

Can It Carry Cargo?

Grades 2-3

Overview

The students will experiment with different objects to see which will float or sink in water. The children will also explore making boats out of aluminum foil, to see what shape boat will carry more pennies, when floated in a tub of water.

Objective

- To help students understand how the shape of an object helps determine whether it will sink or float.
- To help students understand that the shape of a boat affects the amount of cargo it can carry.

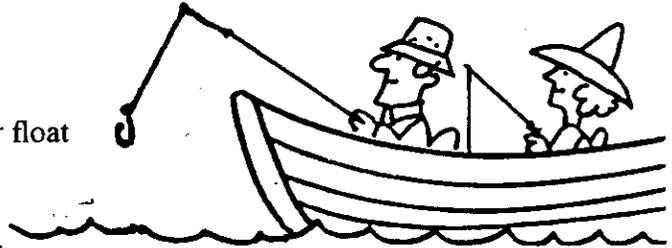
Materials

For the presenter:

- a tub or pan for floating small objects
- a bag with 10-12 small objects to use for floating test (paper clip, pencil, cube of wood, orange, etc.)
- paper towels (for spills)
- labels - **Float, Sink**
- 2 medium plastic bags to hold objects that sink or float

For each group of 4 students:

- Eight - 4"x 4" pieces of heavy duty aluminum foil
- a container of 60 pennies
- 1 small tub - filled 1/3 full of water for floating boats
- paper towels for spills



Getting Ready

Place plastic tub 1/2 full of water in an area where all students will be able to see it from their desks. Have objects ready in a bag by the tub. These will be used for whole group lesson to see what objects will float. Label bags with *Sink* and *Float*. [They will hold objects that sink and float.]

Fill the tubs, that will be used for students to float boats, about 1/3 full of water. Each group of four children will use a tub with water, a container of pennies and paper towel for their activity. Make sure the foil is cut into 4"x4" pieces. Each student will receive 2 pieces of foil.



The class should be divided into groups of four. The students will be sharing a tub of water and will need to be seated near each other.

Procedures

Tell the students that they will be doing some experiments today to help them understand why some things float and some things sink. Use the questions below to get the students thinking and spark their interest.

Activity 1: Sink or Float

Questions

“What things can float? Why do some objects float and others do not? Does the shape of an object have anything to do with whether or not it floats?” Write *float* and *sink* on the chalkboard.

Hold up an object from your bag, ask the class to predict whether or not they think it will float. Choose one student at a time to put an object in the water to test for bouyancy. As the objects are tested, have the students place objects in appropriate bags labeled *Float* or *Sink*. Ask the students if they can find any similarities between the things that did float and the ones that did not.

Activity 2: Building Boats

Explain to the students that they are going to build boats today out of foil. Tell them to think about what they already know about floating when making their boat and that they will be using pennies for cargo in the boats.

Before handing out any materials, explain to the students what they will be doing.

Discuss with the students the rules for using water.

- ◆ Water is to remain in the tub.
 - ◆ Water is only for testing your boat.
 - ◆ If you spill water, please use paper towels for clean up.
 - ◆ Anyone not following the rules will not be allowed to test their boats.
1. You will be given 2 pieces of foil.
 2. Using one piece of foil, you will build a boat that can float.
 3. The tub of water will be for your group to test your boats.
 4. Use the pennies for cargo. See how many pennies your boat can hold. Your group will get a container of pennies to share.
 5. Use the second piece of foil to design a new boat that you think will be able to carry more cargo. Use what you learned building the first boat to help you decide how you want to build your second one.
 6. Ask three students to hand out 8 pieces of foil, 1 container of pennies and paper towels to each group. You will probably want to carry the tubs of water to the groups.

Discussion

As you move around the classroom, ask the students how the shape of the boat affects the amount of cargo it can carry. “How can you change your boat so it will carry more cargo? Can you predict how many pennies your boat will hold?”

Closure

Discuss with the children how the shape of a boat affects the amount of cargo it can carry. Ask students to share how many pennies their boats held without sinking.

Clean up

Tell the students to put the pennies in the container and wipe off their work space. You collect the tubs of water. Ask two students to collect the penny containers for you.

Float

Sink



Dive Right In

Grades 2-3



Overview

The students will observe how water pressure increases in deeper water. They will make a submarine out of a 2 liter bottle, pen cap & clay.

Objective

- To help students have a better understanding of water pressure.

Materials

For the presenter:

- access to sink
- large plastic tub filled with water
- empty tub - used for water pressure experiment to catch water
- Two - 2 liter clear plastic pop bottles with lids
- 1 plastic lid to a ball point pen
- modeling clay
- glass of water
- scissors

For each student:

- 2 liter clear plastic pop bottle with a lid (students could each bring one from home)
- 1 plastic lid to a ball point pen; check with the school office, they may be able to take them off pens in the supply room
- a small ball of modeling clay
- blue food coloring-1 squeeze bottle for each group of 6
- One - 8 oz plastic glass for each pair of students
- 1 tub full of water that students can fill their glasses from

Getting Ready

Make three holes along the side of one plastic bottle, using the sharp point of a pair of scissors. Fill a pitcher with blue water. It will be used later to fill the bottle for the experiment. Have an empty tub ready to catch the water from the experiment. Fill each of the students' 2 liter bottles full of water, leaving about 2 inches at the top. Screw on the lids. Put bottles, pen lids, balls of clay, plastic glasses and the tub of water on a table that has an easy access by students.



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pitcher of
blue water

Procedures

Activity 1: The Pressure's On

Begin by discussing water pressure. Use the questions below to get the students interested and help you find out what they already know about water pressure.

Questions

“Have you ever tried to touch the bottom of a swimming pool? Have you ever felt the water pressing on your ears? Do you know why it does this? (*Water has weight. The weight of the water in the pool is the water pressure that pushes on your ear drums.*) Do you think the pressure is the same on top of the water as it would be down deep? Did you know that when seals dive deeply, they close up their nostrils to keep out the water? Can you think of any other examples of water pressure affecting people or animals? (*scuba diving, etc.*)”

Tell the students that you are going to demonstrate a water experiment. Ask them to think about what they know about water pressure. “As you watch, see if this experiment proves anything about water pressure to you.” Show the class the bottle with the three holes. Tell them that you will choose two volunteers to cover up the holes while you fill the bottle. After the bottle is filled, before you have the students let go of the holes, ask the students the following questions. “What do you think will happen when we let go of the holes? Do you think the water will spurt out of all three holes? Will they look the same?” Let go of the holes. Let the students observe what is happening (*water from the bottom hole should be spurting out the farthest*). Ask the students: “What is happening? Why? What does this prove about water pressure?”

Put away the tub of water and bottle.

Activity 2: Making a Submarine

Questions

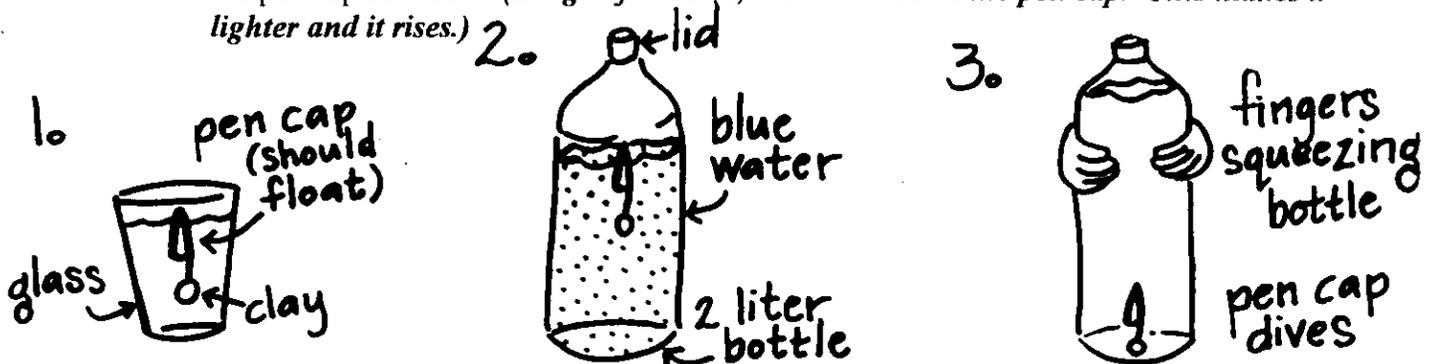
“What is a submarine? Do you know what makes a submarine dive? What keeps it from being squashed by the enormous pressure from the water in the ocean? How can a submarine surface?”

Discussion

Submarines and underwater vessels are special boats that can travel under water and explore the ocean depths. These boats have to be strong to be able to withstand the tremendous pressure deep under the ocean. They contain special tanks that are flooded with water to help make them dive. When they are ready to surface, machines pump air into the tanks to remove the water and make the boats lighter. Because they are lighter, they are able to rise to the surface.

Before handing out any materials, demonstrate for the students how they will make their own submarine.

1. Take a glass and fill it half full of water.
2. Weight the long, thin end of the pen cap with a small blob of clay.
3. Float your cap in the glass of water. Remove or add clay until the cap floats upright.
4. Put two drops of blue food coloring into your 2 liter bottle that is already filled with water.
5. Drop the weighted end of the pen cap into the bottle first. The cap should float at the surface of the water. Then screw on the lid as tight as you can get it.
6. Now to make it dive: Squeeze the sides of the bottle with your fingers. The cap goes down. Ask the students: "Why did the cap go down? (*The water is forced into the pen cap, just like a submarine. This makes it heavy and it sinks.*) What can I do to make the pen cap surface?" (*Let go of the side, the water leaves the pen cap. This makes it lighter and it rises.*)



Hand out the clay, pen caps and glasses with water to the students. Tell them when they get the pen caps to float upright, they may come up and get a bottle already filled with water. They may add two drops of blue food coloring to make their ocean blue. Then take the bottles back to their desk to finish the experiment. Remind them to screw the lids on tight.

Have students experiment controlling the depth of the pen cap by squeezing the bottle different ways.

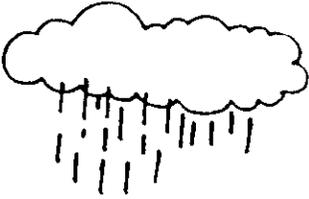
Ask the students: "Can you make your cap go down faster or slower; stay part way down; go down and stay down; or go down and go right back up?"

Closure

As you move around the classroom, ask the children what they have discovered about submarines.

Clean Up

Ask the students to return the glasses and water to the sink and wipe off their tables. They can take the submarines home to share with their families.



Water Cycle at Work

Grades 2-3



Overview

The students will be involved in play acting the water cycle, making their own mini-water cycle and constructing a water cycle hexaflexagon.

Objective

- To help students have a better understanding of the water cycle.

Materials

For the presenter:

- One set of 7 Water Cycle role playing cards from activity packet (may be colored ahead of time)
- paper towels for spills
- Three Words cards: **Evaporation, Condensation, and Precipitation**

For each student:

- One - 8 oz plastic drinking cup
- 1 zip lock sandwich bag
- 1 piece of masking tape to label bags
- water
- cup to measure about 1 oz of water
- 1 hexaflexagon water cycle sheet-available from BPA Public Information Center
- crayons, scissors and glue for hexaflexagon

Getting Ready

Activity 1

Separate the 7 role playing cards [coloring the cards makes them more interesting and fun for the students.] Cut the three word cards into strips. Make sure you have enough space for the role playing activity. You will have 10 children up in front of the class with you.



Activity 2

For this activity, have enough cups, ziplock bags and pieces of masking tape ready for all the students. Take each ziplock bag and cut off one corner so the bottom of the paper cup will fit snugly through it. The bag will be used as a top to keep in the water. Fill a container with enough water so each student will be able to have about 1 oz. of water. Make sure you have the water, 1 oz measuring container and paper towels in a space with easy access by students. Cut out and put together a sample of the hexaflexagon water cycle puzzle. Put student copies in a place with easy access by students.

Procedures

Activity 1: Play Acting the Water Cycle

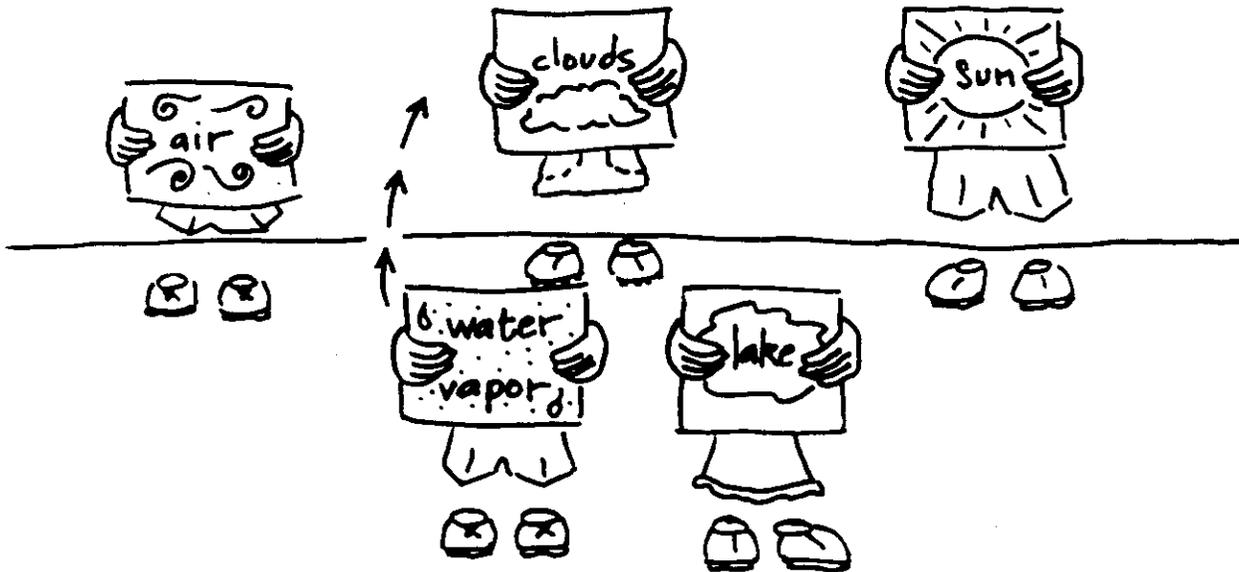
Use the questions below to spark the students' interest and get them thinking. Tell the students that today they will be doing a short play and an experiment about the water cycle.

Questions

“What is a water cycle? Where does rain come from? What happens to rain after it falls? Do puddles really disappear? Could we have a water cycle without the sun? Why is the sun important?”

After a discussion of the water cycle ask students for volunteers to play the parts of the sun, clouds, rain, snow, lake, air (atmosphere) and water vapor. Choose one student for each part and give them the role playing card that goes with their role. Start by placing the the student sun, student lake and the student atmosphere in the front of room. (see diagram on page 2). Begin by telling the children that one day it was very hot outside. The sun had been shining on the lake for hours. Ask the students: “What do you think is starting to happen to the water in the lake? (*Evaporating, the water is turning into water vapor*) Where is the water vapor going?” At this point, have the student water vapor come up and stand by the lake. Have the student water vapor slowly move past the air-atmosphere and towards the back of the room in front and to the left of the sun. Ask the students: “What will happen to this water vapor when it gets up high in the sky? What makes water vapor turn into a cloud? (*Water vapor condenses when it is cooled to the saturation point.*) At this point have the student cloud come out and stand in front of the water vapor. Ask the students: “What will happen when this cloud fills up with water droplets?” (*As a droplet falls through a cloud, it combines with other droplets to produce rain, snow, hail or sleet.*) At this point, have the rain and snow stand behind the cloud and slowly walk toward the lake; when they reach the lake have them kneel down behind the student lake. Tell the students that the water returns to the lake. Ask the students: “Could someone show us how the water cycle continues? (*with the lake*) What happens next? (*The sun shines on the water causing evaporation.*) What does the word *Evaporation* mean?” Have a volunteer bring up the **Evaporation** word card and stand by the lake. Ask the students: “What happens after evaporation?” (*The water droplets form clouds.*)

“Do you know what we call it when water vapor turns into water droplets and forms a cloud?”
(Condensation) Have a volunteer bring up the Condensation word card and stand by the cloud.
 Ask the students: “Once the cloud fills with water droplets, what will happen next? **(Rain or snow will fall.)** What is another name for rain or snow?” **(Precipitation)** Have a volunteer bring up the **Precipitation** word card and stand by the rain and snow students. Ask the students to return to their desk and give them a hand for a job well done.



Activity 2: Making a Mini-Water Cycle

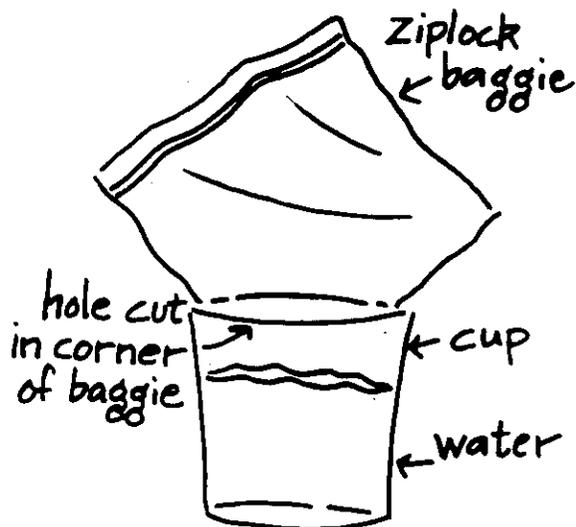
Now that the children have an understanding of how the water cycle works, each one of them will make their own water cycle. Before handing out any materials, demonstrate for the students the steps in making a mini-water cycle.

- Step 1:** Write your name on a piece of tape and put it on the zip lock bag.
- Step 2:** Put the cup into the bag and push it through the hole in the bottom. The bag should fit snug around the top of the cup (see diagram below).
- Step 3:** Pour 1 oz. of water into the cup. Tell students when they are ready for water, they may come up and measure out 1 oz. of water.
- Step 4:** Carefully zip the bag shut without spilling the water.
- Step 5:** Put the mini-water cycle on your desk so you will be able to observe what happens.
- Step 6:** When you are finished, pick up a Water Cycle hexaflexgon, and you may begin coloring it until everyone is ready to put them together.

After the demonstration is completed, hand out 1 bag, 1 cup, and a piece of masking tape to each student.

Discussion

As the students make their mini-water cycles, move around the classroom and ask the students what they predict will happen to the water in their cups. "How long do you think it will take? What will happen to the water droplets that form on the bag?"



Activity 3: Water Cycle Hexaflexagon

Pass out a hexaflexagon to those students who did not get one. Demonstrate the correct procedure for putting the hexaflexagon together. This activity will be a good review for the students. **It can be used as a follow up activity on another day.**

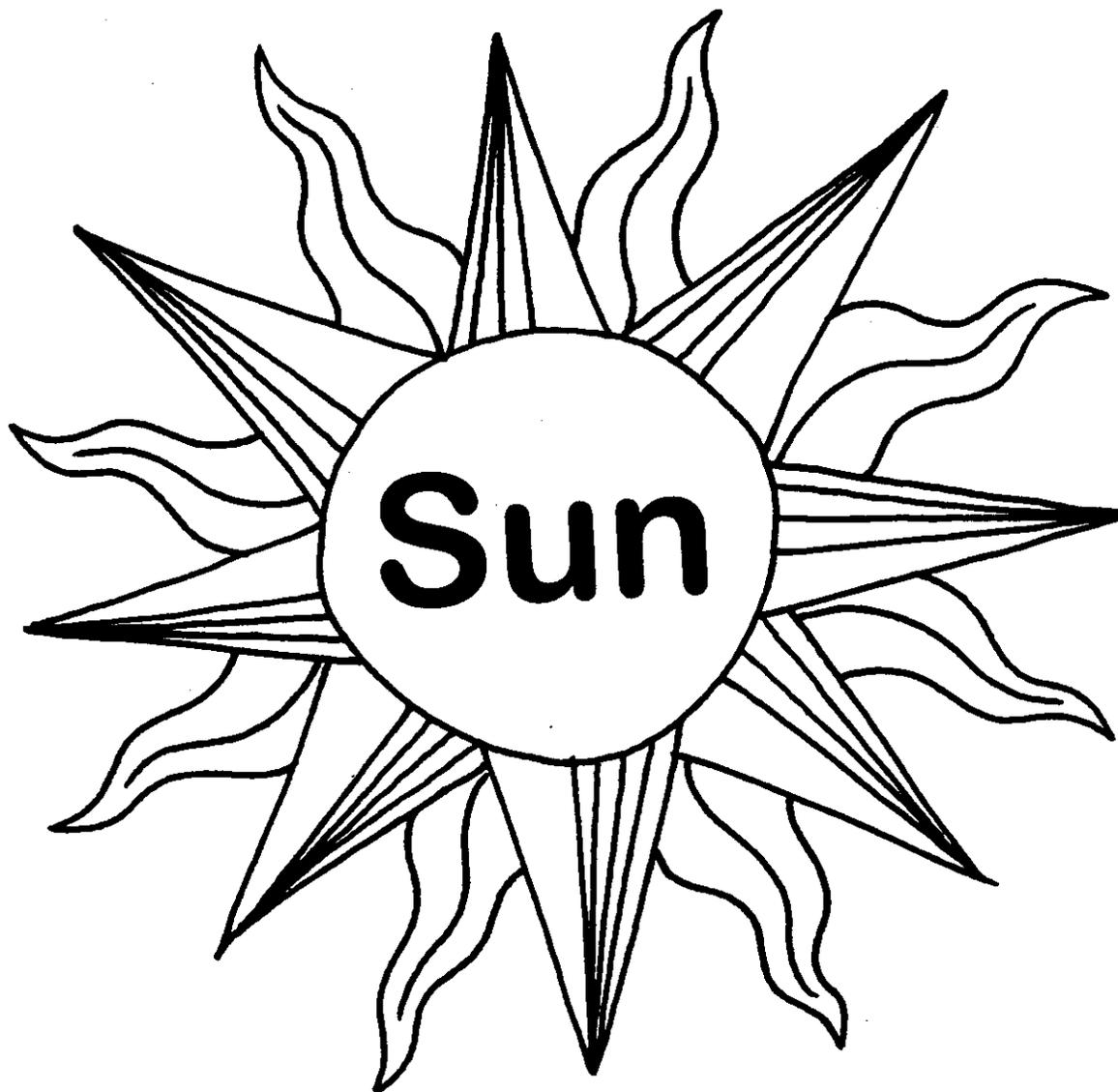
Closure

Hold up the *Evaporation*, *Condensation* and *Precipitation* word cards one at a time; tell the students to whisper to their neighbor what the words means. Ask one student to give the answer out loud.

Clean Up

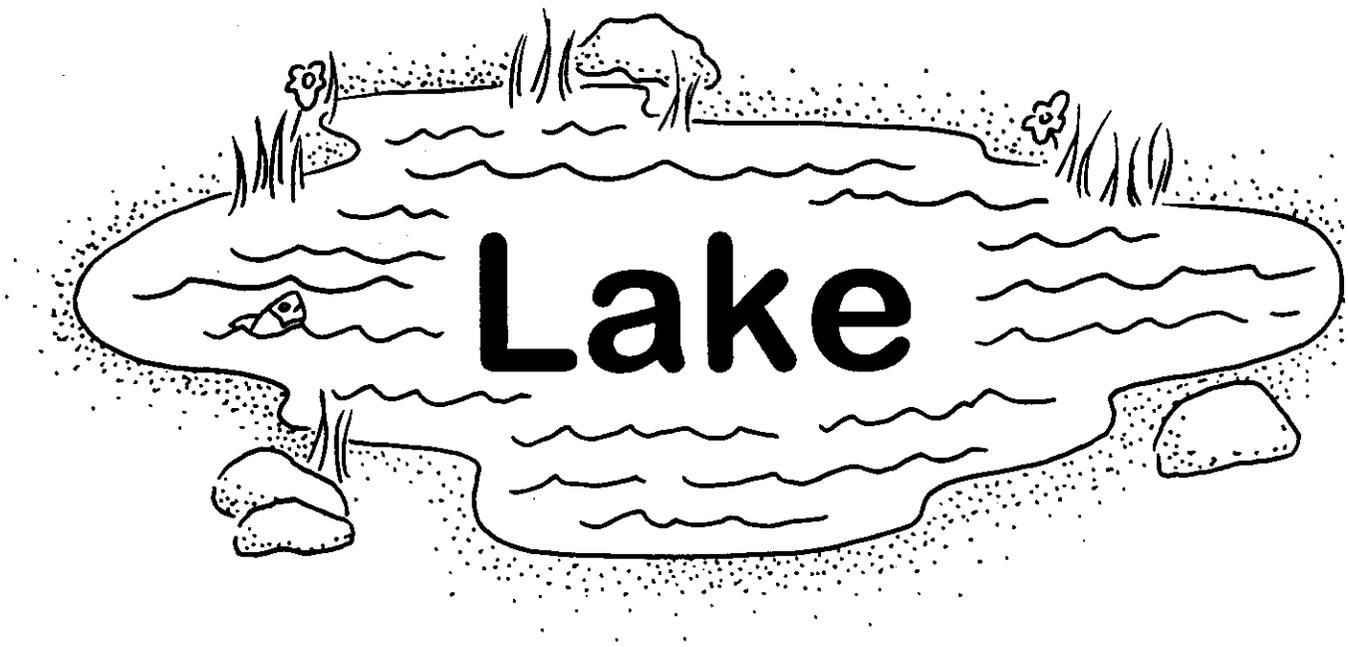
The students will each be responsible to wipe up any water that may have spilled during Activity 2 and pick up paper scraps from Activity 3.

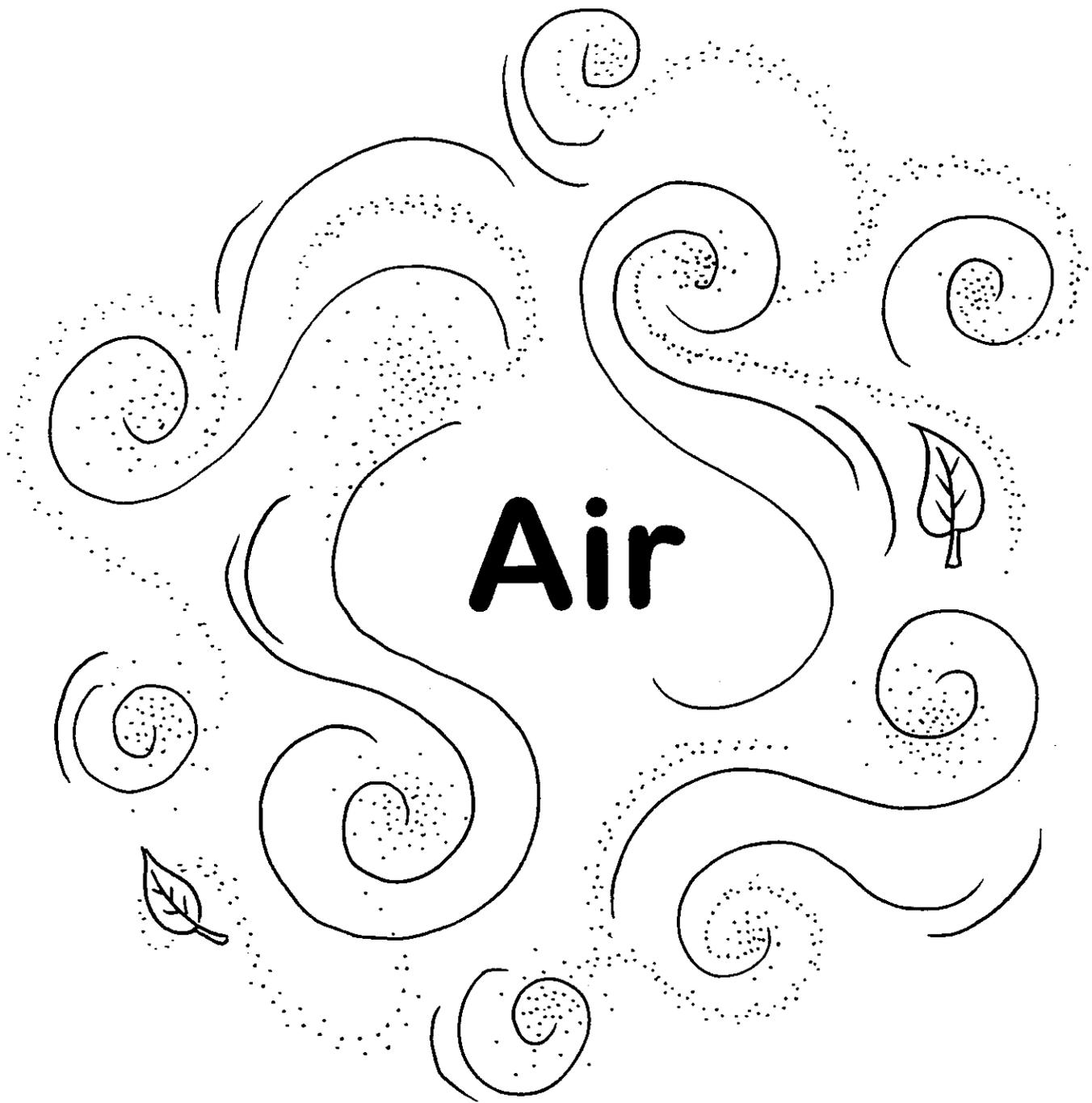


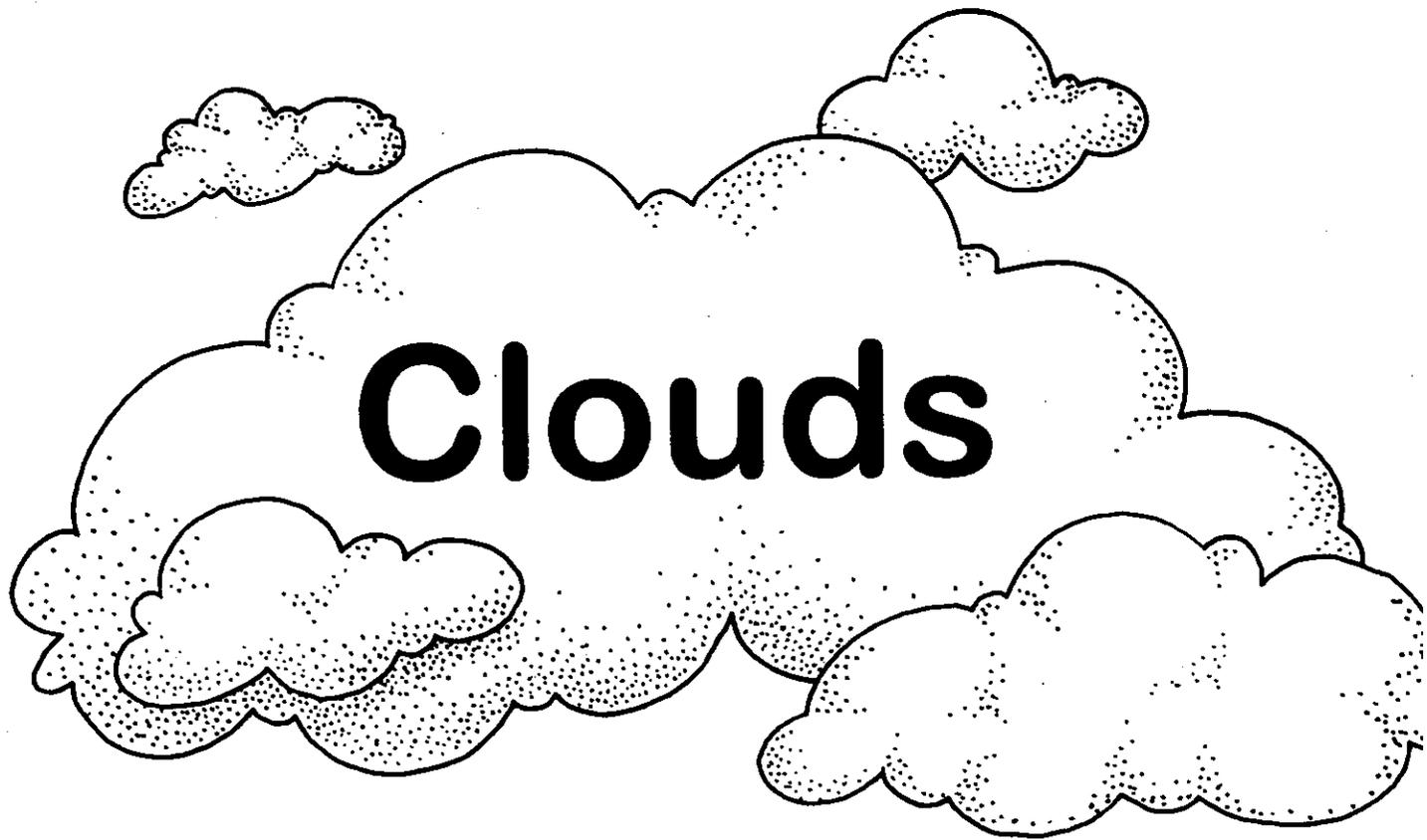


The page features a central illustration of water vapor. It consists of several teardrop-shaped droplets, each surrounded by a cloud of small dots that radiate outwards, representing the evaporation process. The droplets are scattered around the central text. The text 'Water Vapor' is written in a large, bold, black sans-serif font, with 'Water' on the top line and 'Vapor' on the bottom line.

Water Vapor



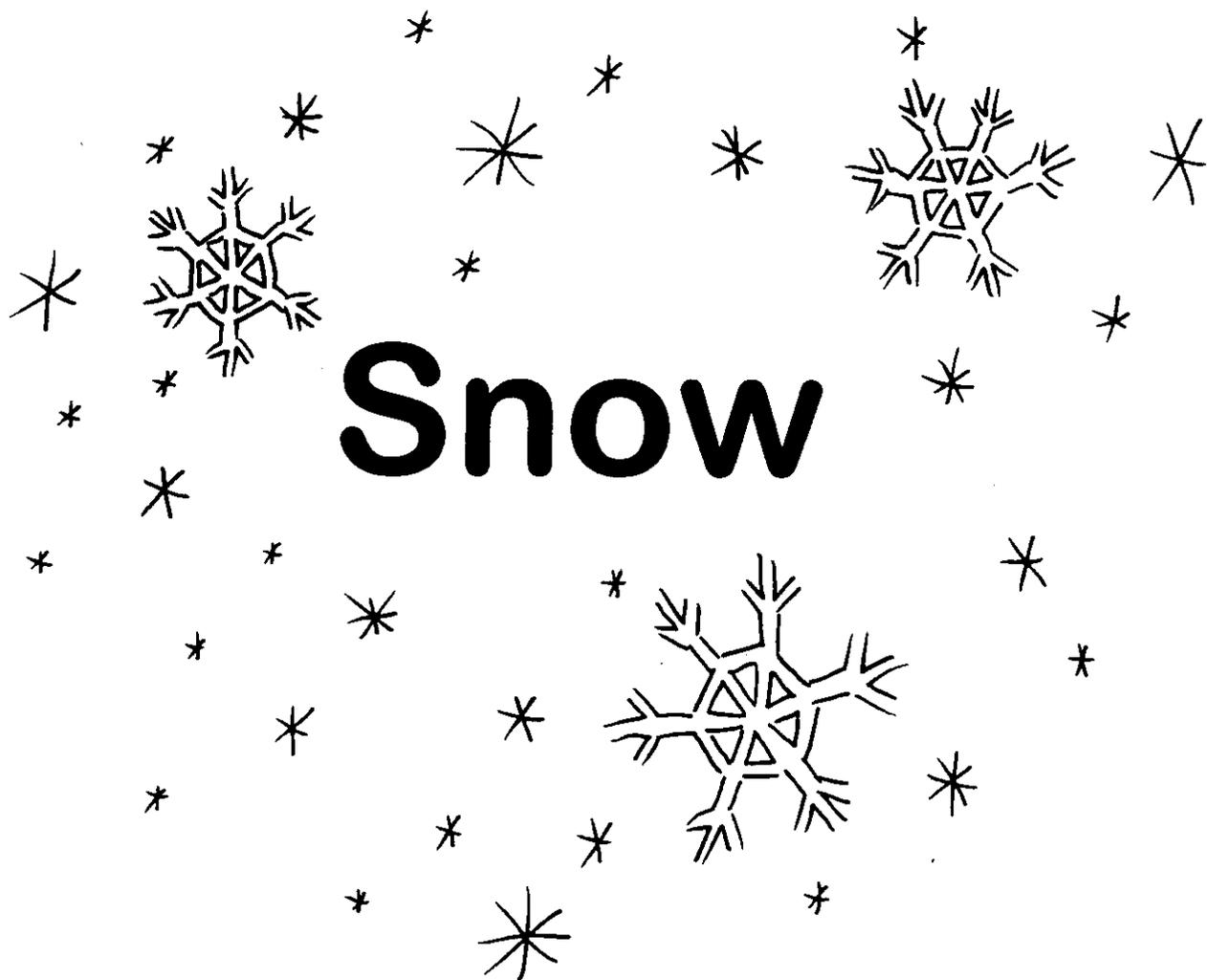






Rain





Evaporation

Condensation

Precipitation