sounds and use our ears to help us figure out what's in the box.
2. Shake the box and collect observations, descriptors, and guesses about the mystery object. Then show the paperclips or other mystery object.

Procedure

1. Have students name a favorite song to sing. Have students sing it normally, then try it really LOUD, in a whisper, low like a giant, and high like a mouse.
2. Compare the four ways that the song has been sung. Hold up the sound cards, and have children change their voice in the middle of the song to match the sound words
3. Talk about the descriptors *loud*, *soft*, *high*, and *low*.
4. Pass out film canisters. Have children shake them and listen.
5. Choose one canister at a time and have all the children shake it. Classify it as *loud*, *soft*, *high* or *low*. Repeat with the other canisters.

Observations and Conclusions

1. Listen and watch as children shake, compare, and describe the sounds coming from their canisters. Note what words they use to describe the sound of each shake.
2. Have students pick one canister and then go find a matching one without using any words.
3. Play a game of charades in which children are not allowed to use any words or other sounds to describe the sound of something, but only actions, e.g., a dog barking, children clapping, someone singing. They must do this silently. Try another round in which they may only sounds to portray something, e.g., a bird singing, a baby walking, a lion roaring. They must do this without words or actions. Compare results. Talk more about use the importance of sounds.

Sample assessment

- Give students a sense assessment in which they have to draw the sensory organ that helps them find out more about each of the following:
 - The sound of a bird singing
 - The taste of a strange vegetable
 - The smell of spoiled milk
 - The feel of a fuzzy kitten
 - The sound of your parent calling you
 - The smell of mom’s new perfume
- Complete the sound chart by having students draw objects that make loud, soft, high, or low sounds.

Follow-up/extension

- Set up a sound station. Provide a small box and two of a number of items that can be hidden in the box. Have one student hide an item in the box and then shake the box. Another student looks at the second collection of mystery objects and tries to guess which object makes that particular sound.
- Make a tape of common community sounds, e.g., cars honking, people cheering, dogs barking, and rain falling, and make picture cards to match. Play the tape, and have students match the sound to the object.
- Research how bats use their sense of hearing for hunting and self-defense, and share with the class.
- Have a guest come to talk to your class about and demonstrate sign language.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.

- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Name: _____

Loud	Soft
High	Low

The Five Senses: Taste

Organizing Topic Investigating the Five Senses

Overview Students test their sense of taste and learn new descriptor words to describe foods.

Related Standards of Learning K.1a; K.2a, b

Objectives

The students should be able to

- taste a variety of foods and group them as sweet, sour, bitter, and salty;
- identify and match their sense of taste with their sense organ — the mouth and tongue.

Materials needed

- Hand-held mirrors
- Index cards
- Large plastic zip bags — one per student — containing one each of the following objects:
 - Paper plates to serve as “science mats”
 - Unsweetened chocolate squares
 - Cookies
 - Sugar cubes
 - Grapefruit rinds
 - Pretzels
 - Potato chips
 - Lemon slices
- Dill pickle slices (not included in the bags, as they can make the other food items mushy)

Safety Note: Take care to discover any food allergies students may have before doing this activity.

Instructional activity

Content/Teacher Notes

We use our mouth and tongue to taste foods. Our tongue has taste buds all over it. Taste buds are tiny receptors that send messages to the brain. The buds in the front of our mouth taste sweet things, behind them is where salty things are tasted. Next is where sour things register, and finally we recognize bitter things with the taste buds in the back of our mouth. These receptors also tell us if things are too sharp, too hot, and too big to swallow.

Introduction

1. Have students come together in a circle and talk about their favorite foods — how they are alike and different. This dialogue should bring up the idea of sweets, salty foods, vegetables, fruits, candy, and other kinds of food.
2. Brainstorm: What is it about all these foods that we like? Their TASTE!

Procedure

1. Pass around the mirrors, and have students look at their tongue and describe it to the class.

2. Talk about taste buds and their job. Tell students that today they are going to complete a taste test and see if they can learn more about their taste buds.
3. Pass out the science bags. Have students carefully open their bags, pull out the science mat, and arrange the food items on it. Have them add the pickle slices to their collection. Talk about and demonstrate nibbling — a small taste of food.
4. Give students a few minutes to nibble each food item and think about its taste. Ask students to group items together based on their tongue’s reaction to each item’s taste.

Observations and Conclusions

1. Watch and listen as students nibble and group the food items.
2. Discuss why the students put foods in certain groups. Have them share descriptors, such as *sweet*, *salty*, *sour*, and *bitter*. Talk about which part of their tongue reacts to each taste.
3. Have students draw an oversized tongue in their journal and color each of the four sections with a different color. Then have them draw some foods that are tasted by the various parts of the tongue, using the appropriate color to draw each food item:
 - Sweet — cookies, sugar cube
 - Salty — chips, pretzels
 - Sour — lemon, dill pickle
 - Bitter — unsweetened chocolate, grapefruit rind

Sample assessment

- Have students use four index cards to make sweet, sour, bitter, and salty voting cards. Call out common foods that your children have tasted, and have students show the card that describes the taste of the food shown. These cards can be made in advance with a corresponding picture to help students recognize the words.
- Have students complete the four-column chart (see next page) by filling in pictures of foods that are sweet, sour, salty, and bitter. Students can draw the foods or cut pictures from magazines to fill the boxes.

Follow-up/extension

- Have a tasting party — a “sweets” or “sour” or “salty” party with various foods that can be described in that way.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Name: _____

Read the labels for each column. Fill each column with pictures of foods that fit the label.

Sweet	Sour	Salty	Bitter

The Five Senses: Sight

Organizing Topic

Investigating the Five Senses

Overview

Students use their eyes to play some games and describe a variety of objects.

Related Standards of Learning K.1a; K.2a, b; K.4d, e

Objectives

The students should be able to

- use shape, color, and size words to describe common objects;
- review the five senses and their matching sensory organs;
- find a mystery object based on clues about its size, shape, and color.

Materials needed

- Magnifying glasses — one per student
- Paper plates for science mats
- Large plastic zip bags — one per student — containing each of the following objects:
 - Cheerios
 - Pipe cleaner pieces
 - Rice
 - Newsprint — black and white and color comics
 - Paper towel — torn squares
 - Piece of cloth — ripped
 - Pretzel sticks
 - Kosher salt

Instructional activity

Content/Teacher Notes

Our eyes are our most used sensory organs. We depend on them every day in a variety of ways. People use their eyes to see colors, shapes, sizes, and all types of actions. There are two important parts to our eyes. The cones tell our brain about colors and bright light, the rods tell about dim light. These receptors collect information and send it to the brain so we can see both in the light and in the dark. This is an excellent time to talk about eye safety. Many people wear goggles or special glasses to protect their eyes from harm. Carpenters, engineers, lumbermen, sports stars, and scientists all wear protection to keep their eyes safe. Scientists use magnifying glasses and microscopes. These tools help our eyes see things we cannot see with our natural vision.

Introduction

1. Play a game of “I Spy.” Tell the children they are looking for something in the room. Slowly give them clues about the object. Share its color, shape, and size. Wait between clues so that children can process ideas and share guesses.
2. Have several students choose an “I spy” object and share clues.
3. Talk about what kinds of clues (colors, shapes, sizes, locations, others) were given.
4. Make lists of words that fit under each category:
 - Colors — *red, yellow, orange, green, blue, purple, black, brown, white*

- Shapes — *circle, square, triangle, square, rhombus, sphere, cylinder*
 - Sizes — *big, little, small, short, tall*
 - Location — *above, below, on top, behind, near*
5. Discuss what part of our body lets us know about all these colors, shapes, sizes, and locations — our EYES!

Procedure

1. Pass out science bags, and review rules about keeping it organized.
2. Ask children to pour out their supplies and put them on their mat.
3. Have the students take a minute just to *look* at all the items on their mat. Have them choose one object at a time and describe it to the class by using color, shape, and size words to tell others about it.
4. Ask children to look at the salt. Ask: What makes it hard to see the salt and then tell about it? It's very small and hard to see. What can we do? What do scientists do? They use a tool, such as a magnifying glass or microscope, that helps them see very small objects.
5. Pass out the magnifying glasses, and have children look again at the objects and describe them to one another.

Observations and Conclusions

1. Watch and listen as children tell about the colors, sizes, shapes, and locations of things during the “I Spy” game and when working with the objects on the science mat. Try to encourage more use of sight words.
2. Have students move around the room with their magnifying glass and look closely at small objects.
3. Review all five senses, and talk about the importance of all five working together. Place a mystery object in a brown bag and have children use one sense at a time to collect clues. Save taste and sight for last. Each step of the way, have them use descriptive words to tell about the mystery object. (A rice-cereal bar treat works very well because all of the senses can respond.)

Sample assessment

- Play a game of “I Spy” in which the children record the color, shape, and size in their journal. When they think they know what the object is, have them draw it in their journal.
- Make a “Who Am I?” project (see p. 46).
- Place four objects on the table, three that are alike in some way (color, shape, size), and one that is different. Have students decide which one does not belong and tell why.

Follow-up/extension

- Use a digital handheld microscope to take a closer look at small objects. These microscopes can be easily connected to the classroom computer. They are relatively inexpensive and very child friendly.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Organizing Topic — Describing Our World

Related Standards of Learning

- K.1 The student will conduct investigations in which
- basic properties of objects are identified by direct observation;
 - observations are made from multiple positions to achieve different perspectives;
 - objects are described both pictorially and verbally;
 - a set of objects is sequenced according to size;
 - a set of objects is separated into two groups based on a single physical attribute;
 - nonstandard units are used to measure common objects;
 - picture graphs are constructed using 10 or fewer units;
 - an unseen member in a sequence of objects is predicted.
- K.4 The student will investigate and understand that the position, motion, and physical properties of an object can be described. Key concepts include
- colors (red, orange, yellow, green, blue, purple), white, and black;
 - shapes (circle, triangle, square, and rectangle) and forms (flexible/stiff, straight/curved);
 - textures (rough/smooth) and feel (hard/soft);
 - relative size and weight (big/little, large/small, heavy/light, wide/thin, long/short); and
 - position (over/under, in/out, above/below, left/right) and speed (fast/slow).

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The students should be able to

- identify and name eight basic colors, including red, orange, yellow, green, blue, and purple. (Indigo and violet are not required at the kindergarten level.) Black and white are not spectral colors, but students should recognize them by name;
- observe objects and describe their basic properties. These include color, shape (circle, triangle, square, and rectangle), size (big, little, large, small), texture (rough, smooth, hard, soft), weight (heavy, light);
- compare and contrast objects that are rough, smooth, hard, and soft;
- compare objects, using the concepts of heavy/light, long/short, wide/thin, big/little, and large/small;
- measure objects, using nonstandard units;
- identify the position of an object using position words: over/under, in/out, above/below, left/right;
- observe an object or objects from multiple positions to achieve different perspectives. In order to accomplish this, the student should look at the object from top, bottom, front, and back;
- group objects according to their speed — fast or slow;
- identify and name a circle, triangle, square, and rectangle;

- compare and contrast objects that are flexible, stiff, straight, and curved;
- arrange a set of objects in sequence according to size;
- separate a set of objects into two groups based on a single physical attribute, including size, color, texture, and weight;
- construct picture graphs, using 10 or fewer units;
- describe objects both pictorially and verbally.

Animal Adventures

Organizing Topic Describing Our World

Overview Students learn a variety of sorting and measurement skills by looking at animals.

Related Standards of Learning K.1b, d, e, f; K.4d

Objectives

The students should be able to

- observe, describe, and sort animals by their color, size, weight, speed, and body covering;
- measure the length of animals, using nonstandard units;
- observe stuffed animals from a variety of positions and perspectives;
- arrange animals in sequence from tallest to shortest.

Materials needed

- Beanie Babies or plastic animals, including animals from the five classes as well as fictional animals
- Animal research materials — computer with Internet access, encyclopedias, and/or other reference materials
- Clay
- Yarn
- Masking tape
- Large bulletin board paper
- Crayons
- Unsharpened pencils

Instructional activity

Content/Teacher Notes

Children love animals and finding out all about them. Children need experiences in which they can measure objects. Most young students are not developmentally ready for measuring with traditional units or rulers. Have students use unsharpened pencils to see how long each animal is. Use the Internet to find pictures of “real life” animals for students to keep.

Introduction

1. Gather students together in a circle. Put the Beanie Babies or animals in the middle. (You could also use picture cards, but 3-D models usually work better and cause more dialogue about attributes.) Have students look at all the animals and start naming some of the ones they see.
2. Have a student call out one animal and name one of its attributes, e.g., “walks on two legs.” Have students work together to put the animals that have that attribute in one pile and the “Not” animals (does *not* walk on two legs) in another. Repeat this process for a variety of attributes, such as “flies,” “walks on land,” “swims,” “has scales,” “has fur,” “hops,” “has wings,” “has a tail,” “eats meat,” and “lives on a farm.”

Procedure

1. Have students select from the animals available a favorite animal that they want to “research” or study. Alternatively, put the animals in a bag, and have students draw them randomly. Make sure

each child knows the name of his or her animal. Have student partners tell each other what they know about the animal, switch animals, and tell again so that they hear some new idea about the animals.

2. Have students draw front and back pictures of their animal, including as many of the details as they can. Have them use a pencil so that they are attending to details and not just the colors.
3. Have students make a 3-D model of their animal, using clay. Have them look at their animal from every angle — top, bottom, front, and back — to make sure they notice and include every detail.
4. While students are working on drawings and clay sculptures, call students or pairs to do research with you. Help each student find out the length of his or her animal, using yarn. Give each child a piece of yarn that long, labeling it with masking tape and the animal’s name.
5. Have students use the unsharpened pencils to measure the length of their animal. Show them how to and help them record this measurement on their drawing.

Observations and Conclusions

1. Have students share their pictures and sculptures. Help them make comparisons about the lengths of their animals.
2. Have some students show how they measured the length of their animal with the pencils. Lead them in discovering whether there were other ways to do this, e.g., leap frog (pencil over pencil), measure and slide, lining up multiple pencils. Have students measure other animal lengths to see if they get the same results.
3. As a class, arrange the animals from longest to shortest.

Sample assessment

- Cut some yarn and have students measure the length with the pencils.
- Have students order the beanie babies from lightest to heaviest.

Follow-up/extension

- Make life size drawings of the animals to display around the room.
- Compare the weights or masses of animals.
- Compare the height of the animals; order these from tallest to shortest.

Resources

- Virginia Department of Education’s *Mathematics Standards of Learning Enhanced Scope and Sequence*, Kindergarten. <http://www.doe.virginia.gov/VDOE/EnhancedSandS/mathematics.shtml>. “How Heavy Is It?” activity.
- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Sorting

Organizing Topic Describing Our World

Overview Students sort and discuss ways to sort, using a variety of objects.

Related Standards of Learning K.1; K.4

Objectives

The students should be able to

- observe and describe objects based on their basic color, shape, size, texture, position, and weight;
- compare and contrast objects based on their attributes (color, shape, size, texture, position, and weight).

Materials needed

- Buttons
- Other objects that can be sorted — a different set of objects for each small group of children — such as
 - Pattern blocks
 - Animal miniatures or Beanie Babies
 - Balls
 - Attribute pieces
 - Lids
 - Stamps
 - Unifix cubes

Instructional activity

Content/Teacher Notes

We sort and group objects all the time in the real world. This sorting or classifying happens daily in grocery stores, libraries, the phone book, and many other places. Children need to observe objects and think about how they are alike and different. They need time and experience with these materials to develop these comparisons skills. They also need time to share descriptive words aloud with one another. Take time to have students share their strategies and thought processes. Children are usually very creative and can come up with many diverse ways to sort and group objects.

Introduction

1. Gather students together in a circle. Put some buttons in the center and have students choose one each. Have each child tell something about his/her button. As each child shares an idea, have the rest of the group look to see if their buttons have that same feature or attribute. Encourage children to share about color, shape, size, texture, and so forth.)
2. Put all the buttons back in the center, and have students choose a different button. Ask students to move about and find a person whose button is like their button in some way. Have them partner up and share with their partners how the buttons are the same. Then have them find someone whose button is different in some way and share how the buttons are different. Repeat both of these steps several times, having students find a new partner each time.

Procedure

1. Have students choose a third button. Put all the extra buttons to the side. Have one child share an attribute that describes his or her button, e.g., “red.” Put this button in the circle. Have the others decide if their button has this attribute. If it does, have them put their button in a pile with the one in the circle. Buttons that do not have this attribute go into another pile. Have students help you name the two groups, e.g., “Red” and “Not red.” Remember that all the “other” buttons have to fit together in one group. Talk about the words *group* and *sorting*, explaining that *sorting* means putting things that are alike into a group.
2. Put the buttons away, and show the students the other objects for sorting. Create small groups or teams of students, and have each team use a different set of objects to play the Tower Game. Have each team take a handful of their set of objects to sort. (Any more than a handful gets in the way.) When you say “Go,” each team will try to sort their “stuff” into only *two* groups and then raise their hands. Your job is to circulate around the room and ask how the objects have been sorted. If it is a sort that works, that team gets a cube to start building their tower. If not, then the group must redo the sort. After each successful sort, each team pushes their objects back together and sorts again in a different way. The object of the game is to sort as many different ways as possible and build the tallest tower of cubes. (Children *love* this!)

Observations and Conclusions

1. Watch and listen as groups sort their objects. What type of words do they use? At what point do they struggle with new ways to sort? Do they go through all the colors and then move to another attribute? What questions can you ask that will help them recognize a new attribute and way to sort?
2. After the Tower Game, have students share and discuss the different ways they sorted.
3. Play again another day, having the groups switch objects to sort.

Sample assessment

- Have students take a handful of objects to sort. Have them sort and record how they sorted, using pictures and words.
- Have students choose a button or another object to describe. Have the students trace the object in their journal and then describe it in as many ways as they can.

Resources

- Virginia Department of Education’s *Mathematics Standards of Learning Enhanced Scope and Sequence*, Kindergarten. <http://www.doe.virginia.gov/VDOE/EnhancedSandS/mathematics.shtml>. “The Button Box” activity.
- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

What's Your Sport?

Organizing Topic Describing Our World

Overview Students investigate a variety of balls and group them based on certain attributes.

Related Standards of Learning K.1; K.4

Objectives

The students should be able to

- observe, describe, and sort a group of objects based on their attributes (color, size, texture, speed, shape, and heaviness);
- construct and discuss the results of a picture graph;
- describe objects both pictorially and verbally.

Materials needed

- Balls — baseball, golf, tennis, lacrosse, wiffle, marble, Nerf, stress, texture ball, basketball, soccer, pillow ball, pilates or exercise ball, super ball, pinky playground ball, and kickball. (See your PE teacher for a variety of ball shapes, sizes, weights, and materials)
- Graphing mat, shower curtain with a grid pattern, or square tile flooring
- Bulletin board paper
- Drawing paper

Instructional activity

Content/Teacher Notes

This is a sorting activity, but the extension of the lesson will focus on graphing. This is an opportunity to make a real picture and symbolic graph at the same time. This transition from the real to the abstract helps young learners see where the boxes or Xs come from. They need to repeat this process often so that graphs become a meaningful part of their learning. A large plastic tub or baby pool is an excellent container to hold the balls as it allows children to see and compare them visually.

Introduction

1. Gather students around the balls. Ask them to name and describe them. Color, shape, size, and texture are obvious attributes, but squishiness, bounce, weight, and other things may be mentioned.
2. Have students try to sort the balls in a variety of ways, e.g., big/little, red/not red, or smooth/bumpy. Ask them to see how many ways they can sort and group them.

Procedure

1. Have several students choose a ball and describe a game that is played with that particular ball.
2. As a class, choose four or five balls that represent games they like to play. Ask the individual students to choose their favorite game from these four or five. Ask: Who likes what? Have students raise hands or even get together with the ball. Ask: What can we tell from raising our hands or standing together in a group? Is there a better way to show who likes what? Guide, but do not tell, children to the idea of standing in a line behind their favorite ball to show their favorite sport. This is a perfect time to use standing on the squares of the tile floor — a ready-made graphing grid. If you do not have tile, children may stand on a graphing mat, a shower curtain with

a grid pattern, or even construction-paper squares (firmly attached to the floor). Ask: Now what can we tell from the lines? Talk about how it is so much easier to see how many there are in each group. Make some comparisons. Ask: What's the favorite sport? Talk about *more*, *less*, *fewer*, *same*, and so forth. This is a “real” graph with real people being represented. You may want to record some of these ideas on chart paper.

3. Turn this real graph into a picture graph by having children draw the ball that showed the game they like best. Then have them color their paper ball, cut it out, and bring it back to the real graph. Have each student place his or her paper ball on his or her square, and “step out” out of the graph. Ask them look at what is left — a *picture graph*. Have students discuss and tell you their ideas while looking at the graph. Look back at the chart for the real graph. Ask: Are these same ideas still true? Yes, the information did not change, just the pieces to make the graph. Repeat this process by exchanging sticky notes for the pictures of the ball. Now it is a *symbolic graph*. Discuss.

Observations and Conclusions

1. Watch and listen as children discuss the attributes found in the balls. Are they able to name and distinguish several different attributes? If you choose an attribute, can the students sort and group the pieces?
2. As the graph is formed and then changed from real to picture to symbolic, listen to children's ideas. Do they see a connection or pattern between the different types of graphs? Can they read the graphs and tell you some *big* ideas that are present?

Sample assessment

- Have students make their own graph with a collection of small objects at their desk. For example, you could give them a handful of three different shapes and ask them to make a picture graph of how many of each shape they have.

Resources

- Virginia Department of Education's *Mathematics Standards of Learning Enhanced Scope and Sequence*, Kindergarten. <http://www.doe.virginia.gov/VDOE/EnhancedSandS/mathematics.shtml>. “Geometric Figures in Our Classroom,” “Geometric Games,” “Geometric Snacks,” and “My Favorite Things” activities.
- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Organizing Topic — Measuring, Sequencing, and Questioning

Related Standard of Learning

- K.1 The student will conduct investigations in which
- f) nonstandard units are used to measure common objects;
 - g) a question is developed from one or more observations;
 - j) unusual or unexpected results in an activity are recognized.

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The students should be able to

- measure common objects with nonstandard units. Examples of nonstandard units include hands, pennies, and paper clips;
- predict an unseen member in a sequence of objects to complete a pattern;
- develop a question from one or more observations;
- identify unusual or unexpected results in an activity.

Measure This!

Organizing Topic Measuring, Sequencing, and Questioning

Overview Students measure a variety of objects.

Related Standards of Learning K.1f

Objectives

The students should be able to

- measure common objects, using nonstandard units.

Materials needed

- Index cards — one per student
- Index cards cut into thirds — 10 pieces per student
- Tape
- Classroom objects

Instructional activity

Content/Teacher Notes

Students of all ages need to be able to measure linearly. Young children begin making comparisons at an early age. They come to Kindergarten with a sense of knowing, “I have more. My pencil is longer than hers.” We need to transition these comparisons into beginning measurement skills. Students need to see where we get our measuring tools and how they are useful. In this activity, we will take a common item — an index card — and use it as a nonstandard measuring tool.

Introduction

1. Give each student an index card.
2. Ask students to look at the “long” side of their card. Then have them move about the room and find something that is “about” as long as their card; something that is longer than their card; something that is shorter. Repeat each comparison until everyone has shared several comparisons. During each step of the process, make sure you get students to explain the comparison and show how they know it to be true.
3. Ask: What if we want to find something that is two cards long? How would we do it? What if we want to find out the length of the table? Let different students share different ways. Some will leap frog, others will mark and slide, and others will flip end over end: there is not one right way.

Procedure

1. Some students might have worked together to find the length of the table. Point this method out too. Then say: Today we are going to make an index-card ruler so each one of you can measure long objects. Show students how you can cut index cards into three strips the *long* way, and demonstrate taping 10 of these strips end to end. They need to see that the strips are the same *length* as the cards they have been using to measure.
2. Partner up students, give each pair 10 card strips, and have the pairs work to make their own ruler by holding and taping their strips end to end: each ruler will be about 10 strips long, depending on the amount of overlapping.

Observations and Conclusions

1. After all the rulers have been made, have students measure the table. Ask: Did you get the same results as when we used the single cards? Talk about this. Tell them: Now find an object in the room that is about 5 strips long; 6 strips long; more than 7 strips long; about 2 strips long.
2. Complete the measurement activity by choosing some objects in the room to measure. Have the students predict how long they might be and then measure them with their ruler. Students can use the “Measure This!” handout, found on the next page, to record their data. Have students draw a picture of the objects in the boxes or write the names of the objects in the boxes.

Sample assessment

- Draw several lines, and have students measure them accurately with their ruler.
- Have students informally measure objects around the room and demonstrate that something is 6 strips long; more than 2 strips long; etc.

Follow-up/extension

- Find the mass of objects, using pennies, tiles, bouncy ball, or bear counters and a pan balance.
- Use paper clips or unifix cubes to find the length of smaller objects.

Resources

- Virginia Department of Education’s *Mathematics Standards of Learning Enhanced Scope and Sequence*, Kindergarten. <http://www.doe.virginia.gov/VDOE/EnhancedSandS/mathematics.shtml>. “How Long is It?” and “How Tall Are You?” activities.
- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Name: _____

Measure This!

<p>I predict it is _____ long.</p> <p>It was _____ long.</p>	<p>I predict it is _____ long.</p> <p>It was _____ long.</p>
<p>I predict it is _____ long.</p> <p>It was _____ long.</p>	<p>I predict it is _____ long.</p> <p>It was _____ long.</p>

Unusual Events

Organizing Topic Measuring, Sequencing, and Questioning

Overview Students try to explain “why” when an unusual event happens.

Related Standards of Learning K.1g, j

Objectives

The students should be able to

- develop a question from their observations;
- identify an unexpected activity or event.

Materials needed

- Candle holder
- String cheese
- Almond sliver, burnt on the tip
- Matches

Instructional activity

Content/Teacher Notes

Sometimes the unexpected happens. At times, you think one thing is going to happen and the opposite happens. In science we call these *discrepant* events. Discrepant events get children thinking; they make students wrestle with their thinking and get students asking WHY? Such events and the responses they elicit are a wonderful way to clear up misconceptions or introduce a new concept.

Introduction

1. To prepare, cut the string cheese in half, and place one half in the candleholder. Burn the tip of the almond sliver, and put into cheese “candle” to look like the “wick.”
2. Ask the children to look, watch, and think about what they are seeing. Show them the candleholder with the “candle.” Have them tell what they see and make observations, sharing their observations and ideas aloud.

Procedure

1. Light the “candle,” and have the students make observations, sharing their ideas aloud. *Safety Note: Use caution near the open flame.*
2. Quickly blow out the “candle” and take a large bite. Chew and swallow it in front of the children, and ask them to make some new observations.

Observations and Conclusions

1. Have students share their observations, reminding them that *observations* are only something that we can see, feel, smell, hear, and/or taste with our five senses; observations are not “I think” sentences, but really what you actually see, feel, smell, hear, and/or taste.
2. Have students write a question about what they observed. Ask them: What do you still wonder about what happened? Share their questions, for example: Why did my teacher eat a candle? Then share what really happened — what the candle is made of.

Sample assessment

- Show another discrepant event, and have children respond. For example, fill a plastic zip bag with water, and stick a sharpened pencil through it. Ask: What happens? Why? Have students draw and write to tell what happens. Have them articulate a question based on what they observe.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Organizing Topic — Investigating Water

Related Standards of Learning

- K.1 The student will conduct investigations in which
- a) basic properties of objects are identified by direct observation;
 - g) a question is developed from one or more observations;
 - j) unusual or unexpected results in an activity are recognized.
- K.5 The student will investigate and understand that water flows and has properties that can be observed and tested. Key concepts include
- a) water occurs in different states (solid, liquid, gas);
 - c) some materials float in water, while others sink.

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The students should be able to

- identify examples of the different states of water (solid, liquid, and gas);
- classify examples of different states of matter as solid, liquid, or gas;
- describe the natural flow of water;
- predict where a stream of water will flow;
- predict whether items will float or sink when placed in water. Items to use include wood, metal, fruits, paper, and plastics.

Sink or Float?

Organizing Topic Investigating Water

Overview Students test a variety of objects to learn about sinking and floating.

Related Standards of Learning K.1a, g, j; K.5c

Objectives

The students should be able to

- predict, test, and then classify objects depending on whether they sink or float.

Materials needed

- Bowl of water — one per group of students
- Baggie — one per group — with a variety of small objects, such as a penny, spoon, marble, paperclip, rock, bead, screw, Styrofoam, sponge, seed, peanut, rubber ball, cork, and toothpick

Instructional activity

Content/Teacher Notes

From a very young age, children play with the concepts of sinking and floating. They test these concepts in the bathtub and sink at home. This is a wonderful kid-friendly area where children can learn more about sinking and floating through prediction and testing — like scientists, who constantly test their ideas. Have children take note of their predictions and explain why they predict the way they do. Many students assume that things sink because they are heavy or float because they are “light.” Help them correct this misconception by looking at the items before they are placed in water. It is a wonderful “aha” moment when students find a “heavy” item that floats. An example would be the comparison of a watermelon, which floats, and a cherry, which sinks. Sinking or floating has to do with an object’s density compared to the density of water. Although density is an abstract concept for children, it is important to correct misconceptions wherever possible.

Introduction

1. Read a story about a boat that sinks. Discuss reasons why a boat might sink.
2. Challenge the class to sort the objects in the baggie by how each will react in water. As the students predict what will happen to each object, place it in one of two piles — those that will sink and those that will float.
3. Gather children in groups of three around the bowls of water. Pass out baggies of objects, and let them test each one. Have them sort and classify the objects by which sink and which float. Leave the objects on view to share with others.

Procedure

1. Have students share what they found. Ask students to name each pile or group.
2. Put materials aside, and talk about the ideas of *sinking* and *floating* in the context of the previous activity. Share the idea of *density* as how much “stuff” is packed into the space of the object.

Observations and Conclusions

1. Have students find two other objects in the room that they think will sink and two that will float. Again, have them predict, test, and classify.
2. Have students complete the “Sink and Float” sheet (see next page) by drawing objects that sink and object that float and by writing about the concept.

Sample assessment

- Have students predict whether ten new objects will sink or float and then test and classify each one.
- Bring in a “surprise” object from home. Have the class predict whether it will sink or float, and then test it!

Resources

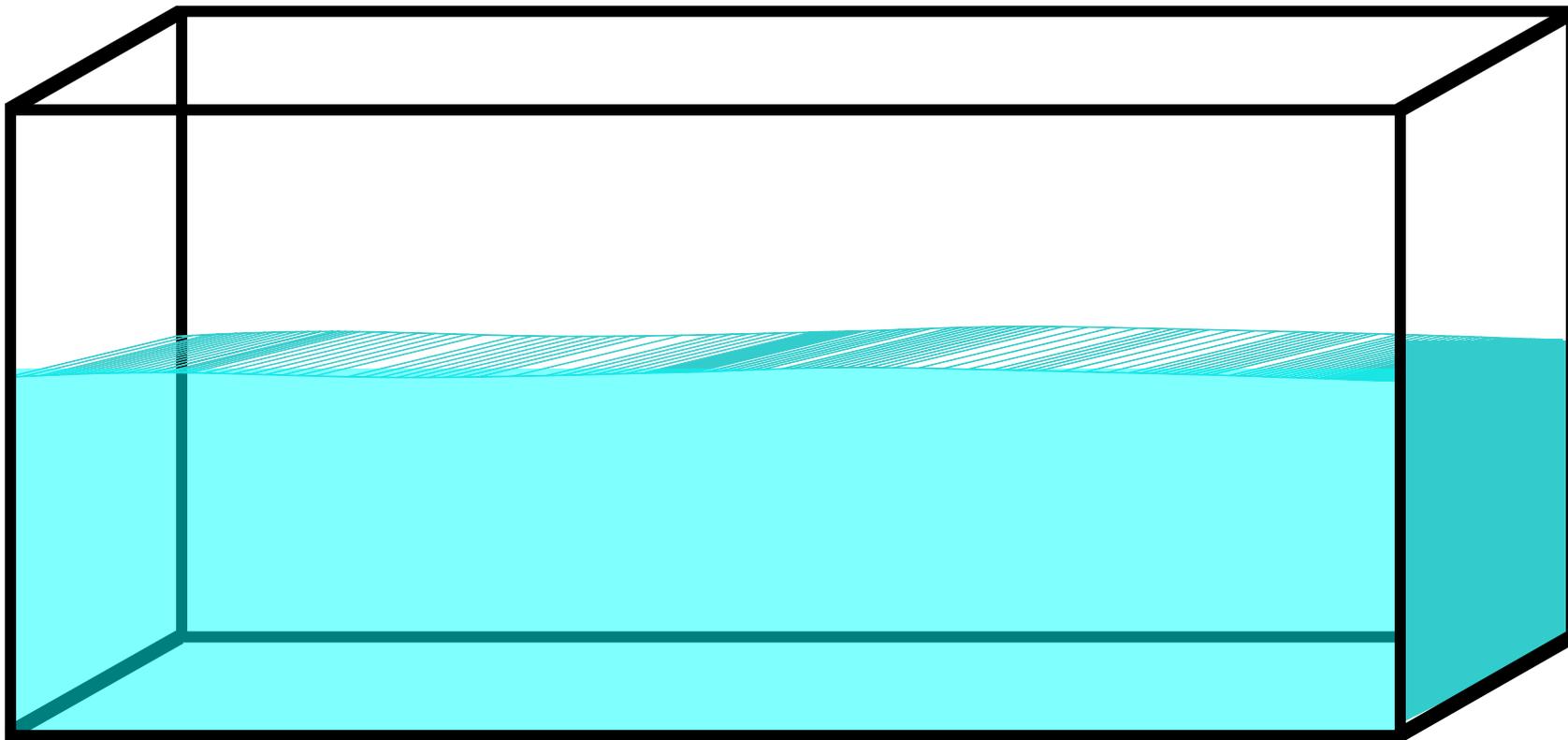
- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Name: _____

Sink and Float

When objects stay on top of the water, we say they _____. When they go down to the bottom, we say they _____.

Here are some things that sink and others that float:



Solid, Liquid, or Gas

Organizing Topic Investigating Water

Overview Students conduct simple experiments to learn more about solids, liquids, and gases.

Related Standards of Learning K.1a, g, j; K.5a

Objectives

The students should be able to

- identify examples of the different states of water;
- classify examples of different states of matter as solid, liquid, and gas.

Materials needed

- Ice
- Data sheets
- KWL charts
- Bowls — one per group of students
- Cooking pans
- Hot plate or hot pot

Instructional activity

Content/Teacher Notes

Matter is everything around us. Every type of matter can be classified as either a solid, liquid, or gas. These are the three states of matter. Water is one such type of matter, and it can be in all three states. We come in contact with water's three states often. Just think about our weather: sometimes it rains (liquid); sometimes we have hail or snow (solid); and sometimes there's fog (gas) in the air. Most children have seen water and ice, but some might not have noticed or named steam.

Introduction

1. Start a KWL chart about water. Have students come together and share what they know (or think) about water. Record ideas in the K (know) section. Guide students by asking focus questions about water, such as:
 - Where do you see it?
 - What does it do?
 - How does it act?
 - Can it change? Can it look or feel different?
2. Begin the W (want to know) section of the chart. Have students brainstorm, and record questions they have about water.

Procedure

Safety Note: Have a three-feet-away-from-the-heat-source rule to keep children three steps away from the hot pot or plate at all times.

1. Pass out the data sheets. Give each group of students a bowl of ice cubes. Have the groups draw what they see in the bowl and describe it. Encourage students to touch and feel the cubes. Share

what each group discovered. Introduce the idea of a *solid*. Share a simple definition, such as that on page 41. Have students label the first column on their data sheet “Solid.”

2. Have students pour their ice cubes into the cooking pot, noting what is already happening to the ice. Place the pot on the heat, and have students watch. Have them record what they see happening in the pot. Describe the “stuff” in the pot. Remove from heat when ice has melted. Let students touch the “stuff” once you have checked that it is still cool enough to touch. Share what everyone thinks, and then introduce the idea of a *liquid*. Share a simple definition, such as that on page 42. Have students label the second column on their data sheet “Liquid.”
3. Place the pot back on the hot plate, and turn the heat up high. Have students observe what is happening. Talk about the temperature rising and the water boiling. Ask: What might happen? Watch and see as steam begins to form and rise into the air. Have students describe what they see and think. Introduce the idea of a *gas*. Share a simple definition, such as that on page 43. Have students label the third column “Gas.” (If a child asks, you may need to clarify why the “stuff” we put in the car is called “gas”: that it is not really a gas but is just called by that *nickname* because its real name is “gasoline.”)

Observations and Conclusions

1. Complete the L (learned) section of the chart. Let students share ideas that they have learned about water.
2. Help students name what water is called in each state. Hand out the “Solid, Liquid, or Gas” chart (see p. 40). Referring to the definitions that you introduced earlier, challenge students to name other objects that are solids, liquids, and gases and to place the names in the correct column on the chart. To get them started, name a few objects, and have students correctly place them.

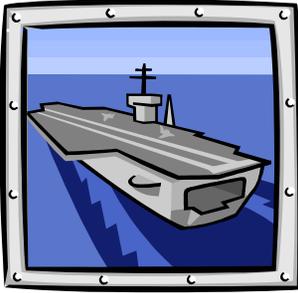
Sample assessment

- Cut apart the “Solid, Liquid, or Gas Assessment” pictures (see next page), and give each student a set. Have students glue each picture in the correct column on another “Solid, Liquid, or Gas” chart.
- Show household items, and have students correctly label them as solid, liquid, or gas.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Solid, Liquid, or Gas Assessment

Name: _____

Solid, Liquid, or Gas

Solid	Liquid	Gas

Solid

a state of matter that has a
definite shape and volume

Liquid

a state of matter that takes
the shape of its container

Gas

a state of matter that spreads out to evenly fill its container

Organizing Topic — Investigating Sunlight and Shadows

Related Standards of Learning

- K.1 The student will conduct investigations in which
- a) basic properties of objects are identified by direct observation;
 - b) observations are made from multiple positions to achieve different perspectives;
 - g) a question is developed from one or more observations.
- K.7 The student will investigate and understand that shadows occur when light is blocked by an object. Key concepts include
- a) shadows occur in nature when sunlight is blocked by an object; and
 - b) shadows can be produced by blocking artificial light sources.

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The students should be able to

- identify a shadow or variety of shadows;
- describe how to make a shadow;
- identify and describe sources of light — sun, electric lights, and flashlights — that can produce shadows;
- match objects with the shadow they would create;
- analyze how shadows change as the direction of the light source changes.

Sun and Shadows

Organizing Topic Investigating Sunlight and Shadows

Overview Students explore light and shadows with a variety of objects.

Related Standards of Learning K.1a, b, g; K.7a, b

Objectives

The students should be able to

- understand that a shadow is made from a light source and an object blocking that light;
- explore simple objects and discover the shadows they make;
- identify and describe some sources of light that could make a shadow.

Materials needed

- Overhead projector
- Objects for making shadows (see below)
- Chalk

Instructional activity

Content/Teacher Notes

Students see shadows everywhere — at home, on the playground, and even in the movies. Ask students: Where do shadows come from? You need a source of light and an object to block it to make a shadow. Shadows change when the object moves or changes or when the light source moves. The length of a shadow on the ground is based on the height of the light and the size of the object. A good rule of thumb is: the higher the light, the smaller the shadow. The sun makes its shortest shadows at noon; before and after noon, the sun is lower and shadows are longer. This may be hard for young children, but it is enough for them to understand that shadows move and change.

Introduction

1. Have students sit around an overhead projector so they can see the screen. Place a manila folder around the base so they cannot see the mystery objects placed on the projector. Project a variety of solid objects, and have children discuss the shadow they make. Try scissors, tape, book, marker, and fork — anything that makes a nice shadow. Have the students try to guess what is making the shadow.
2. Talk about what we see on the screen. Ask: Do we see the object? Its colors? No, we see darkness, and we see the object’s shadow. Talk about how the shadow is made. Place your hand on the overhead, and have students discuss. Ask: What are we seeing? What is blocked? Your hand blocks the light. Let children hold up fingers to make a shadow on the screen. Talk about what is displayed on the screen.

Procedure

1. Read a book about shadows. Have the children look at each page and guess what it might be based on its shadow.
2. Recall what was needed to make a shadow — light and an object to block it. Talk about where you see shadows: outside on the playground, when you use a flashlight, behind a lamp in your house are a few that may come up.

3. Go shadow-watching outside on a sunny day. Have students stand on the black top and find their shadow. Tell them to move around and see how their shadow changes. Direct them to stand with a friend and compare shadows. Have students sit down and share their ideas.
4. Have pairs of students use chalk to trace the outline of each other's feet and their shadows. Write the time somewhere near their shadow. A few hours later, have them trace their shadows again with their feet in the same positions, and compare. Talk about the changes with your class.

Observations and Conclusions

1. Listen and encourage lots of dialogue about shadows and how they are made. Bring in a small lamp. Have a student stand in the middle of the room, and hold the lamp high in the air. Have students notice where the student's shadow is located. Move the lamp, and see what happens to the shadow. Talk about what happens and why. Repeat by moving the light in a variety of ways.

Sample assessment

- Make a "Who Am I?" project. Place an object on the overhead. Tape black paper on the board so that the shadow falls on the paper. Trace the shadow, and cut it out. Glue it to the front of a folded sheet of paper. You might also list some clues on the front. Have the class use the clues and the shadow to guess the mystery object.
- Have students complete the "Me and My Shadow!" worksheet (see next page) to show how a shadow is made. Have them include the light, object, and shadow. See that they have each item in the correct alignment.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Name: _____

Me and My Shadow!

Draw a picture of you and your shadow on a bright sunny day. Think about where to draw the sun and what your shadow might look like.

Organizing Topic — Investigating Change

Related Standards of Learning

- K.1 The student will conduct investigations in which
- a) basic properties of objects are identified by direct observation;
 - c) objects are described both pictorially and verbally;
 - g) a question is developed from one or more observations;
 - j) unusual or unexpected results in an activity are recognized.
- K.8 The student will investigate and understand simple patterns in his/her daily life. Key concepts include
- c) animal and plant growth.
- K.9 The student will investigate and understand that change occurs over time and rates may be fast or slow. Key concepts include
- a) natural and human-made things may change over time; and
 - b) changes can be noted and measured.

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The students should be able to

- identify some changes that people experience over time, such as height, weight, and color of hair;
- predict how their own height and weight will change over the school year;
- describe how animals and plants change as they grow (related to K.6.);
- describe how people cause things to change — e.g., demolition of buildings, construction of buildings, cutting down trees, planting trees, and building highways;
- describe how things change naturally. This includes seasonal changes, the growth in seeds and common plants, common animals, including the butterfly, and the weather;
- identify examples of fast changes and slow changes. Slow changes should be the kinds of familiar changes that occur over weeks, months, or seasons. Students are not responsible for identification of long-term changes.

Beanstalk Growing

Organizing Topic Investigating Change

Overview Students investigate plant growth through planting seeds and making observations.

Related Standards of Learning K.1a, c, g, j; K.8c; K.9a, b

Objectives

The students should be able to

- describe how plants and animals change as they grow;
- make and share observations;
- develop a sense of “how long” seeds take to grow and develop;
- describe how things change naturally.

Materials needed

- Plant seeds — beans, lima beans, corn, peas
- Small baggies with a moist paper towel
- Soaked lima bean seeds
- Large paper
- Art supplies — tissue paper, glue, paint, Q-tips, cotton balls

Instructional activity

Content/Teacher Notes

When a plant’s or animal’s basic needs are met, it grows and develops. These changes are observable and measurable. This process does not happen overnight like in story magic — it takes time. After reading a seed story, have students observe a seed, plant the seed, and keep a science journal about its growth.

Introduction

1. Read *Jack and the Beanstalk*. Have students talk about what happened to the seeds. Talk about how the plant changed overnight. Ask: Do real plants change that way? What is different?
2. Review what a plant or animal needs to survive — its basic needs (air, space, food, and water).

Procedure

1. Pass out the soaked bean seeds, and have students look, feel, and discuss. Have students describe the look and size of the beans.
2. Take two more moist bean seeds, and place them in a baggie. Hang the seeds in the window for plenty of sun. Keep the baggie closed so that the seeds do not dry out.
3. Have students record in their science journal about the day’s activity. Have them record the date, size of seed, and picture of the baggie. Each day have students check on the seeds, take measurements, and make a drawing in their science journal.

Observations and Conclusions

1. After the seeds have grown considerably, have students go back and check through their journal to see the overall growth and development of the plants. Talk about how long it took the seeds to sprout and then develop.
2. Read a story about the life cycle of a tree and how it changes throughout the seasons. Talk about the tree and its changes each season. Create an art/science activity to show each season. Have the students use brown paint and Q-tips to draw four similar tree trunks with braches. Then direct them to show each season as follows:
 - Fall — sponge paint red, yellow, and orange leaves;
 - Winter — add bare branches with paint and snow with cotton balls;
 - Spring — glue on pink tissue blossoms;
 - Summer — add torn paper green leaves and red apples from torn paper or sticky dots.
3. Talk about animals and how they grow and change just like plants.

Sample assessment

- Have the students sequence the life cycle of a bean plant. Have them draw the various stages of the cycle on cards, cut them out, put them in the proper sequence, and paste them to a chart or large sheet in the proper order.
- Photocopy the students' cards, have them trade the copied cards with a partner, and have them repeat the process above.

Follow-up/extension

- Read other versions of *Jack in the Beanstalk*.
- Plant other seeds to compare growth times.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

All about Me!

Organizing Topic Investigating Change

Overview Students take measurements and compare themselves several times during the school year.

Related Standards of Learning K.1a, c; K.9a, b

Objectives

The students should be able to

- identify some changes that people experience over time;
- predict how their own height and weight will change over the school year;
- measure and note changes.

Materials needed

- “All about Me!” handouts (see pp. 56 and 57)
- Paper
- Crayons
- Measuring tapes
- Scale

Instructional activity

Content/Teacher Notes

This is an ongoing lesson that can be started at the beginning of the year and then revisited again and again throughout the year. Start the year by having the children complete the “All about Me! 1” sheet (see p. 53) with a prediction as to how much they might grow this year. At the end of the year, have the students complete the “All about Me! 2” sheet (see p. 54) and then describe the year’s changes.

Introduction

1. Read a story about “me.”
2. Have students talk about themselves and what they like about themselves.

Procedure

1. Help students complete the “All About Me! 1” sheet. They will need to record a picture of themselves, their height, their weight, and their hand size. Call students to the scale and measuring tape so they can complete this data with your help.

Observations and Conclusions

1. Have students present their sheet to others in the class, telling how they think they will change during this school year.
2. Listen and note what type of changes the students think will happen the year. Discuss: What if we measured you again tomorrow? Would we get different answers? Why, or why not?
3. At the end of the year have students complete the “All About Me! 2” sheet. Again, help students with measurements, as necessary. Discuss the changes that have happened over the year.

Sample assessment

- Cut out magazine pictures that might show what individual people look like as children, as young adults, and as older people. Have students tell about these changes.

Follow-up/extension

- Send home a note asking parents to complete a baby version of the “All About Me!” sheet. Have students make comparisons between what they looked like then, including their size, and what they look like now.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

All about Me! 1

<p>Here is how I write my name:</p> <p>_____</p>	<p>I am ____ years old. My birthday is _____.</p>	<p>I am ____ inches tall. I am as tall as a _____.</p> <p>At the end of the year I think I will be ____ inches tall.</p>
<p>I weigh ____ pounds. I am as heavy as a _____.</p> <p>At the end of the year, I might weigh ____ pounds.</p>	<p>Here is what I look like now.</p>	<p>This is what I will look like at the end of the year.</p>

On the back of this paper, trace your hands to show how **BIG** they have grown.

All about Me! 2

<p>Here is how I write my name:</p> <p>_____</p>	<p>I am ____ years old. My birthday is _____.</p>	<p>Now I am ____ inches tall. I am as tall as a _____.</p>
<p>Now I weigh _____ pounds. I am as heavy as a _____.</p>	<p>Here is what I look like now.</p>	<p>Wow, have I grown! Now I can...</p>

All about Me as a BABY!

This is a picture of me when I was a baby.
I was so cute!

When I was born, I weighed ____ pounds.

I was as heavy as a _____.

When I was born, I was ____ inches long. I
was as long as a _____.

When I was born, my hands were probably
this big. (Draw a picture of your hands.)

Organizing Topic — Investigating Patterns

Related Standards of Learning

- K.1 The student will conduct investigations in which
- a) basic properties of objects are identified by direct observation;
 - c) objects are described both pictorially and verbally;
 - g) a question is developed from one or more observations;
 - j) unusual or unexpected results in an activity are recognized.
- K.8 The student will investigate and understand simple patterns in his/her daily life. Key concepts include
- a) weather observations;
 - b) the shapes and forms of many common natural objects including seeds, cones, and leaves;
 - d) home and school routines.

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The students should be able to

- observe and identify daily weather conditions — sunny, rainy, cloudy, snowy, windy, warm, hot, cool, and cold;
- predict daily weather based on basic observable conditions;
- chart daily weather conditions;
- identify simple patterns in natural objects — veins in a leaf, spiral patterns in cones, shapes and colors of common seeds;
- identify and describe patterns in their daily schedule at home;
- identify and describe patterns in their daily schedule at school;
- distinguish between the patterns in home activities and those in school activities.

Patterns

Organizing Topic Investigating Patterns

Overview Students observe a variety of objects and situations to identify and describe patterns.

Related Standards of Learning K.1a, c; K.8b, d

Objectives

The students should be able to

- identify and describe patterns in nature, at school, and at home.

Materials needed

- Items from nature:
 - Pine cones
 - Sweet gum balls
 - Maple seed-whirllys
 - Acorns
 - Pineapples
 - Leaves
 - Other seeds and items from your environment
- Magnifying glasses
- Clipboards
- Colored pencils
- Paper

Instructional activity

Content/Teacher Notes

You can find patterns everywhere you go. Nature contains many patterns to be seen, described, and appreciated. Night and day is a pattern that repeats itself again and again. The seasons are a wonderful example of patterns that happen repeatedly. There are a great variety of patterns to observe — color, shape, size, growth, and repeating patterns.

Introduction

1. Review what students know about patterns. Have them share some of the patterns that they have created with classroom materials (unifix cubes, toothpicks, pattern blocks, keys, and such).
2. Set the scene for today’s work by stating, “We’re going to go outside and go on a walk looking for those same types of ideas. We’re going on a nature walk to look for patterns.” Have students bring clipboards, paper, and colored pencils so they can record what they see.

Procedure

1. Have small groups of children get together and share some of the patterns they observed. Record ideas on chart paper labeled “Patterns in Nature.” Have each group share their ideas.

2. Give each group the nature items and magnifying glasses. Have them touch, feel, and search for patterns in these items, looking for patterns in colors, shapes such as spirals, veins, and other patterns.
3. Add these ideas to the nature patterns. Share.

Observations and Conclusions

1. Have students look at the charts, and review all the patterns they found in nature. Ask: How is school like nature? Are there colors, shapes, behaviors or routines that are repeated during our school day or year? What are some patterns that we see in school? Calendar, calendar time? Lunch? Special classes? How we line up? School colors? Make a chart of these “School Patterns.”
2. Have students think about these same ideas for their at home time. Make a chart of these “Home Patterns,” and have students share ideas about patterns that take place at home. Ask: Do you eat at a certain time each day? Do you have a bedtime routine? Do you do the same stuff when you get off the bus each day?
3. Talk about these three charts, and compare how they are alike and how they are different from one another. Some patterns happen daily, others seasonally, and others happen only once a year but repeat themselves year after year.

Sample assessment

- Lead students in folding a sheet of paper into a three-box (a burrito fold). In one section, have them draw some patterns they see in nature. In the second section, have them draw some patterns they see at school. In the third, have them draw patterns from home. Have them share their drawings with others, compare their drawings with those of others, and tell how they are alike or different.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Weather Patterns

Organizing Topic Investigating Patterns

Overview Students collect information about recent weather and look for patterns.

Related Standards of Learning K.1c; K.8a

Objectives

The students should be able to

- observe, identify, and chart daily weather conditions;
- predict daily weather based on basic observable conditions.

Materials needed

- A window or door to open daily
- Weather pieces — sun, rain, wind, cloud, snow, hail
- Class thermometer — a real one for outside
- Large paper thermometer for demonstration, color coded for hot, warm, cool, cold, and freezing
- Weather maps (check daily newspapers)
- Weather bear with weather necklace

Instructional activity

Content/Teacher Notes

Studying the weather is a good way to learn about observations and patterns. Weather happens daily and can be easily seen and recorded. There are lots of daily and seasonal patterns that occur in weather. These patterns help us make predictions about weather trends and occurrences.

Introduction

During daily calendar or class meeting time:

1. Use a square sticky note to indicate each day’s precipitation with a drawing or with words. Place these squares on a chart in applicable columns. After some weeks, have the students “read” this chart like a bar graph. They should easily see what type of precipitation has occurred the most and what type has occurred the least over these weeks.
2. Appoint a “weather person” who looks out a window or goes outside to collect daily observations and then tells the class about the
 - sky — sunny, mostly sunny, partly cloudy, cloudy
 - precipitation — dry, rain, snow, hail, sleet
 - temperature — hot, warm, cool, cold, freezing
3. The “calendar helper” may record this information. Here are some ideas:
 - A weather bear (a stuffed bear with three cardboard clouds tied around his neck to represent the clouds each day) might be used to show the day’s cloud cover. Today is cloudy, so weather bear wears all three clouds to the front and nothing behind his neck. Today is mostly sunny, so weather bear wears one cloud to the front and the other two behind his neck. Each day the actual clouds can be compared to yesterday’s cloud cover, as shown by weather bear, before he records today’s clouds.

- The temperature might be recorded in two ways:
 - Move the indicator on a large paper thermometer to indicate the day’s color-coded temperature: in the red area for a *hot* day, in the dark blue area for a *freezing* day, etc.
 - Make a monthly temperature graph by putting a sticky dot on the graph each day to show the day’s color-coded temperature. This enables an end-of-the-month look at the temperature trends.

Procedure

1. Have the students look at the calendar, and talk about some of the patterns we see in the weather. Help students see that when the sun is out, the temperature is usually higher or warmer; when it is cloudy, the temperature is usually lower or cooler. Ask: Is there a connection between rain and temperature? If so, what is the pattern? How about snow and clouds and temperature? Help students identify these patterns and share with one another.
2. Ask students how they know what to wear each day. Parents, TV, radio, newspaper, and the weather channel are a few possibilities. Another way is to read the weather map in the newspaper. Pass out several maps to small groups. Have students take a few minutes to look these over and get ready to share what they see and understand.
3. Discuss among the class.

Observations and Conclusions

1. Listen for the weather words that students use in the context of using the weather maps.
2. Talk about how we might use these ideas and the weather maps. Ask: How could all this help us get ready for tomorrow? How would it help us if we were going on trip?
3. Add a new weather-oriented job to calendar time. Have a student use the day’s weather and a weather map to predict what the weather might be tomorrow. Record his/her ideas, and ask for reasoning for the predictions.

Sample assessment

- Have students predict, by drawing pictures, what they think the weather might be tomorrow.
- Have students fold a six-box and draw and label in each box a type of weather we have here in Virginia.

Resources

- *Wonderful World of Weather*.
http://www.k12science.org/curriculum/weatherproj/index_NEW.html.
- *The Weather Channel*. <http://www.weather.com/>.
- *Severe Storms: Online Meteorology Guide*.
[http://ww2010.atmos.uiuc.edu/\(Gh\)/guides/mtr/svr/home.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/svr/home.rxml).
- *Weather and Climate Information for Teachers*. USA Today.
<http://www.usatoday.com/weather/wteach.htm>.
- Virginia Department of Education’s *Mathematics Standards of Learning Enhanced Scope and Sequence*, Kindergarten. <http://www.doe.virginia.gov/VDOE/EnhancedSandS/mathematics.shtml>. “Hot or Cold?” activity.
- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.

- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Organizing Topic — Investigating Magnets

Related Standards of Learning

- K.1 The student will conduct investigations in which
- a) basic properties of objects are identified by direct observation;
 - c) objects are described both pictorially and verbally;
 - g) a question is developed from one or more observations;
 - j) unusual or unexpected results in an activity are recognized.
- K.3 The student will investigate and understand that magnets have an effect on some materials, make some things move without touching them, and have useful applications. Key concepts include
- a) attraction/nonattraction, push/pull, attract/repel, and metal/nonmetal; and
 - b) useful applications (refrigerator magnet, can opener, magnetized screwdriver, and magnetic games).

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The students should be able to

- predict and test which common objects will be attracted to magnets and which will not be attracted to magnets;
- classify objects as being attracted or not attracted to magnets such as iron nail, iron-bearing paper clip, cereal, and book;
- explain in their own words essential vocabulary, including the concepts of attraction/nonattraction, push/pull, attract/repel, and metal/nonmetal;
- identify items in the home that contain a magnet or magnets such as can openers, magnetized screwdrivers, magnetic games, and refrigerator magnets;
- evaluate the importance and usefulness of magnets in the home.

Magnet Madness

Organizing Topic Investigating Magnets

Overview Students conduct simple explorations to develop an understanding of magnets and their uses.

Related Standards of Learning K.1a, c, g; K.3a, b

Objectives

The students should be able to

- develop an understanding of magnetic properties, such as push, pull, attract, and repel;
- identify and describe the many uses of magnets at home and beyond;
- classify objects based on their behavior with magnets.

Materials needed

- Magnets — at least one per student or small group
- Bags — one per group — filled with one each of the following objects
 - Paper
 - Pencil
 - Paper clip
 - Washer
 - Steel nail
 - Coated paper clip
 - Plastic spoon
 - Cork
 - Steel wire
 - Penny
 - Refrigerator magnet
 - Safety pin

Instructional activity

Content/Teacher Notes

These activities are written as one lesson but could easily be broken into three or four lessons over several days. The more experience children have with magnets, the stronger their understanding and the better their development of the concept. The following Web site contains background information for the teacher: http://www.sciencetech.technomuses.ca/english/schoolzone/Info_Magnets.cfm#whatare

Magnets are very useful. They help make work easier. You can find magnets in the lab, in jewelry, for fishing, on the construction site, in the kitchen, in cars, radios, video recorders, and even on the farm. Students need to explore and investigate magnets. By doing this, they can come up with many of the properties and behaviors of magnets.

Safety Note: Keep magnets away from electronic devices such as computers, watches, and clocks, as they can damage these items even with brief contact.

Introduction

1. Give each child or small group a magnet and bag of materials. Ask them to sort (group) the objects in the bag into two piles by using “this,” referring to the magnet. At this point, it is not important to name “this” or tell them how to sort; let the students find different ways to sort.
2. Give students ample time to sort in a variety of ways and then share how they sorted.
3. Listen to different explanations, but call attention to the groups that sorted by “picked up” and didn’t pick up.” Take note of the different terminology the children use to describe these groups, such as “sticks,” “doesn’t stick,” “attracts,” “doesn’t attract,” and so forth.
4. Have students put the materials back in their bags, and introduce the words *magnet*, *attract*, and *not attract* in the context of the sorting activity.
5. Have students use their magnet to test other objects in the classroom to see if they are attracted to or are not attracted to the magnet. Be sure to explain the safety issue concerning magnets!

Procedure

1. Have the students go back to the materials and look at the ones that are attracted to the magnet. Talk about what they have in common, getting to the idea of metal and nonmetal. Talk about the pencil and how it acts both ways depending on what part of the pencil you touch to the magnet. Talk about the penny. Ask: Why isn’t it attracted to the magnet? Talk about different types or kinds of metal, such as aluminum, copper, steel, and iron.
2. Have students put all materials away except for the magnets. Give students several minutes to play with the magnets and see how they act with one another. If you have donut magnets (those with holes in the middle) let children try to put two of them on a pencil. Share what happens.
3. Introduce the vocabulary words *push*, *pull*, *attract* and *repel* in the context of this exploration.

Observations and Conclusions

1. Brainstorm some places that magnets are used. Show students examples of games that use magnets, tools that use magnets, refrigerator magnets, and other applications.

Sample assessment

- Have students complete the sheet about things magnets attract and things they do not attract (see p. 67).
- Have students complete the Magnet Vocabulary sheet (see p. 66), sharing their ideas with pictures and words.
- Have students record in their journal “Things I Learned about Magnets.” Check to see what ideas they remember and what concepts they can illustrate and explain in their own words.

Follow-up/extension

- Have students test magnets in sand, in water, and through a table. Ask: Can it still pick up or attract a metal object?

Resources

- “Background Information for Magnets.” *Canada Science and Technology Museum*. http://www.sciencetech.technomuses.ca/english/schoolzone/Info_Magnets.cfm#whatare.
- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.

- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

Name: _____

Magnet Vocabulary

Use pictures and words to tell what you know about each idea.

<p>Push</p>	<p>Pull</p>
<p>Attract</p>	<p>Repel</p>

Name: _____

Think about your work with magnets. Complete the chart by drawing some objects.

Things that a magnet CAN pick up (does attract):	Things that a magnet CANNOT pick up (does not attract):

Organizing Topic — Investigating Plants and Animals

Related Standards of Learning

- K.1 The student will conduct investigations in which
- a) basic properties of objects are identified by direct observation;
 - b) observations are made from multiple positions to achieve different perspectives;
 - c) objects are described both pictorially and verbally;
 - d) a set of objects is sequenced according to size;
 - e) a set of objects is separated into two groups based on a single physical attribute;
 - g) a question is developed from one or more observations;
- K.6 The student will investigate and understand basic needs and life processes of plants and animals. Key concepts include
- a) living things change as they grow, and they need food, water, and air to survive;
 - b) plants and animals live and die (go through a life cycle); and
 - c) offspring of plants and animals are similar but not identical to their parents and to one another.

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The students should be able to

- describe the life needs of animals and plants. The life needs are food, water, and air;
- predict what will happen to animals and plants if life needs are not met;
- describe some simple changes animals and plants undergo during the life cycle. For animals this may include changes in color, body covering, and overall size. For plants this may include size, presence of leaves and branches and ability to produce flowers and fruits;
- compare and contrast young plants and animals with their parents, using pictures and/or live organisms.

Life Cycles

Organizing Topic

Investigating Plants and Animals

Overview

Students look at the different stages of plants and animals to compare and contrast.

Related Standards of Learning K.1a–e, g; K.6a, b, c

Objectives

The students should be able to

- compare the changes that happen in plants and animals as they grow;
- sequence and order the stages of growth for plants and animals.

Materials needed

- Baby and adult picture sheets (see pp. 73 and 74)
- Frog and butterfly life cycle pieces
- Paper

Instructional activity

Content/Teacher Notes

Plants start as seeds and go through several changes before they become adult plants. Seeds are usually small, but many seeds can grow into enormous plants, such as trees. At some point they die. Some die within one year, while others live for hundreds of years. Animals also go through a life cycle. They start as “eggs” and grow into young animals and then into adults. Animals also go through the final stage of dying. Both plants and animals have the ability to reproduce and start this amazing cycle again.

Introduction

1. Read a book about the life cycle of a tree.
2. Ask: Where do trees come from? Seeds! Collect some acorns, maple seeds, or other tree seeds to observe.
3. Plant the seeds in pots, and let them develop into seedlings in the classroom. Be sure to have the students observe their growth frequently. Find pictures of adult trees, or take children outside to observe mature trees. Have the students compare these pictures/real trees with the seedlings. Ask: What’s different? Some differences expressed might be size, shape, number and size of leaves.

Procedure

1. Ask students: How might a frog or butterfly be like these seedlings and trees? Help students develop the idea that frogs and butterflies also grow, change, develop, and die. Share a story about frogs or butterflies.
2. Role play the life cycle of a frog or butterfly. Have students talk about its growth and change each step of the way. Point out the changes in color, size, shape, and body.

Observations and Conclusions

1. Compare the plants and animals that have been studied. Ask: What happened to both? They got older. They looked different. They both died or will die. Talk about the similarities.

2. After students make observations and talk about the similarities, give each student one picture from the baby sheet and one from the adult sheet (see next pages). Have them match the baby with the adult by searching for the partner who has the matching picture. Once they have found their partners, have pairs sit and talk about how their object has changed from the way it looked as a baby to the way it looks as an adult.

Sample assessment

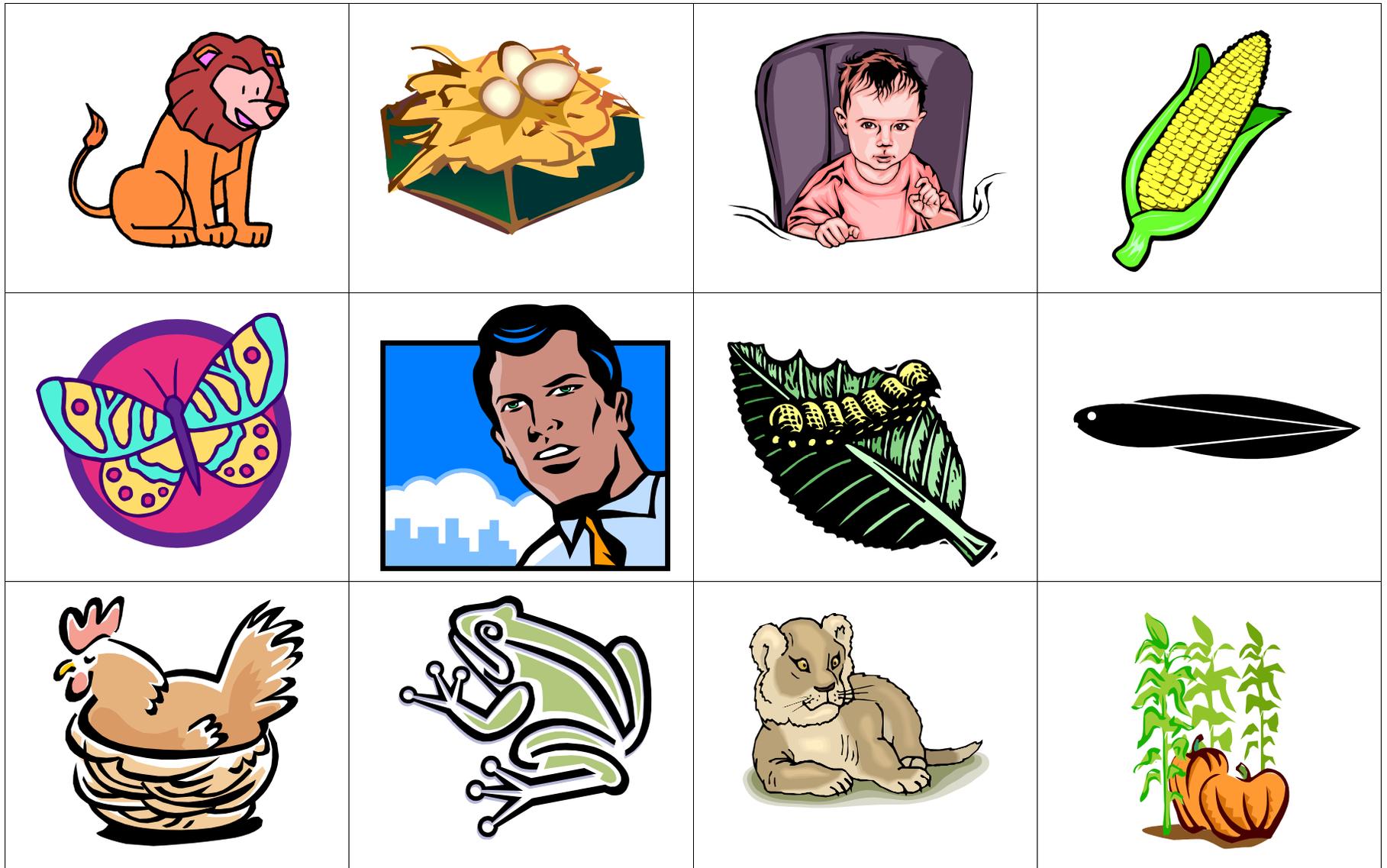
- Glue each pair of matched baby-adult pictures side-by-side on a sheet of paper. Have students compare the two and tell how they are alike and different.
- Have the students complete the Butterfly Life Cycle (see p. 73) by putting it in order. Ask them to tell about each stage and what changes are happening.
- Have children fold a piece of paper to create four equal sections, and ask them to draw the four stages of a plant — seed, sprout, plant, and death.

Follow-up/extension

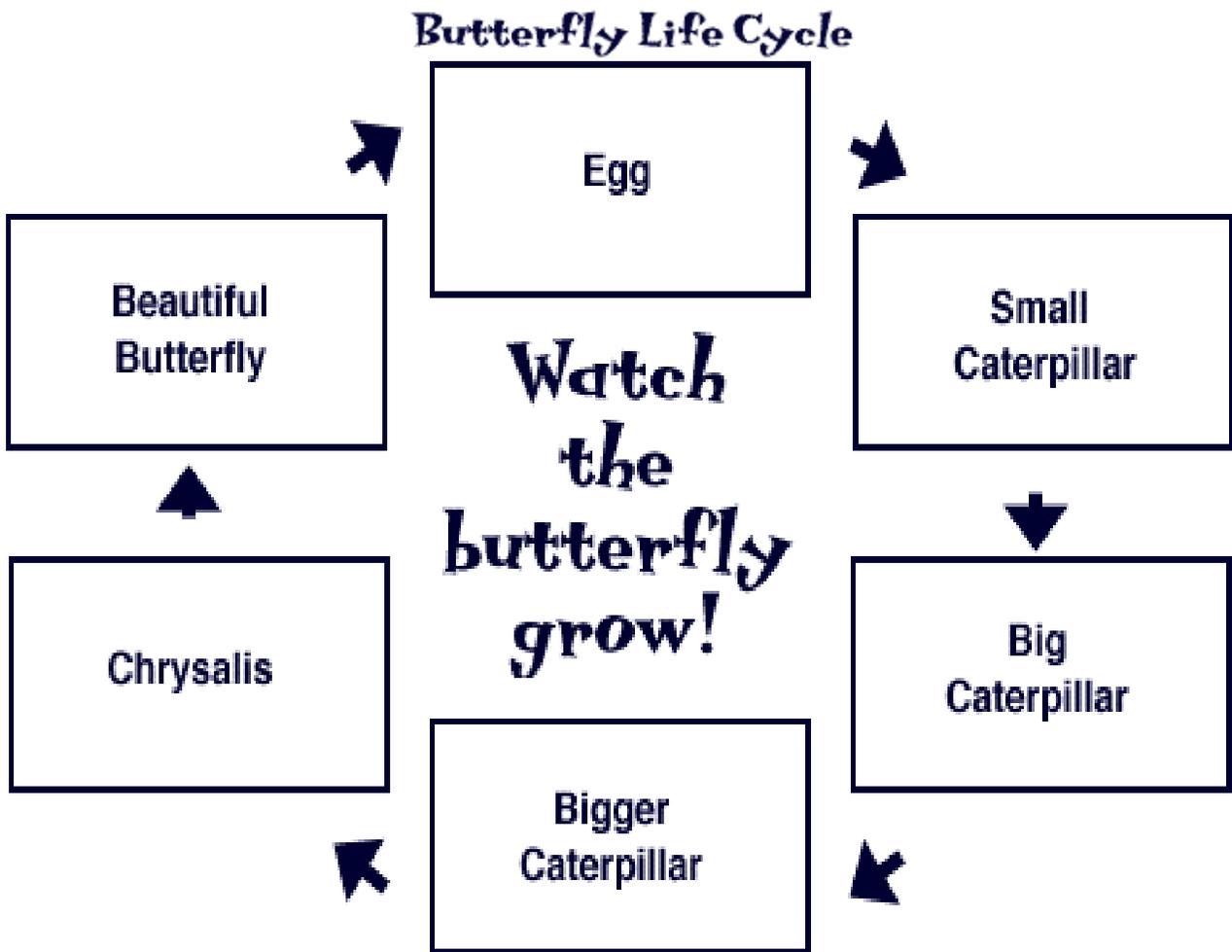
- Grow butterflies, frogs, or mealworms (available from science supply catalogs). Have students keep a journal of the changes they observe. *Safety Note: Consult the Virginia Wildlife laws at http://www.dgif.state.va.us/wildlife/regs/wildlife_laws_educators.pdf when dealing with living organisms in the classroom.*
- Illustrate the life cycle of a butterfly with a cotton ball (egg), dyed, stuffed sock (caterpillar), small brown bag (chrysalis), and a clothespin with clip-on wings (butterfly). Have students tell others the stages of change and the physical changes that happen along the way.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.

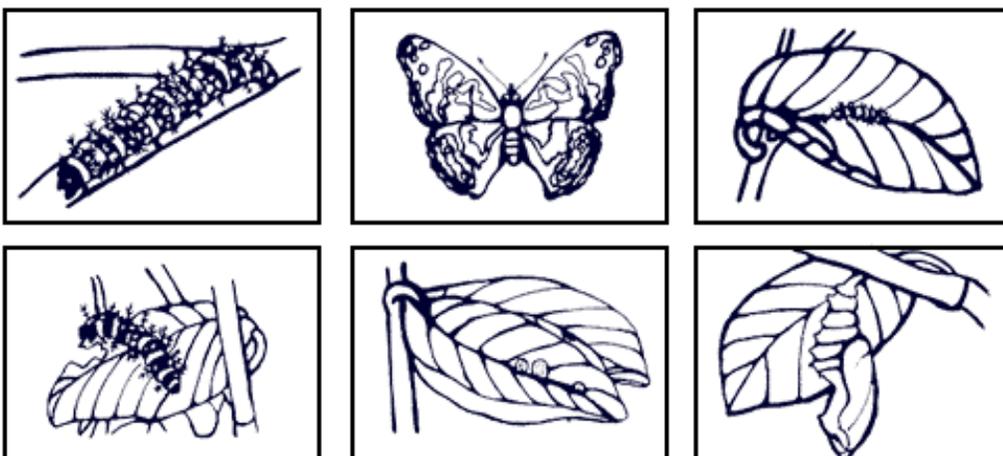






✂ Cut along here...

Color these pictures. Then cut them out and paste or tape them onto the life-cycle chart. Be sure to match each picture to the correct life-cycle stage in order from egg to butterfly!



Plant and Animal Needs

Organizing Topic Investigating Plants and Animals

Overview Students read and discuss the basic needs of plants and animals.

Related Standards of Learning K.1a, b, c, g; K.6a, b, c

Objectives

The students should be able to

- identify and discuss the basic needs of plants and animals;
- explain what happens to plants and animals when their needs are not met.

Materials needed

- Plant and animal magazines
- Basic-needs cards (see pp. 78–80)

Instructional activity

Content/Teacher Notes

All plants and animals need air, food, and water to survive. Food and water is collected in a variety of ways. Some animals search and hunt for their food and water. Others wait and scavenge off of the hard work of others. When plants do not have their basic needs met, they wither and die. When animals do not have their basic needs met, they have to move to find them, or they too will die.

Introduction

1. Ask students to fold a piece of paper in half. On one half, have them draw and/or write everything they know about plants; on the other half, everything they know about animals.
2. Have students come together and share what they drew and wrote about plants and animals. Record their ideas on chart paper. Look for references to food, air, and water. Ask: Can you find any similarities between the plants and animals?

Procedure

1. Talk about the basic needs that came out in the comparisons. Both plants and animals need AIR, WATER, and FOOD. Talk a little about each one and what it means for us as humans: we need AIR (so we can breathe), WATER (to keep us hydrated and alive), and FOOD (we usually need to eat three times a day — breakfast, lunch, and dinner).
2. Brainstorm different habitats or places for plants and animals to live. You may want to read a story or two to stimulate thinking. Choose one of these that the children know:
 - Desert — cactuses, coyotes, snakes, scraggly trees, flowers, camels, etc.
 - Forest — bears, oak trees, maple trees, moss, chipmunks, owls, birds, etc.
 - Ocean — fish, kelp, whales, sharks, octopuses, sponges, plankton, dolphins, etc.
 - Rainforest — howler monkeys, sloths, toucans, flowers, boa constrictors, turtles, salamanders, fig trees, water lilies, etc.
3. Cut out magazine or Internet pictures of animals and plants that live in the selected habitat. Draw the ones you cannot find. Give a picture to each student to glue onto construction paper and tie on as a necklace.

4. Have students make a circle and pretend that they are the plant or animal on their card. They are to act (eat, drink, and breathe) like their animal or plant. Sit in the center of the circle with the needs cards. Show the water card, and ask: Who needs this? How do you need it? Let several students explain. Ask: What would happen if the water got dirty, what if it made you sick? Who else would get sick if the water got dirty? An example might sound like this: “The water is dirty and poisonous so the plants die. The turtles got sick from the sick water or plants and either died off or they had to move and find fresh, clean water.” Look for a variety of animals.
5. Repeat with the other needs.

Observations and Conclusions

1. Listen as the children discuss who “needs” what and what happens when those needs are not met. Notice when the students make connections between plants and animals. Help them see that if one need is not met, then plants sometimes die, and animals have to move away or they too may die.
2. Read a story about a tree’s changing habitat over time. Talk about the different members of the habitat. Ask: What happens to them if the trees are cut down? What happens if the rains stop falling? How does it affect the plants and animals?

Sample assessment

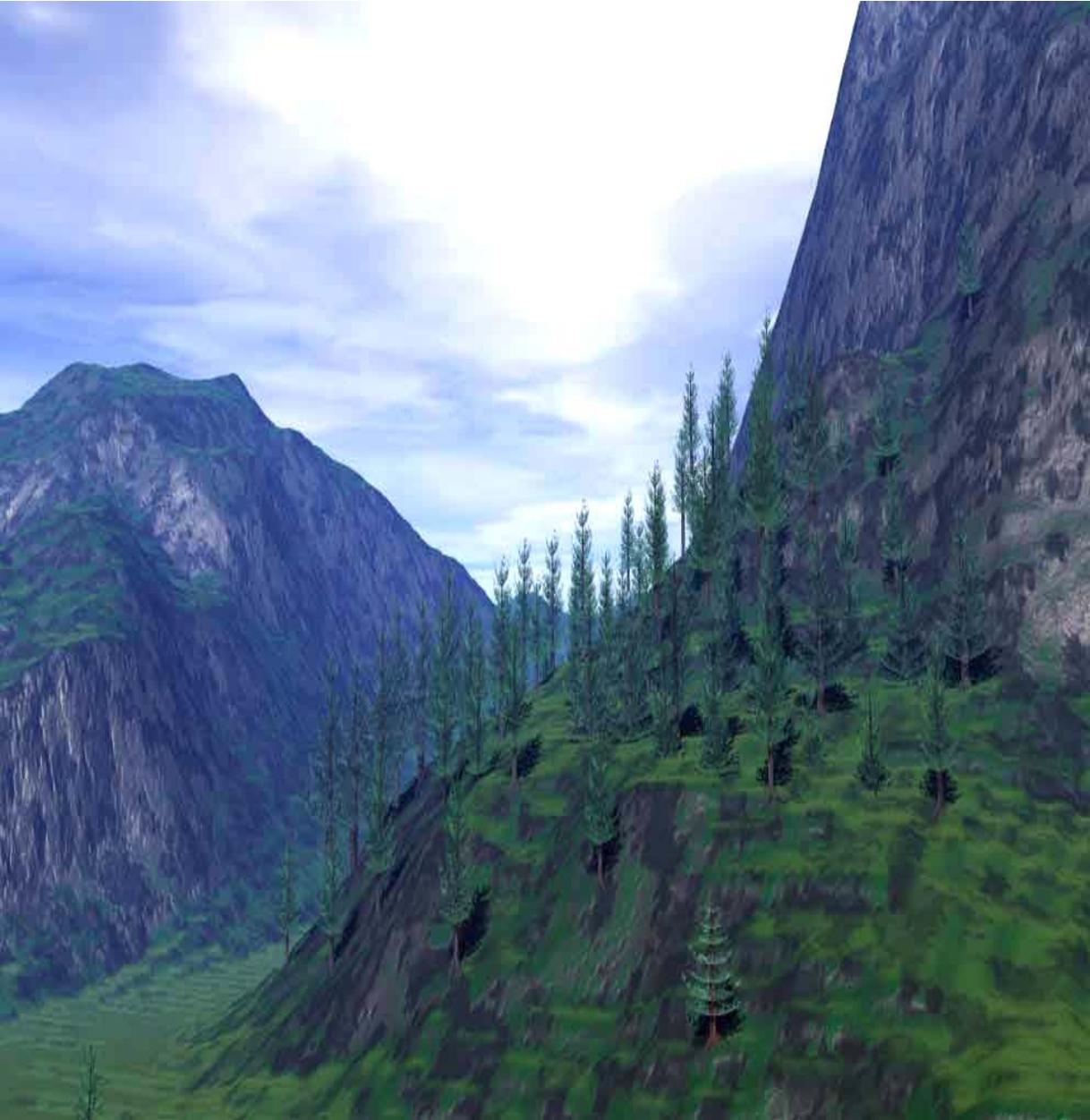
- Have students complete a basic-needs chart by drawing and labeling the three basic needs of plants and animals.
- Have students draw a picture of a habitat, which should include plants, animals, food, air, and water.

Follow-up/extension

- Set up experiments to test the basic needs of plants. Get flats of inexpensive flowers and “test” to see how they react 1) without water, 2) without air, or 3) without food.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.



AIR



FOOD



WATER

Organizing Topic — Investigating Recycling

Related Standards of Learning

- K.1 The student will conduct investigations in which
- a) basic properties of objects are identified by direct observation;
 - c) objects are described both pictorially and verbally.
- K.10 The student will investigate and understand that materials can be reused, recycled, and conserved. Key concepts include
- a) materials and objects can be used over and over again;
 - b) everyday materials can be recycled; and
 - c) water and energy conservation at home and in school helps preserve resources for future use.

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The students should be able to

- give examples of objects, such as paper, plastic containers, and glass containers, that can be recycled;
- identify materials that can be reused;
- describe the difference between recycle and reuse;
- name ways to conserve water and energy;
- describe how to recycle a given material — paper, oil, aluminum, glass, and plastics;
- predict what would happen if recycling and reusing were not practiced.

Recycling

Organizing Topic Investigating Recycling

Overview Through dialogue, stories, and role playing, students develop an understanding of the importance of recycling.

Related Standards of Learning K.1a, c; K.10a, b, c

Objectives

The students should be able to

- give examples of objects that can be recycled or reused and how to go about this process;
- describe the difference between recycle and reuse;
- name ways to conserve water and energy;
- predict what happens to our world if we do not recycle and reuse.

Materials needed

- Stories
- Paper
- Crayons
- A bag of garbage items — glass bottles, plastic bottles, banana peel, old batteries, paper, junk mail, plastic straws, plastic butter tubs, paper towel tubes, egg carton, Popsicle stick, and others

Instructional activity

Content/Teacher Notes

We *all* need to do our part to take care of our world and planet — the Earth. We need to be aware of what damage we do to the Earth every single day and how we can help to control this damage.

Introduction

1. Read a story about how animals are affected by litter. Ask students: What can we do to stop this from happening around us? Introduce the words *reuse* and *recycle*. Ask: What do they mean?
2. Place the bag of “trash” on a table covered in paper. Pour out contents of the bag and let students observe. Ask: What do you see? What can we do with this stuff? Review the words *recycle* and *reuse*. Ask: Is there anything on this table that might be recycled or reused? Discuss.

Procedure

1. Ask: How else can we help Mother Earth? Read a book about the Earth and how we can keep it clean and beautiful. Ask thought-provoking questions, such as: What can we do with all the litter? What can we do with our lights and electric appliances? What about carpools, how do they help? What about using water — brushing teeth, running the shower, and filling the tub? How can each person help?
2. Have students draw or paint pictures of Earth. Then have them trace their hands on their picture and write in the hands ways they can help to be connected to Earth and preserve its resources for future use.

Observations and Conclusions

1. Have the students create colorful posters that remind others to recycle and reuse. Hang them around the school and community.

Sample assessment

- Have students fold a piece of paper in half. On one half, have them draw items that can be recycled, and on the other half, items that can be reused.

Follow-up/extension

- Have the children make pieces of art out of recycled and reused materials. Create a “Re-Museum” in part of the classroom or elsewhere in the school, in which all pieces on display are made from recyclables.
- Take a field trip to a recycling plant or center.
- Start a recycling project at your school, collecting, for example, white paper from classrooms or cans from the cafeteria and teacher’s room.

Resources

- *Outstanding Science Trade Books for Students K–12*. National Science Teachers Association (NSTA). <http://www.nsta.org/ostbc>.
- *Search for Literature: Literature for Science and Mathematics*. California Department of Education. <http://www.cde.ca.gov/ci/sc/ll/ap/searchlist.asp>. Web site with searchable database.